

BIRD-BANDING

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GROWTH RATE OF THE SPOTTED SANDPIPER CHICK WITH NOTES ON NESTING HABITS¹

(Photographs by Alfred O. Gross)

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THE following studies on the Spotted Sandpiper (*Actitis macularia*) were made at the Biological Station of the University of Michigan at Douglas Lake, Michigan, during the summer sessions of 1925-1929.

NEST AND EGGS

At Douglas Lake the Spotted Sandpiper is the commonest shorebird, as it is in many places. There has been an average of six nests for each summer found in the vicinity of the Station during June and July since 1925. The tract of land on which the Biological Station stands extends along the south and east shores of the lake. Here the shore is pure white sand from which shallow dunes arise, and it is back on these that the sandpipers nest chiefly, among the bracken ferns and blueberry bushes. The nest is a saucer-shaped depression lined with pine-needles and dried ferns, and usually protected by some small bush, tree, or fern. The clutch of eggs has been four in every nest observed and (characteristic of the *Limicolæ*) placed with their pointed ends in and down so that they fit into the nest with little waste space. The eggs are ovate with a very slight gloss. The ground color is vinaceous. They are irregularly spotted and blotched with rufous brown and chestnut. The average size of the eggs measured is 32 mm. by 23 mm.

¹ Contribution from the University of Michigan Biological Station. Read at the Philadelphia meeting of the American Ornithologists' Union, October, 1929.

BEHAVIOR AT THE NEST

Incubation and brooding are both done by the male bird alone. Six records of adults collected either on the nest or with downy young, support this assertion. In no case was there another adult present.

In June, 1928, several nests were under daily observation. One of these was built at the base of a small maple tree in front of one of the houses at camp and right beside the board walk to the mess hall. The nest was built and the four eggs were laid before any human arrived to disturb the beauty and serenity of the scene. At first only a handful of people came to open camp. This was alarming! Within two weeks these few had increased to some one hundred and fifty people passing along that sidewalk six times a day. For a wonder the bird did not desert his nest. One June 22d a blind was put up and pictures taken. Observations made from the blind at various times during the succeeding days showed the adult bird to be very restless and always alert. When flushed suddenly, he would leave the nest, flying toward the forest. When merely suspicious of approaching danger, he would run from the nest a short distance through the ferns and watch. While incubating he was particularly nervous, snapping at insects from the surrounding plants, continuously rearranging the pine-needles about the nest, or getting up and rolling the eggs about. Once he got some pitch on his bill and tried to wipe it off on the edge of the nest. This made matters worse, as pine-needles got stuck in it. Once he stood up and turned the eggs end over end instead of rolling them. When it came time for the eggs to hatch, the adult was absent from the nest for shorter periods of time. Often as he approached at this time he would call softly, "Hurrweeee, hurrweeee, hurrweeee". During the rain the bird stayed at the nest almost constantly, sitting low over the eggs. He continually pecked at the raindrops on the surrounding sticks and leaves.

Anxious to find whether it was always the same bird which brooded, the author determined to mark the adults under observation. A box trap was used, the framework of which, made of laths, was about 2x2x3 feet and was covered with a dull green cheesecloth. The bottom of the box was open. A window about 8 inches square was cut through the cloth of one side, and over this was fastened a curtain slightly larger than the opening. This was sewed down securely on two adjacent sides, but free on the other two in order to permit reaching in and getting the trapped bird. The trap was set over the nest and held up at one corner by a stick to which a

PLATE I



ADULT MALE SPOTTED SANDPIPER ON NEST

string was fastened. The string led into the blind. The adult birds differed in their reactions to this trap. Some paid little attention, while others walked around it a number of times before they would go beneath and sit upon the eggs. All of the adults did enter finally, and when they were thoroughly settled, the stick was pulled out and the trap dropped over them. Fluttering against the soft cloth sides did not hurt them, and they could be reached through the window and a leg-band put in place with little trouble. When released, they always left flying toward the lake, crying piteously their "peet-weet" alarm-call. Just as soon as they were gone, the trap was moved out of sight of the nest. The birds usually returned within a half-hour. The leg-band was not easy to see when the birds were walking through the brush, so they were marked further. This was done by using different-colored paints. Red was used with success on one individual. A number of pine-needles were dipped in very thick paint and placed around the edge of the nest. The bird sat on these and arose with a beautiful rosy breast and under tail-coverts. As soon as the sandpiper was marked, all evidence of the paint was removed so that no other bird might be marked likewise. This color on the breast feathers showed fairly well at night when the author by the aid of a flashlight investigated the nest to see whether the incubating bird was the same as the one seen during the day.

Another nest was a mile down the lake and about fifty feet back from the water's edge. Since it had been discovered before the last egg was laid, it was a very important nest. As it was desired to mark this adult also, green paint was used on three little strips of absorbent cotton placed about the edge of the nest. When the bird returned and saw that his nest was thus decorated, he gave a sharp cry and, picking up the first piece of cotton, flew with it to the forest. He returned at once and, taking the second piece, carried it into the grass. He ran back for the third and, carrying it to the second, picked up both, crying all the while, and flew away with them. Not wishing to tease the bird, the paint question was pressed no farther. This adult sandpiper was far shyer than the others under observation and very, very easily disturbed. It was concluded that this was his first nest.

HATCHING AND CARE OF YOUNG

To return to the nest by the Mess Hall sidewalk: June 27th, the first little chick hatched out prematurely. On coming to the blind, the author found the chick with eyes not open, the

PLATE II



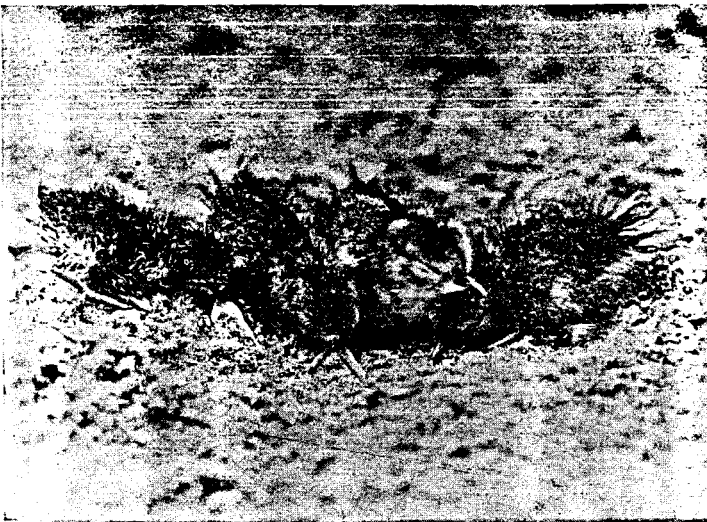
NEST OF THE SPOTTED SANDPIPER SHOWING FOUR EGGS IN TYPICAL POSITION

down dry and hard and with much shell adhering. He was lying on the ground beside the nest kicking feebly. The adult was gone but returned very soon. He settled down well over the three remaining eggs, clucking softly. He remained quiet for a few seconds and then took a pine-needle in his bill and threw it over to one side. All at once he seemed to discover the little one outside of the nest, for he stood up, reached forward, and pecked at the shell. A large piece became detached. He flew with this at once, going inland first, then turning, and, dropping the shell on the beach, he came running back to the nest. He settled down over the eggs and remained quiet for about two seconds and then noticed the squirming chick. He did not stand this time but, reaching forward, pecked at the chick's foot. The peck was vigorous, but the response very weak. Then the adult stood up and, carefully gathering up chick, shell, and all, flew away with them. It was impossible to see where he dropped his burden, nor did it come to light even after much searching. The old sandpiper returned, calling softly as he ran through the ferns, and settled down over the three eggs. That night the eggs hatched out, and by breakfast time the next morning all three chicks were strong enough to run about and peck at the leaves and raindrops and of course stop every once in a while and teeter up and down the way their father did. The old bird led his chicks away from the nest just as soon as they were able to travel. They would progress about a foot or two, and then the parent would hover them, with many interruptions from the people passing by. The chicks were banded before they had gotten very far from the nest. By evening they were one hundred and forty paces away from their nest, and in this territory they spent the remainder of the summer, a wonderful place for sandpipers because a jagged root jutted out where the adult might perch and watch for coming danger. Beneath him the waves had washed natural caves in the bank, and here the young lived and grew up. This parent stayed with his young until they were three weeks old.

The father sandpiper is always on the alert and takes good care of his chicks. While they are very small he hovers them frequently. The chicks are delicate, feeling extremes of heat, cold, and moisture very much. When one chick is weaker than the others, the parent will go to him and hover him, making the stronger little birds come to them. A parent sandpiper was observed to jump into a shallow hole where a chick had fallen and could not get out, and seemingly wrap his wing about the little one, giving that soft "hurrweeee-hurrweeee"



NEWLY HATCHED CHICKS IN NEST AMONG THE GRASSES AND SEDGES
Note the round head and short bill of the chick at this age



NEWLY HATCHED SANDPIPER CHICKS
The one at the extreme left has just come out of the shell

call, never showing impatience at its weakness. On the other hand the parent has been seen to peck a slow little chick to make him hurry when the rest of the brood were under the protecting wings. When it rains at night, the adult scoops out a nest-shaped cavity and hovers the young in this, the top-most chick when flattened out not being above the surface of the ground. The adults do not bring food to the young. The food is insects, snails, and small worms. One juvenile, two weeks old, ate a quantity of *Tubificidæ* when he was in the laboratory being measured. The young sandpipers are very difficult to keep in captivity; in fact they frequently die over one night. Therefore, if a series of measurements are being made on the same birds, it is essential that they be either measured in the field or returned from the laboratory as soon as possible. In the course of the summer the students brought in numbers of young chicks picked up at various points around the lake-shore. Having had one fatality after another in trying to act as parental sandpiper, the author determined to return the young to some near-by parent for adoption. The results have been much the same in all cases. The young birds brought to their foster father at night would be accepted without question, the wing being spread out a little farther to accommodate them. On one occasion the foster chick was very weak from being in the laboratory too long, and could not run to the adult. He left his own brood and went to this one, calling the others to follow.

Distinct territory rights have been observed in several cases. The adult of the Mess Hall nest commanded a given area, which as the young grew older he extended down the beach for about a quarter of a mile, to a point where the lake meets the high ground. As the juvenile birds learned to fly, he would go parallel to them along the high ground, while they ran at the water's edge feeding and making short flights out over the water. Other parent sandpipers have been observed raising their young on the same territory apparently without any difficulties.

The nest with the incomplete clutch of eggs was discovered on June 26th. On June 27th the fourth egg was laid. In the morning of July 18th the eggs hatched; the first at 4.30, the second at 6.00, the third at 6.40, and the last at 9.15. This gives an incubation period of 21 days.¹

¹Bent, A. C. *U. S. Nat. Mus. Bul.* No. 146, p. 84, gives the incubation period as fifteen days. Another nest observed in 1925 and found with a complete set of eggs hatched nineteen days after discovery.



DOWNY YOUNG "93886," AGE THREE DAYS



DOWNY YOUNG "93886," AGE ONE WEEK

Note that the primaries are growing out and beginning to unsheathe

GROWTH-RATE AND MEASUREMENTS

Whenever possible the chicks were banded just as soon as they hatched. Thus their age was definitely recorded and they could be recognized when caught for measuring. Several of the more general measurements are given in the accompanying tables. In these the serial number on the band is given at the top of each column along with the age of that particular individual. It will be seen that the same individual was seldom caught on two consecutive days. Therefore the plotted growth-curves are compilations of the measurements of as many young sandpipers as could be obtained, and the curves are smoothed for individual variations and sexual differentiations. In general the bill increases in length an average of 1 mm. a day for the first fifteen days. Along with this the skull changes markedly from the round infant head to the elongate adult. The primaries are the first to appear and unsheathe. These are followed closely by the secondaries, scapulars, and tail feathers. The entire ventral surface and the crown of the head follow. At two weeks we have juvenal plumage on all but the sides of the head, entire neck, back, and flanks. By the tenth day the juvenile bird is using his wings, although he does not raise himself from the ground. By the sixteenth day he can fly short distances, although inclined to use his legs rather than his wings when pursued. The chicks swim well and are inclined to take to the water and dive under when all other means of escape have been cut off.

Measurements of a chick of unknown age may be placed against those obtained from birds whose age is known, and the approximate age of the former obtained.

DESCRIPTION OF PLUMAGES

Downy young, one day old: Bill deep mouse gray tipped with lighter. Tarsus and toes light mouse gray, unfeathered portion of flanks and tarsus spotted with dark brown. Nails dark neutral gray tipped with lighter. Entire under parts white. Upper parts drab to drab-gray, mottled with black. Conspicuous median line of black. Black line through the eye back to region of the nape. Iris, dark clove brown.

Young, two weeks old: Down on center of crown replaced by juvenal plumage. Juvenal plumage unsheathed on ventral side showing pectoral gray bands. Wings and wing-coverts unsheathed and entirely replacing natal down. Sides of head, margin of crown, entire back, and tips of the tail feathers with down still a conspicuous part of the plumage. In general the upper parts are of the same color as in the adult plumage, an



"93886," AGE TWO WEEKS
Shows development of juvenal plumage



NEST AT THE BASE OF YOUNG MAPLE TREE
showing the surrounding vegetation—blueberry bushes, wild false
lily-of-the-valley, and bracken ferns

olive with brownish tinges. These scapulars and upper tail-coverts are tipped with a conspicuous band of ochraceous buff.

EXPLANATION OF MEASUREMENTS FURNISHING DATA
FOR GRAPHS

Length—Tip of bill to tip of down on tail.

Tail with down—Base of uropygial gland to tip of down.

Bill—Tip of bill to base of forehead where down begins.

Extent—Wing-tip to wing-tip; out to tip of down and later to tip of longest primary.

Tarsus-toe—From tibio-tarsal joint to tip of nail of third toe.

Wing—Distal third, that is from the bend of the wing to tip of either down or primary as the case may be.

Weights and measurements of the four chicks pictured on the cover, averaging 4 hours old, July 12, 1928.

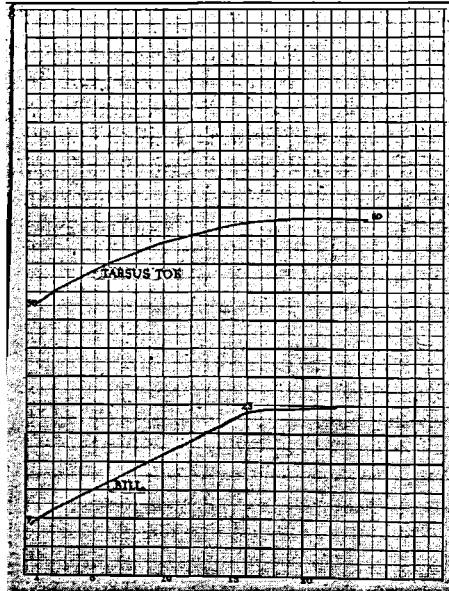
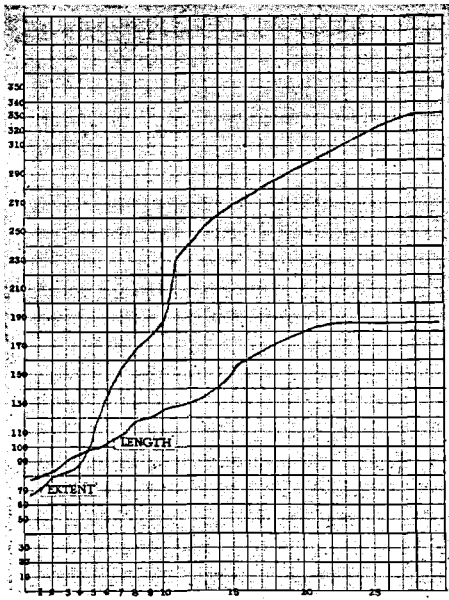
This table of measurements demonstrates the individual variations in one brood of chicks:

	188344	188345	188341	188347
Weight.....	6.7 gm.	7.1	7.4	7.4
Length.....	80 mm.	83	76	83
Tail with down.....	26	24	26	22
Bill.....	8	9	9	9
Extent.....	70	67	67	65
Right wing.....	21	21	17	20
Tarsus-toe.....	44	44	44	43

MEASUREMENTS OF SPOTTED SANDPIPER CHICKS

Age	Newly Hatched	1 Day	2 Days	3 Days	4 Days	5 Days	6 Days
Band Nos.....	188347 188341	426484	188341	188347 93885	93886 93887	188347	188341 696257 93887
Weight (grams)	7.4	6	6.1	7.6	8.2 7.8	8.8	10.6
Length (mm.)	83 76	77 85	95 94	97 99	103 30	102 27	109 30 105 30
Tail with down	22 26	18 27	30 23				
Bill.....	9 9	9 9	11 6	11 12	12 12	12.5	14 14.5
Extent.....	65 67	70 65	80 79	85 82	87 87	110	135
Right wing.....	20 17	16 22	20 17	18 20	17 18	20	27 31 32
Tarsus-toe.....	43 44	38 41	40 44	42 46	44 44	46	42 45

Age	7 Days	8 Days	9 Days	10 Days	11 Days	12 Days	13 Days	14 Days	16 Days	21 Days
Band Nos.....	93886 93885	93885	93886				188344	93886	188344	
Weight (grams)	15.1		17							
Length (mm.)	118 105	115	120	125	130	140	155	125	160	
Tail with down	32 28	28	33	32	35	44	45	40		55
Bill.....	15 15	16	17	18	18	20	20	18	19	21
Extent.....	154	167	175	186	237	254	241	232	269	
Right wing.....	35 35	41	55	46	68	74	68	65	77	87
Tarsus-toe.....	46		46.5	44		50	50	48	50	



Upper Graph, Growth Curves of Length and Extent
 Lower Graph, Growth Curves of Tarsus Toe and Bill
 (Graphs not on same scale)