SOME BLUEBIRD OBSERVATIONS

By WENDELL P. SMITH

AT my banding station at Wells River, Vermont, two pairs of the Eastern Bluebird (*Sialia s. sialis*) nested in boxes close to my home each year during the five year period 1930–1934. The birds were intermittently observed in the nesting season. While the record is incomplete, some interesting observations were made, and these are offered in the hope that they may lead to further intensive observation of this and other species.

The spring arrival dates of Bluebirds at Wells River for the period of 1930–1934 were as follows: 1930, March 16; 1931, March 28; 1932, March 26; 1933, March 26; 1934, March 29.

These first migrants are apparently birds of passage, for there is an interval of several days following the arrival of the species when Bluebirds are not present continuously. Then comes a period when singing is more often heard and the individuals show a sustained interest in a definite locality and inspect frequently possible nesting-sites. The dates when this form of activity was first noticed follow: 1930, April 1; 1931, April 7; 1932, April 5; and 1934, April 7. On March 31, 1933, three males were contending for the possession of a nest-box. The average date of arrival of breeding Bluebirds determined by this method is ten and one-half days later than the first appearance of the species at this place. For the five-year period the first-appearance date varies by fourteen days, while during the same length of time the first evidence of sustained interest in breeding territory varies by only eight days.

In only one instance can the length of time elapsing between the selection of a breeding territory by the male and the acquisition of a mate be given. On April 2, 1934, a male Bluebird was seen several times in the vicinity of a nesting-box. On the following day he was observed clinging to the entrance at intervals and he entered once, at least. On April 9th, he was joined by a female, who began a more thorough inspection of the box.

The date of the beginning of nest-building varies considerably for the period. While the data are not complete for either of the two pairs, the partial records indicate an average date for the inception of nest-construction thirteen days later in the case of the occupants of No. 2 box than for those using box No. 1. The earliest date on record is April 11, 1930, and the latest, May 7, 1931. The average date when nest-building activity was first observed for the two pairs was April 22d.

Nest-building did not proceed with uniform speed, especially in the case of an early beginning. There seemed to be some correlation with temperature, as cessation of activity coincided with lower temperature and resumption of construction began with the coming

of warmer weather. The time required for a nest's completion differed in consequence. The shortest period recorded was four days, and the longest twelve days.

Material was secured within a radius of seventy-five feet of the nest, and much of it within less than half that distance. In one case dried grass was used, while in the other, dead pine needles were obtained from the ground near by. Observations showed that the female performed nearly all the work of collecting.

Between the completion of the nest and the laying of the first egg some time intervened, usually two or three days. The earliest date of nest-completion was April 17th, and the latest May 11th, while the records of first egg were April 20th and May 13th respectively.

Usually egg-laying proceeded regularly with one egg each day until the completion of the clutch, but one exception was noted in the case of No. 2 pair. The female of this pair began laying on May 13, 1931, and continued laying one each day until the 15th, but on the 16th no egg was laid. Laying was resumed again on the 17th, and continued in consecutive order until the 18th, when the clutch was completed with the fifth egg. Clutches varied in number from four to six eggs. The same individual female differed in the number laid in the first nesting from year to year. No. A223086, banded as the occupant of No. 2 nest on May 10, 1932, and retaken in the same box on May 7, 1933, incubated a clutch of six eggs in 1932 and five in 1933. Incubation also varied somewhat. It usually began with the completion of the clutch, but one instance was recorded where it began with the laying of the fourth egg in a complement of six.

Of nine successful incubations of the two broods, the period consumed 14 days in four instances, 15 days in three, and 13 and 16 days respectively, in two instances. There could not be detected any cause for the difference, no seasonal variation being evident, nor individual so far as the limited observations went. No. A223086 required 14 days for the incubation of the five eggs of the first brood, while 15 days were occupied in that activity for the second brood of the same number.

The time of egg-laying varied somewhat with the individual, and considerable difference existed between the females of the two pairs. The female of No. 1 pair laid before six o'clock in the morning, while the female of No. 2 pair usually laid between 6.30 and 8.00 A.M., although entering and leaving the nest in connection with this activity were delayed half an hour in a number of cases, and on one occasion the bird did not enter for laying until nine o'clock.

The duties of incubation were performed largely by the female, but in one instance the male was seen to take his mate's place upon the eggs three times in the course of three hours. The male

of No. 2 pair fed his mate at intervals and maintained the semblance of a watch during her absences for food. Often the male would fly to the box, or a near-by limb, uttering rapid call-notes, whereupon the female would fly out and away for feeding. The male did not always remain near until his mate's return, but not infrequently he left shortly after the departure of the female. Absences, from meager observation, varied both in frequency and in regard to length of time. One nest was under observation from 3.15 to 5.30 P.M., and schedule is as follows: Female left at 3.27, returned at 3.35; remaining on the nest until 3.52. At 3.57 the male entered the nest and incubated until 4.17, when he left. At 4.18 the female returned to stay until 4.25. The male returned to the nest at 4.26, staying until 4.33 and returning again three minutes later for another period on the nest, which lasted until 4.48. The female entered the box at 4.59, and remained until 5.16. After four minutes' absence, she came back and was still on the nest at the close of the observation period, ten minutes later. The male of No. 1 pair was not seen to take any part in the duties of incubation, although considerable time was spent in observation, three and a half hours being spent at one sitting.

Observation of the care of the young consumed some time and in this it was noted that a marked difference in individual behavior occurred in the parents and some variation in the same individual. The male of No. 1 pair was not seen to feed the young. He was in the vicinity of the nest often and sang a phrase or two at intervals, but did not approach the nest while we were watching. The male of No. 2 pair, on the other hand, was particularly active and during some of the observation periods fed the young more often than the female did. The brooding of this pair was carried on exclusively by the female so far as we could learn. Typical feeding schedules follow. Brood of No. 2 pair under observation for one hour on second day, period extending from 2.09 to 3.09 P.M. Female entered box at 2.14:30, brooded until 2.22, left and returned with food at 2.24, brooding until 2.28:30, when she left to return at 2.29:30 to brood until 2.43. She returned with food at 2.43 and brooded until 2.52, when she left to return to feed at 3.00 and brood until 3.08. At 3.09 she came back to feed. Meanwhile the male brought food at 2.34:30, 2.37, 2.45, and 2.58:30. Total feedings for the interval were nine, five by female and four by male, and brooding lasted twenty-seven and a half minutes divided into five separate periods. This may be compared with an hour's observation five days later, the period extending from 2.54 to 3.54 P.M. Nine feedings occurred within this interval also, but six were by male and three by female and the brooding occupied twenty-nine and a half minutes divided into two separate intervals. Two of the male's visits with food occurred when the female was inside the box, and the former thrust his head into the entrance hole and presumably delivered the food

to his mate. Observation of No. 1 pair revealed some differences in behavior, due in part perhaps to the inactivity of the male. One hour's schedule when the young were four days old totaled three feedings and one period of seventeen minutes' brooding. At five days old, forty minutes' observation yielded seven feedings and two intervals of brooding, amounting to thirteen minutes. Three hours and forty-five minutes of watching, when the brood had reached the age of ten days, showed twenty feedings and no brooding periods.

In general the period passed by the young in the nest was eighteen days. One exception occurred in the case of No. 2 pair in 1933, when the first brood of four left the nest after seventeen days.

The growth of the young was observed and daily measurements taken. Nestlings on the first day varying from 31 to 41 millimeters in length had at time of leaving (17th or 18th day) increased to a minimum of 125 mm. or a maximum of 130 mm. Culmen on the first day varied from 5 to 5.5 mm. and completed its growth on the fifteenth or sixteenth day. Wing varied from 12 to 14 mm. on first day but at nest-leaving time had increased to from 90 to 95 mm. The tarsus, varying in length from 4 to 5 mm., attained complete growth on the 15th day. The most rapid gain in length, 12 to 14 millimeters, occurred between the 4th and 5th days, while that of the wing, an increase of 5 to 6 mm., came between the 7th and 8th days; that of the bill, 1 to 2 mm. between the first and second days, and that of the tarsus, a gain of 2 to 3 mm., between the 6th and 7th days, in the case of No. 2 pair in 1931. For two years the brood raised in this nesting-box showed the most rapid gain in length between the 16th and 17th days, a growth of 9 to 10 millimeters. No twenty-four hour period produced a disproportionately longer growth of the culmen. The most rapid growth of wing in the 1933 brood came between the 7th and 8th days, coinciding with that of the 1931 brood. The eyes usually began to open on the 4th day, but in one instance this was delayed until the seventh day. Completion of the process required from three to five days. Tail-feathers appeared on the 8th day. Primaries became noticeable on the 4th day.

The colors of the developing plumage and the soft parts were in part observed during the period passed within the nest. The natal down was dark mouse gray.[1] The bill was antimony yellow except the edges of the mandibles, which were mustard yellow and the feet cinnamon buff. By the second day the bill had changed to chamois, while the edges had become Marguerite yellow. The upper mandible became noticeably darker on the third day, and on the fourth day both mandibles were much darker with the edges white. Darkening continued with the edges remaining light longer than other parts, and it was not until the 14th day that darkening of this area was observed. By the 17th day the bill had become like that of the adult

[1] Colors according to Ridgway's "Color Standards and Color Nomenclature."

in color. Tarsi and toes changed more rapidly, becoming the color of an adult's on the 9th day. The first blue tinge appeared in the wings on the 9th day, and the spots on breast appeared on the 14th day.

As far as possible the family fortunes were followed after nest-leaving. The initial flight carried the young only a short distance from the nest, and the succeeding four or five days were passed within a radius of three hundred feet. The first brood of No. 2 pair left the nest on June 18, 1931. Until June 22d, they remained in the vicinity, varying in distance from one hundred to three hundred feet. Then followed a break in observation due to our absence. On June 30th, they were still in the same locality and also on July 1st. The latter date marks the beginning of a second nest by the parents, but, notwithstanding, some time was spent by both parents with the young. On July 6th the same conditions obtained. On July 7th, the four young were seen without their parents some six hundred feet from the nest. On this date the first egg in the second clutch of their parents was laid in the old nest-box. Four young Bluebirds were seen together on three subsequent occasions, the last being on July 21st, but they could not be approached near enough to determine presence or absence of bands. During the period of August 2d–7th, a flock of Bluebirds containing both adults and young were seen about eight hundred feet from the nesting-site. Among them were both adults and young wearing bands, but they could not be trapped to determine their identity. On August 18th, and again on August 24th, a mixed flock of eight or nine individuals of this species was seen a third of a mile away. One immature bird was wearing a band. A brood of No. 2 pair left the nest on June 8, 1933, and their subsequent history is similar, the male being seen with them until the second brood hatched on July 2d. On July 11th one individual of the first brood was seen on the nest-box cover. A parent bird nearby viewed the intrusion with indifference. On July 13th the female of No. 2 pair disappeared, and on the following day the young of the second brood were found dead in the nest. The male spent this day (July 14th) in calling from a near-by building and then rejoined the first brood, as he was seen with them on July 15th. They were last seen on July 28th some twelve hundred feet away from the nesting site.

As far as possible the degree of success attending breeding activities was noted during three seasons. One or two nestings probably occurred in a different locality and in a location where observations could not be made. It seemed certain that this was the case for the second brood of No. 1 pair in 1932. During the season of 1931, the two pairs laid 19 eggs, hatching 17 young, and 8 of these left the nest. The season of 1932 for the three nestings of the two pairs yielded 15 eggs, from which 11 nestlings hatched and 9 young birds

left the nest. In 1933, 20 eggs were laid, with 13 hatching and 8 young leaving the nest. During the three-year period, destruction of eggs was occasioned by a high wind in one instance, causing the fall of the nest-box and breaking five eggs; by a boy in two instances with a loss of five eggs; and by the removal of one egg from the nest, possibly by a squirrel, and the failure of two eggs to hatch. Mortality in the young was caused by illness in one case, a diarrhoea attacking one of a brood of five and making rapid progress, causing the death of all within forty-eight hours; in another instance an unknown disease caused the loss of five; four young died from starvation, probably due to the death of a parent; and one young bird removed from the nest by an unknown agent. This gives a reproductive efficiency rate of 46.29 per cent.

An attempt at a third nesting occurred in 1934. The occupants of No. 1 box became mated about April 17th. We did not keep detailed records of the activities of this pair that year, except to record the raising of two broods. On August 22d we found 5 eggs in the box, and incubation was carried on until September 4th, when the eggs were abandoned and the pair disappeared from the area. This coincided with the passing through the area of a large flock of migrant Bluebirds. We did not see the behavior of the nesting pair and cannot say that they joined the birds of passage, but the facts suggest possibilities that would make further observation interesting. Unfortunately such late nesting is rare at the author's station.

The male of No. 2 pair showed considerable pugnacity whenever his right to the territory seemed challenged. Two small trees overshadowing the box and a fence close by seemed to be deemed inviolable, and any intruder was instantly menaced. An amusing instance of this occurred when a young rooster flew to the top rail of the fence and began to crow. The male Bluebird darted at him so swiftly and with such a show of spirit that the cock abandoned his activity with undignified haste after the third or fourth sally. A more serious clash followed an attempt on the part of a male Tree Swallow to take possession of the box. The two birds closed with each other and descended to earth, even rolling on the ground during one contest, but after efforts lasting a day the Swallow gave up the attempt.

The above observations have been interesting not only for the facts noted but even more for the problems suggested, which are many, requiring both intensive and extensive study.

Wells River, Vermont