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RECESSION IN WEIGHT OF NESTLING BIRDS

By J. M. EDSON

In the course of some observations on the nesting of the Northern Violet-green Swallow in the summer of 1928, I noted a circumstance that was quite new to me. It was discovered that the nestling birds when about fourteen or fifteen days old, and before the feathers had broken from their sheaths, had attained a weight much greater than that of an adult of their species, and that from that time on there was a great shrinkage before the young birds were ready for flight. Although a reader of ornithological literature for many years, I could not recall having seen any reference to phenomena of this kind. Since making these observations, however, two other writers have mentioned a diminution in weight of young birds of certain other species. The subject appealed to me for further investigation, not only with reference to the swallows, but as to other species as far as practicable. With the season of 1929 my opportunities were far from what had been hoped for; but the following named species to some extent at least came under observation: Northern Violet-green Swallow (*Tachycineta thalassina lepida*), Western House Wren (*Troglodytes aëdon parkmanii*), Yellow Warbler (*Dendroica aestiva*, subsp.?), and English Sparrow (*Passer domesticus*). Only in the cases of the swallows and wrens, however, were the investigations materially successful.

Northern Violet-green Swallow.—The swallows observed were domiciled in a nesting box beneath the cornice at the end of a sleeping porch. The wrens occupied a similar box beneath the cornice at the side of the porch. I myself occupied the porch during sundry hours of the night and day. Prior to the series of observations to be discussed, both the swallows and wrens had made abortive attempts at nesting in other locations on the premises. The shadow of tragedy seemed to enfold the earlier reproductive projects of all the species referred to. Verily the rearing of the young is a process fraught with abundant peril.

When the swallows came to the box at the porch it was because their first clutch of eggs at the garage had been destroyed, by wrens or English Sparrows no doubt. This box contained the ready-made nest of the aforesaid sparrows of evil memory, now happily deceased, who had formerly driven away these rightful swallow claimants of the box and had hatched but failed to rear a brood of young of their own therein. On taking possession once more the swallows did not trouble to remove the coarse nest of twigs and grass left by the sparrows but merely added a liberal quantity of hen's feathers to the structure. During the laying period both swallows hovered about the nest much of the time, quite devoted to their project.

On June 30 there were three eggs in the nest. Incubation proceeded for the requisite twelve days in the usual manner of the species. That is to say, after the first few days the birds were away from the nest nearly all day for almost the

entire period. On the ninth day of incubation it was noted that it was as late as 8:33 p. m. that an old bird retired to the nest. The warm, feather-lined cradle in a snug box doubtless retained the proper temperature for incubation throughout the day. Early in the nesting period some vagrant English Sparrows put in an appearance, quite to the annoyance of the swallows. On investigating to see if the nest had been disturbed I found a swallow on it, and sitting so tightly that she would not move at the touch of my fingers even though I pinched her a bit. With the sparrows finally gone, the swallow came off, and neither of them was found again on the nest till hatching took place.

On both July 11 and 12, I found a bird on the nest, and she refused to let me look beneath her. I did not wish to use violence and it was not until the 13th that I saw the little birds, which then appeared to be about two days old. The three weighed eight grams. At three days old their combined weight was 12 grams; at five days it was 21 grams; seven days, 32; ten days, 50; seventeen days, 62; twenty days, 59; twenty-two days, 54; twenty-five days, 50. On the twenty-sixth day one of the young birds had left the nest. The average weight of the remaining two was $15\frac{3}{4}$ grams. At no time did the young birds differ in weight more than a fraction of a gram. On the twenty-seventh day, August 7 at 7 p. m., the nest was empty, although the birds had been seen there as late as 3 p. m. Weights for that day were not procured. July 21, one of the old birds was captured and found to weigh 16 grams. Absence from home on the sixteenth day regrettably precluded my securing the weights at that interesting date. The maximum weights recorded were taken when the young birds were seventeen days old and when their average weight was $20\frac{2}{3}$ grams. Thus it is to be seen that without having the weight for their last day in the nest the young birds lost during the last nine days an average of almost five grams; also that at their maximum they were individually 29 per cent heavier than the parent bird. The accompanying tabulation shows that the daily increase or decrease of weight was not altogether uniform. Variability in the content of the alimentary canal will perhaps explain that satisfactorily.

By the time the young birds had their eyes fully open, at the age of ten days, they were as heavy as their parents. Gray pinfeathers now concealed in major part the pinkish skin. Not till five days later did the remiges and rectrices break from their sheaths. The body, particularly the abdomen, was large in comparison with the limbs. During the reducing period the abdominal prominence steadily diminished till at the last it was almost a concavity.

After the little birds were hatched the parents showed great activity in supplying them with food, visiting the nest many times in the course of an hour. When the maximum of growth had been reached there was a diminution of parental activity. In fact, during the latter days there were hours together when the parents did not visit the nest, and evidently the food supply had been largely if not wholly cut off. The reduction period was one of notable feather development.

VARIATION IN THE WEIGHT OF YOUNG SWALLOWS

Days old	Grams	Days old	Grams
2	$2\frac{3}{4}$	17	$20\frac{2}{3}$
3	4	18	$20\frac{1}{3}$
5	7	19	20
7	$10\frac{2}{3}$	20	$19\frac{2}{3}$
8	$13\frac{1}{3}$	21	$19\frac{1}{3}$
10	$16\frac{2}{3}$	23	17
11	$16\frac{1}{3}$	24	$17\frac{1}{3}$
12	$18\frac{2}{3}$	25	$16\frac{2}{3}$
13	$19\frac{2}{3}$	26	$15\frac{3}{4}$
14	$19\frac{2}{3}$		

The 1928 Record.—As before stated, the swallows had nested in the same location in 1928. June 23, one young bird was found to have hatched, and the following day there were four. The development of the one bird all along was markedly in advance of that of the others, and evidently it must have been at least two and possibly three days older than they. This fledgling weighed 22 grams when about sixteen days old. Its excess in size at that time was what suggested weighing the birds. This bird had already demonstrated the dexterity of its wings, but it remained in the nest till 5 p. m. July 16, when it fared forth to see the world. When the younger three were 18 days old weights of all were taken as follows: 17, 17, 17 and 18 grams; at 20 days, 15, 15, 15 and 16 grams; at 22 days, the average weight of the three remaining ones was 14 $\frac{1}{3}$ grams. At the age of 23 days, July 17, these also departed from the nest, and the family was seen no more that season.

Western House Wren.—A Western House Wren appeared in our dooryard May 6, 1929. It was presumed to be one of the birds that had nested there the year before. It lingered about for several days and then disappeared, to reappear May 29; or at least it was presumed to be the same bird seen earlier. With it came a mate, and together they at once proceeded with construction of a nest in the box provided for that purpose under the cornice of the garage. They worked with speed and were not particular as to the interior finish of their structure, omitting any lining softer than a section of snake skin and some coarse grass. June 4, there were four eggs in the nest. On the 8th there were six eggs and incubation had commenced. Also a few feathers had lately been brought in.

On June 9 there were unexpected happenings. A fierce battle between two wrens near the nest was witnessed. Later there was another engagement; and still the war was not over. In the twilight that evening I discovered what appeared to be a wren's egg on the chopping block of the shed near by. Next morning the supposition was verified, and several small holes were observed in the shell. Investigation showed the nest to be empty.

Soon after this event I transferred the abandoned nest box to the cornice of the sleeping porch, where it was promptly visited by the wrens. Still the triangular mix-up appeared to continue. June 19, two rival wrens were about, singing with vigor and fighting with vim. Once a wren sat on a geranium stalk at the porch and sang as rapidly as he could catch his breath for nearly three minutes, all the while excitedly fluttering his wings. At the same time another wren sat facing him not fifteen inches away, also fluttering his wings and continuously scolding in a guttural tone.

A few days later peace regained its sway, and only two birds remained to occupy the nest. June 28, the nest was found to contain four eggs. The following afternoon there were six, and a bird was on the nest. Not till July 6 was the nest again examined, when somewhat to my surprise eight eggs were discovered in the nest. At six in the afternoon of July 12 one egg had hatched. Three hours later there were two little birds. Next morning at eight there were three, at four in the afternoon there were four, and at seven, five babies. Placed on the scales the group weighed seven grams. July 14, there were six little wrens, and their combined weight was 12 grams. July 16, there was a further enlargement of the family, bringing the number of juveniles to seven (the eighth egg never did hatch), with an aggregate weight of 27 grams.

Providing food for this brood necessitated great activity on the part of the parents. The day's labors began as early as 4:15 a. m. according to one morning's observation. One feeding per minute was the average for a considerable period of

watching. Occasionally there were intermissions. The female (presumably) when at or near the nest would not allow her mate to enter the box, but would flutter to him with drooping wings and significant sputterings to take his offering and carry it to the babes herself. Both parents were diligent workers, the female possibly a bit the more so.

As previously stated, the first egg hatched July 12, and the seventh on the 16th; thus there was a range of four days in the ages of the individual youngsters. Yet this difference was not conspicuous in their size or appearance, and they finally left the nest practically all at the same time, and at the average age of sixteen days. When about nine days old their eyes gradually opened. Soon they were energetically protesting against being handled, and were very nervous and quick, unlike the swallows. At fourteen days they broke away as they were being weighed, and fluttered about in all directions. The following day their nest box might have been the chest of Pandora if rapid "scatteration" when the lid was lifted were the determining factor. Indeed, one little one could not be recaptured. At this time their feathers were well developed, although the primaries and particularly the tail were noticeably shorter than those of adults. Very early in the morning of July 30 all but one left the nest, and it did so at 6:15 a. m.

The maximum weight of the brood, 75 grams, was reached at the average age of ten days. Had all been of the same age the maximum would theoretically have gone a trifle higher; also the recession in weight would have been more sharply defined, with all decreasing together. One of the parent birds was captured and found to weigh just ten grams. The maximum average weight of the little wrens was ten and five-sevenths grams, which was thus a considerable fraction of a gram, or more than 7 per cent, heavier than their parents. Weights subsequently taken were not very conclusive and failed to show much diminution. It seems quite probable that the reducing process was continued for a time after the nest was abandoned, but to what extent can only be conjectured. They left the nest younger by about ten days than the swallows, and with development of flight feathers much less advanced than in the case of those birds. It is a reasonable guess that their weight continued to decline until it was somewhat less than that of their parents.

VARIATION IN WEIGHT OF YOUNG WRENS

Days old	Grams	Days old	Grams
1	1 $\frac{2}{7}$	11	10 $\frac{5}{7}$
2	2	12	10 $\frac{5}{7}$
4	4-	13	10 $\frac{3}{7}$
6	6	14	10 $\frac{4}{7}$
7	7 $\frac{3}{7}$	16	10 $\frac{5}{7}$
8	8 $\frac{4}{7}$	17	10 $\frac{2}{3}$
9	9 $\frac{4}{7}$		
10	10		

Unsuccessful Weighing Attempts.—The English Sparrows earlier referred to, commenced incubation with five eggs. However, considerable of mystery surrounds the story of their endeavors. One egg disappeared; then one by one young birds did likewise, the last having been deliberately abandoned by its parents and allowed to perish of cold and hunger while they heartlessly loafed in the vicinity of the nest. It was then nine days old and weighed sixteen grams. The weighing of Yellow Warblers was begun in two instances, but both projects were terminated by the interference of (probably) Crows, the little birds having disappeared prematurely.

Conclusion.—The food of swallows is gathered in flight, and this fact suggests that wings need to be well developed to equip the young to make their own living. Therefore a longer occupancy of the nest seems logical, while possibly there is also a relation between the excess of weight reached by the young and this need of feather development. On the other hand, the little wrens upon leaving the nest take to the shrubbery where merely hopping about with very short flights is all that is required. The much greater nervous energy and alertness of the young wrens also is quite compatible with their mode of living, as contrasted with that of the swallows.

The young English Sparrow seemed to give promise of surpassing its parents in weight. Yellow Warblers at six days old appeared to weigh eleven grams, although difficulty in weighing them and an eccentricity of the scales may have made these data unreliable. In any case the little warblers were plainly not underweight in appearance.

This subject of reduction in weight in young birds seems interesting and worthy of further investigation.

Bellingham, Washington, November 30, 1929.