

PRELIMINARY NOTES ON THE DEVELOPMENT OF
NESTLING PILEATED WOODPECKERS

BY J. SOUTHGATE Y. HOYT

Plates 14, 15

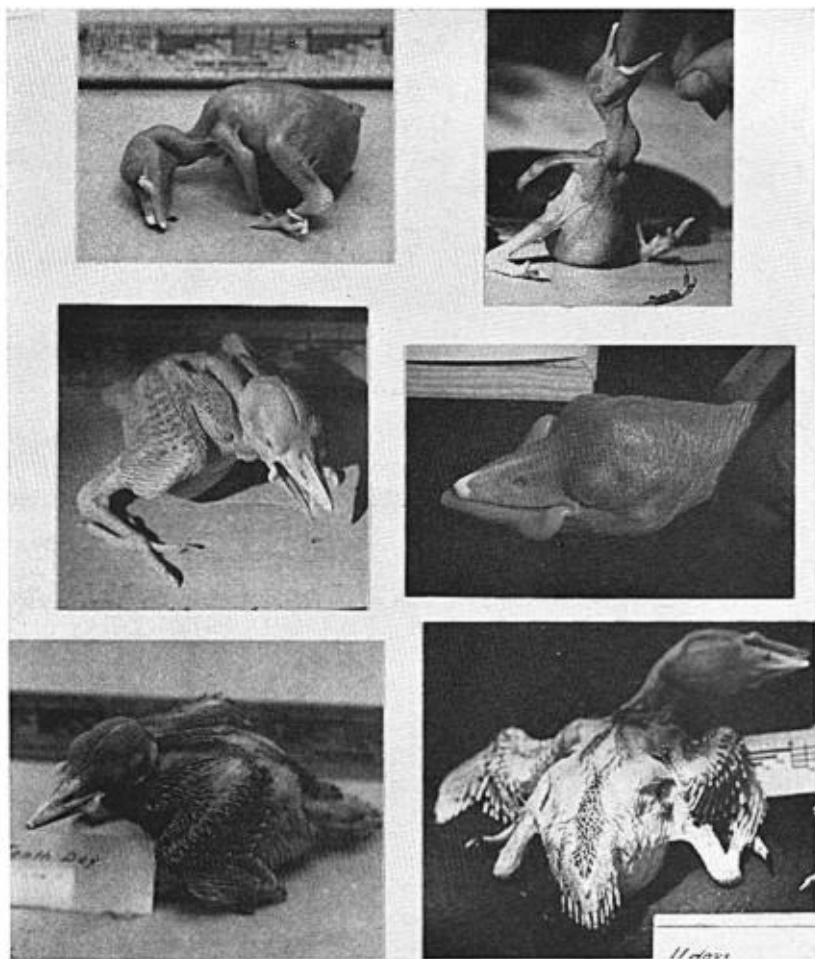
THE work here reported was done on the Northern Pileated Woodpecker (*Ceophloeus pileatus abieticola*) nesting in the vicinity of Ithaca, New York, in the spring of 1939. The nest was under observation throughout the period of incubation and the date of hatching was eagerly awaited. The notes detailed in this paper commence with the first day after hatching, which is designated as the first day. The young birds were removed from the nest each day, studied, weighed, photographed, and carefully replaced as soon as possible. The same nestling was photographed each day, thus making a comparable series of pictures.

On several occasions the parent birds appeared while this work was being done, but they seemed to show remarkable tolerance for human intrusion, for on but one occasion did they become unduly excited. In this case, the male entered the nest a few minutes after I had replaced the young and withdrawn to a position about fifteen feet from the nest stump.

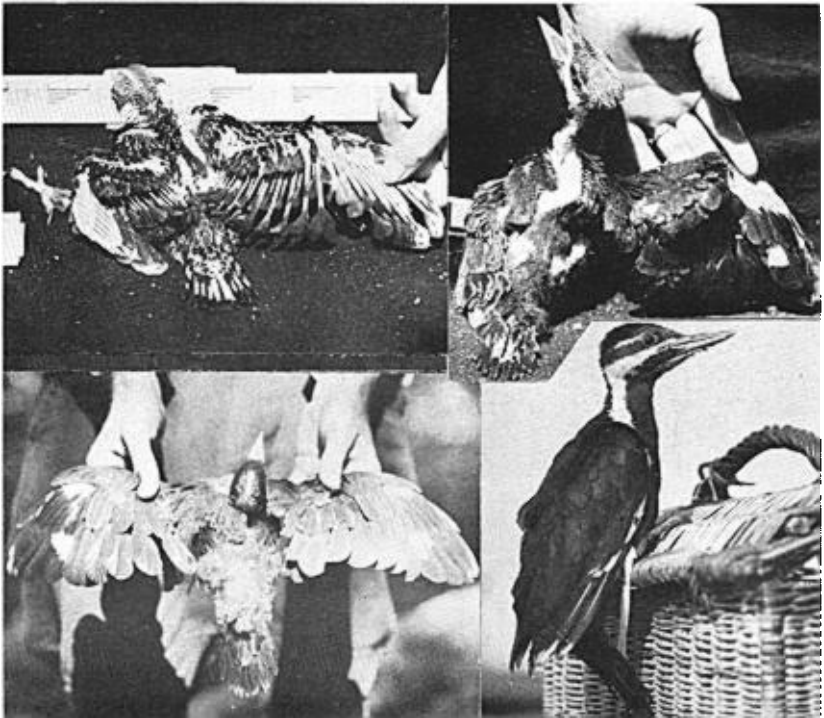
FIRST DAY

The woodpeckers are altricial and the young are hatched completely naked and helpless. The young of most birds are rather ugly and extremely awkward, but I think the young Pileated Woodpecker excels in these qualities. The newly hatched bird is a small, squirming, ugly, awkward, and completely helpless mass of life. The abdomen is the largest part while the neck is very much like a small pencil in size, stretching well up in the air when the bird is disturbed. The skin over the entire body is flesh colored and so thin that one can readily see the internal organs through it. The skin extending between the femur and the tibio-tarsus is very loose and allows free movement of the femur in the acetabulum. The tarso-metatarsus is extremely short, being just about an inch long. The feet are very small and do little towards supporting the clumsy body; the toes are rather stubby and have very small claws. Balance is maintained with the feet with the assistance of the large abdomen which sags to the ground between the legs.

The neck is long and snake-like and is usually held curved under the body (Plate 14, upper left). The head is small and the eyes are extremely large in comparison but are tightly sealed. The lower



YOUNG PILEATED WOODPECKER. (Upper left), ONE DAY OLD. (Upper right), FOUR DAYS. (Middle left), EIGHT DAYS. (Middle right), HEAD; AT FOUR DAYS. (Lower left), TEN DAYS. (Lower right), ELEVEN DAYS.



YOUNG PILEATED WOODPECKER. (Upper left), FIFTEEN DAYS OLD. (Upper right), NINETEEN DAYS. (Lower left), TWENTY-ONE DAYS. (Lower right), TWENTY-SIX DAYS.

mandible is very large and broad at the base, with the corners of the mouth abnormally large. This large portion projects from the sides of the mouth as a soft, round, and greatly swollen area. The upper mandible is small and rests within the lower one much in the fashion of a smaller boat stacked within a larger one. This upper mandible is much shorter than the lower one. Each mandible has a white tip of a quite different texture from the rest of the bill. This tip remained white for some time, becoming smaller and finally sloughing off shortly after the bird left the nest. The picture of the one-day-old young shows this structure very well and a comparison of the different stages of growth illustrates the slow change. Whether this tip is a form of the egg tooth in this bird I am not sure, but it may well be used for the same purpose. The egg tooth may possibly appear at an earlier stage and be lost soon after hatching, and this tip may be an entirely different structure. This white tip is present on both mandibles, being larger on the upper than on the lower one. As in the adult bird, the upper mandible is deeper than the lower while the latter is flat and broad.

The wings are small and useless even as a means of balance. On the posterior border there are small pits through which the primaries will later develop, but there is just a very small hair-like projection in each pit at the present stage. The rectrices are in the same condition as the primaries but are slightly larger. The heel is thick and covered with a soft and padded skin on which the body frequently rests. None of the feather tracts shows any signs of development. The abdomen is very round and on the under side and a little anterior to the anus is the yolk stalk. This stalk is rather long and twisted and projects from the abdomen much in the fashion of the umbilicus of a mammal. The ear does not show on the head at this stage. The oil gland is large and stands out well at the base of the tail.

The largest of the three birds is just barely able to support its body enough to raise its head above the body and open its mouth. When disturbed the birds make a very faint, squeaky, hissing noise that cannot be heard very far away.

The average weight of the three birds is 28.9 grams.

SECOND DAY

Of course there is very little change the first few days after the birds have hatched. The wings show very small and almost minute black spots under the skin where the flight feathers will soon appear. The rectrices are in about the same condition, showing no signs of devel-

opment. The auricular orifice is slightly more developed, and there is a small indentation in this region of the head. The only sign of development of the eye is a small thickened line across it. This line will separate the two eyelids within a few days. The average weight of the three birds is 41.2 grams, a gain of 12.3 grams within the last twenty-four hours.

The birds show more activity and exert much more strength in their actions while I have them out of the nest. Their heads are still kept bent under their bodies, and are raised only when I make any noise or commotion near their position on the ground.

THIRD DAY

The eyes show a thickened streak, much like a very tightly shut eye, having more the appearance of an eyelid. The ear is much more prominent and the opening is considerably larger than before.

Many of the feather tracts show as well-defined lines of darkened spots running across the smooth, delicate skin. These tracts are in the form of raised ribs that are filled with the developing feathers which give them the dark appearance. No feathers on the head have started to develop yet, but on most of the rest of the body the tracts are well started. All of the birds have considerably more strength and are very much more active. Their voices are stronger and from beneath the nest one can hear the buzzing, hissing sound.

The average weight of the three birds is 51.0 grams, a gain of 9.8 grams.

FOURTH DAY

All three of the young birds have developed well in the past twenty-four hours. The primaries and secondaries have just started to break through the skin. The rectrices are showing signs of breaking through also but not as much so as the remiges. Each of the feather tracts that I mentioned above is much more clearly defined and plainly shows the tips of the feathers through the skin. As yet there are no feather tracts to be found on the neck or head. The ventral tract is clearly defined by the ridge of feathers that extends down the side of the belly. The dorsal tract is easily recognized by the same appearance and is seen to divide on the back, running down on each side of the center (Plate 14, lower right). The humeral tract extends across the base of the wing in the same fashion as does the crural tract across the proximal portion of the leg. The pelvic region shows but few signs of feather development.

In photographing the young birds, I noticed that they opened their

mouths wide and raised their necks high in the air when a shadow was passed over them or when any movement on my part caused a disturbance of their position, although their eyes were still shut. When I put my finger down their throats, they immediately closed their mouths on it and started jerking their heads up and down, sucking hard all the time (Plate 14, upper right). This suction was so strong that I could almost lift the birds from the ground with them hanging to my finger in this manner. If the hole is darkened the young will extend their necks to full length, open their mouths, and call for food. On one occasion the largest of the three birds gave a faint call that sounded like a small edition of the nasal *cuk* of the adults.

The average weight is now 67.1 grams, a gain of 16.1 grams in the past twenty-four hours.

FIFTH DAY

The feet are growing rapidly and are now able to support the body. The heel, which has a thickened pad on it, now is used as a means of support, and the bird frequently rocks back and forth, at times completely falling backwards. The yolk stalk is almost entirely gone, leaving just a scar on the abdomen. The skin is much thicker, so that only by stretching and examining it carefully am I able to see the internal organs that I could so clearly see a few days ago. The feathers are starting to break through the skin and appear as sharply pointed, waxy protrusions. The primaries are the longest but the rectrices are nearly the same size. The secondaries and the alula are in the same stage of development.

The upper mandible is enlarging rapidly and in the largest bird is nearly as long as the lower mandible. The white tip, to which I referred earlier, is becoming less conspicuous and seems to be hardening. The auricular orifice is a deep hole leading into the head just behind the eye. The skin around this is drawn into the hole, thus forming a somewhat funnel-shaped opening.

The average weight of the young birds is 79.1 grams which is a gain of 12.0 grams since yesterday.

SIXTH DAY

The coverts are starting to break through the skin. The feather tracts of the abdomen are becoming well defined and the head shows the first signs of feathering. The tracts of the capital region show as small pimples under the skin, but no color can be ascertained as yet. The eyelids are thick and show two definite parts rather than one raised line as before noted. The toes are much stronger than before

and are beginning to grasp articles brought in contact with them. The oil gland is large at this stage of development and stands out as a conspicuous bump on the dorsal side at the base of the tail.

The average weight is now 98.9 grams, a gain of 19.8 grams, the greatest gain noted in any one day.

EIGHTH DAY

Owing to the more advanced development of the feathers, all the body has a dark complexion. In all the tracts that were but dark lines two days ago, there are now small pin feathers breaking through the skin (Plate 14, middle left). The flight feathers are nearly a quarter of an inch long but are still confined to the sheath, which gives the appearance more of a spine than a feather. On the largest bird one can see the tips of the feathers starting to push through the skin of the head. At this early stage it is possible to determine the sex of the birds. The two females have a distinctly darker color at the base of the bill where in the one male there is a reddish cast. The median capital apterium can even be seen extending from the right side of the base of the bill over the top of the head in midline to the occiput.

The eyelids of the largest bird may be opened although they are usually kept shut. The eyes of the other two birds are still shut. The eye is a deep slaty blue, almost a blue-black but slightly grayer. Although the larger bird opened its eyes enough to see me on numerous occasions, it showed no fear when I picked it up for study. The large swelling at the corners of the mouth is becoming smaller day by day. This reduction of size is accompanied by a toughening of the structure of this part.

The average weight of the three birds is 135.2 grams, a gain of 36.6 grams in the past two days.

TENTH DAY

All three birds have their eyes open today and for the first time they show signs of extreme activity. When placed on the ground to be photographed they scramble off the paper backwards. This method of getting around is entirely new for them, as they have no such freedom in the nest.

While I am working with them they shiver constantly, as though either greatly frightened or cold. If they show signs of fright, this is the only manner in which it manifests itself. When placed on the cloth for observation, they grip it with their feet, using their claws much more than at any previous time. The upper mandible is now

the same length as the lower mandible on all three birds and the white tip is becoming much less conspicuous (Plate 14, lower left).

The feathers are starting to break through the sheaths at the tips. This is noticed on almost all the feather tracts over the body. The feathers on the head are thick enough and long enough to give a distinct color to the head, although all of them are still well protected by the sheaths. This coloring on the head causes the median capital apertium to show very well indeed.

The average weight is 165.2 grams which is a gain of exactly 30.0 grams since the eighth day. The male now weighs the same as one of the females, and is only five grams less than the other female which has constantly been the heaviest.

TWELFTH DAY

All the feathers are through the sheaths to such an extent that they give the birds quite a bit of coloring. The crest is very much like a red pincushion, as all the feathers are still tightly bound within the sheaths (Plate 14, lower right).

The feet are slowly becoming a deep blue-gray color, changing from the flesh color they were at hatching. The toes are quite strong and the claws are sharp enough to inflict a scratch when they grasp the fingers. None of the three birds can hang to the side of a tree as yet, and when placed in such a position they quickly slip off onto the ground.

The soft enlargement at the side of the mouth is now slowly becoming a part of the rictus and it no longer looks so tremendously out of proportion to the rest of the bill. The eyes are a deep blue-gray color with a very shiny black pupil.

The average weight of the three birds is 185.5 grams, a gain of 20.3 grams in the last two days. The male is now the heaviest of the three birds and remained so throughout the nesting period.

SIXTEENTH DAY

As is to be expected, the body is taking on more the appearance of a real bird, although there is much left to do in the way of completing the plumage. The feathers are a great deal longer and that part out of the sheaths is increasing rapidly, giving the body real shape and color (Plate 15, upper left).

In trying to get the young to accept my finger as they had done earlier, before their eyes were opened, I found that they would not take it. This, I imagine, is to be expected since the young can see what is being offered them. When the male came in to feed the young

today, two of the young met him at the entrance. The parent drove them back into the nest as he pumped the food into them.

The average weight of the three young is 209.2 grams, an increase of 23.7 grams in the last four days. The bird which at first was the heaviest of the three birds is now the lightest by seven grams. It remained in this relative position throughout the remainder of the nesting period.

TWENTY-FIRST DAY

On approaching the nest one can plainly hear the buzzing noise of the young. One person likened it to the noise of a swarm of bees, which is a rather good description.

No apteria can be seen without looking under the feathers, as all the surface is well covered (Plate 14, lower left). The crest feathers have broken through the sheaths and the crest stands up when the bird is excited. This crest is by no means fully developed, and is very round and short compared to that of the adult. The feathers of the malar region are still somewhat confined to the sheaths.

I removed all the young from the nest as usual and placed them on the trunk of a tree. This time they remained well fastened in this position and one of them made frequent attempts to climb up out of reach. None of the young showed any signs of fear, and permitted me to handle them as much as I pleased.

The average weight of the three birds is 225.6 grams, which is a gain of 16.4 grams within the last four days.

TABLE I.
DAILY GAIN IN WEIGHTS OF YOUNG PILEATED WOODPECKERS

<i>Days old</i>	<i>Date</i>	<i>Red*</i>	<i>White*</i>	<i>None*</i>
1	5/23/39	20.4 gr.	36.6	29.9
2	5/24	27.6	50.8	45.1
3	5/25	40.5	59.5	53.2
4	5/26	56.5	73.5	71.5
5	5/27	62.3	89.6	85.4
6	5/28	87.6	109.1	100.0
7				
8	5/30	126.5	138.8	140.2
9	5/31	155.3	155.4	142.5
10	6/1	163.5	168.5	163.5
11	6/2	172.1	170.8	172.1
12	6/3	190.0	186.0	180.5
13	6/4	199.3	194.2	192.0
14	6/5	206.1	199.7	196.1
15	6/6	211.0	200.4	200.0
16	6/7	213.5	203.3	210.7
21	6/12	243.6	209.1	224.2
24	6/15	244.4	218.7	227.3
26	6/17	All birds left nest on this day.		

*Colors used to differentiate the birds in the nest.

TWENTY-SIXTH DAY

All of the young left the nest on this day (Plate 14, lower right). Climbing to the entrance, they jumped out and fluttered to the base of a near-by tree. Climbing up by slow jumps, they reached the top ready for a similar fluttering jump to the base of another tree. By such successive actions, they spent the first few days learning how to fly from tree to tree. Within four days they were well able to fly around with their parents, but still confined their flights to short trips.

SUMMARY

1. The young Pileated Woodpeckers do not all hatch at the same time, for the nest contains young of considerable variation in weight and development.

2. The newly hatched young is completely naked, extremely awkward, and very ugly, and weighs less than fifteen grams.

3. The skin on the abdomen in particular is as thin as tissue paper for the first few days, but becomes much thicker and stronger by the fifth day.

4. The bill is very peculiar in shape, with the lower mandible very large and broad at the base. The upper mandible is shorter than the lower one and lies in it much in the fashion of a smaller boat stacked in a larger one.

5. The ends of both mandibles have a white portion that is of a different texture from the rest of the bill. This white portion becomes less conspicuous and harder as the bird develops in age until shortly after the bird leaves the nest when this white part sloughs off.

6. The corners of the mouth have an abnormally large structure, the exact nature of which is not yet known. This structure gradually decreases in size and by the fifteenth day has lost its abnormal appearance and become a portion of the rictus.

7. The first signs of feather growth appear on the third day as small dark lines under the skin. The pterylae can be seen fairly well even at this early age.

8. By the fourth day, the young birds open their mouths and call for food when a shadow is passed over them or the entrance to the hole is darkened. On this day the feathers first break through the skin.

9. The eyes of the largest bird in the nest may be opened for the first time on the eighth day, though usually they are kept shut until the tenth day.

10. By the eighth day one can determine the sex of the young by the darker color on the forehead of the females, for the head feathers start development on about the seventh day.

11. The young climb to the entrance of the hole to receive food from the parents on about the fifteenth day.

12. The young left the nest in question for the first time on the twenty-sixth day, but in other nests observed, this time has varied from the twenty-second to the twenty-sixth day.

13. Even after leaving the nest the young birds are under parental care for some time.

Laboratory of Ornithology
Cornell University
Ithaca, N. Y.

NEST SURVIVAL OVER WINTER

BY H. ELLIOTT McCLURE

IN the course of a study of the life history of the Mourning Dove, *Zenaidura macroura* (Linn.), in southwestern Iowa during 1938, it became evident that the presence of old nests of other birds was important in the economy of the dove. Following the winters of 1938-39 and 1939-40, all of the nests that had withstood winter rigors at Lewis, Iowa, were counted. The town covers an area of approximately 160 acres in which there were over 1600 trees an inch or more in diameter. In the summers of 1938 and 1939, all of these trees were examined every two days in an effort to discover Mourning Dove nests. Incidentally, the nests of other birds were noted, too. When the post-winter survey was made in March of 1939 and 1940, it was possible not only to record the nests that were remaining, but also to indicate those that had been used by doves the previous season.

Table I lists the information concerning this post-winter survey. Any nest that had retained its structure, such as high walls in that of the Eastern Robin or the Bronzed Grackle, was considered in good condition. Any one that was falling apart was considered in poor condition. Of those found in both years, more than sixty per cent were in good condition. Nests of the Eastern Robin ranked first in survival for the two years. Those of the Baltimore Oriole were second in number.

The nest of the robin is an important aid to Mourning Doves in their nesting. It is large enough to contain the dove nest that is often built within it, and sturdy enough to survive bad storms, so that dove-nesting success is higher in the robin nest than in one of dove construction alone. Nineteen per cent of the robin nests surviving each winter had already supported dove nests during the past