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### COURTSHIP AND TERRITORIAL BEHAVIOR OF HAIRY WOODPECKERS

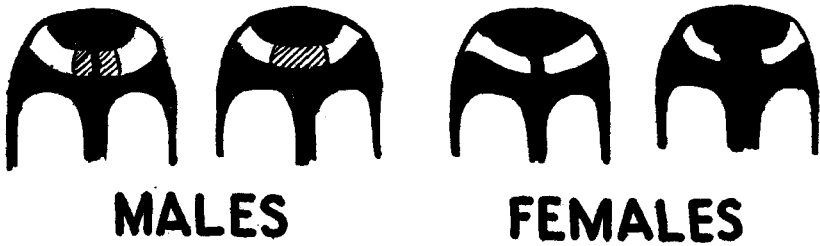
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THE present study of a pair of Hairy Woodpeckers (*Dendrocopos villosus*), made in a swamp near Seneca, Maryland, indicates that this species has a lively courtship in which the female may attract a mate to her fall and winter territory by drumming and then join him in display flights. I observed this behavior in the pair HF-HM from mid-October 1958, until nest excavation in April 1959, in all a total of 130 hours. The phenomena described are not readily observable in any one year, and I have encountered the prolonged type of pair formation in only one of the years from 1951 to 1960 in which I have been studying Hairy Woodpeckers in the same swamp. These birds appear to be more or less paired the year around under usual circumstances. Hairy Woodpeckers are not easy to study in wooded country, and this may explain why published accounts of their life histories, such as those of Bent (1939), are far from complete. Hailman (1959), for example, has pointed out that the drumming of female Hairy Woodpeckers is not mentioned in most accounts. As described below, the female HF did an extraordinary amount of drumming.

Individual recognition of the woodpeckers studied became possible with close and prolonged observation. Figure 1 gives the head markings by which I distinguished HF and HM as well as of two other Hairy Woodpeckers with which they had occasional contacts. Certain features of habit and territory, given below, further aided in the recognition of individual birds.

#### TERRAIN AND TERRITORY

*Territory and drum trees.* Observations were centralized in the terri-

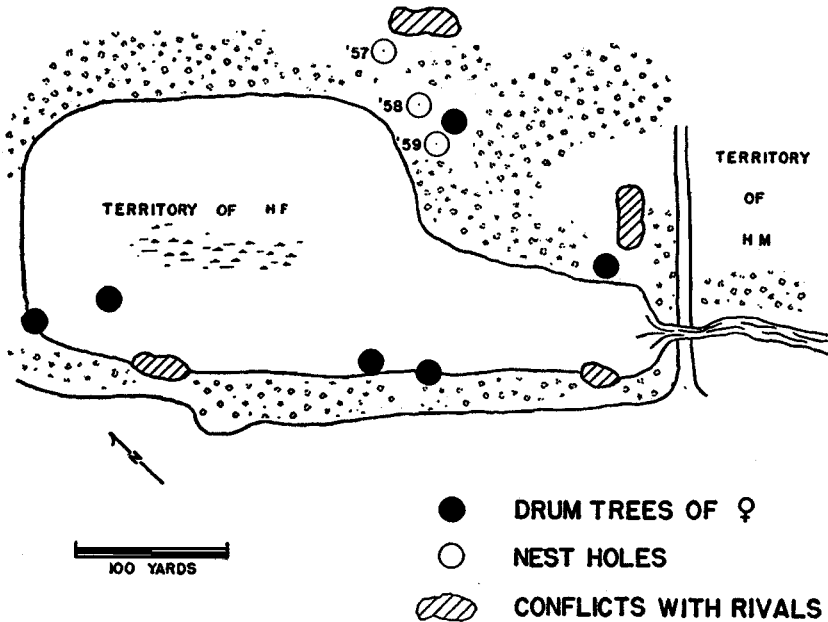


**Figure 1.** Variations in the black and white markings on the heads of four Hairy Woodpeckers, which aided in recognition of individuals. The male HM and the female HF are represented by the two central figures.

tory of the female HF, where most of the courtship and the later nest excavation took place. The terrain consisted of a rim of trees surrounding three to four acres of open swamp. Since the open area was dry during the fall and was frozen during much of the winter, I was able to walk about the center of HF's territory and adequately view her activities. There were several indications that the territory of HF had fairly definite boundaries. One was that she continually made rounds of certain drumming trees, of which three were visited on many occasions and five others with less frequency. She would alight at particular spots where she could obtain the greatest reverberation. The farthest distance between regular drum trees was 450 yards (Figure 2). The width of HF's territory was in the vicinity of 250 yards, as estimated by the locations of conflicts and distances between two of the main drumming trees. The male HM had an adjacent territory, approximately 400 yards long, but I had less complete observations on its dimensions since most of the activities concerned with pair formation took place in the territory of his mate.

*Territory and conflicts.* A second circumstance that served to establish the boundaries of HF's territory consisted of seven conflicts with intruding Hairy Woodpeckers that I observed in boundary zones (Figure 2) in the course of nine months. Five of these conflicts were between females, and two were between rival males. There was a tendency for conflicts to be repeated in the same zones, for two of the female conflicts were in one zone and two took place in another. Conflicts in a third zone were of a different pattern. On 14 March HM fought another male, and on 21 March 1959, his mate HF fought a rival female along the same boundary, which was not far removed from the tree where HF excavated a nest hole in late April.

*Nest sites of three different years bunched.* The territory of HF



**Figure 2.** Diagram of the fall and winter territory of the female Hairy Woodpecker HF, showing the locations of her main drum trees, the zones of boundary conflicts, and the nest sites of three successive years.

was not only the site of nest excavation in 1959, but also of nest holes where I had observed parent Hairy Woodpeckers feeding their young in 1957 and 1958 (Figure 2). The three nest holes were within a distance of 100 feet.

#### PAIR FORMATION IN FALL AND WINTER

*Drumming.* I heard drumming from HF's main drum tree during September and October 1958, but it was 18 October before the swamp became dry enough for me to start consistent observations. The female HF drummed hundreds of times on favorable days. Such a day was 8 November. HF began drumming at 7:45 A.M., when the swamp was covered with frost and skim ice. She drummed 54 times in five minutes on what I called her China Tree because it had a reverberation and tone, due to its hardness, which I could recognize at 800 yards. Her drumming rate of 11 bursts a minute represented an intense level of behavior. This intensity was also reflected in another type of drumming. At about 8 A.M., on the same morning, I found HF feeding

among low willows, but pausing here and there to drum one or two bursts in places of no particular resonance. She drummed 19 bursts on eight different spots within 10 minutes. It appeared as if she had a great urge to drum even when feeding. I watched her drumming from 2:35 P.M. until sunset of the same day, and by dusk I had heard her drum at least 400–500 times.

The drumming of HF was particularly striking because no other species of woodpecker in the swamp did much drumming during the fall, and because, with continued observation, it became obvious that HF was trying in a persistent fashion to attract the male HM. This situation was clearly seen on 9 November. On this day, HF drummed a total of 98 bursts in 20 minutes as she moved from her main China Tree to a dead willow close by the territory of her mate HM. She stopped drumming as soon as he flew across to join her. The pair were together for about 15 minutes. HF did not always come close to HM's territory when trying to attract him by her drumming, for she often drummed on her Low Tree, which was nearly 450 yards away, and he would fly to her there. On 26 December, for example, HF's drumming rang out clearly from a hollow portion of the Low Tree. I watched as she flew to the top of an adjacent tree as if expectant, then flew to join HM in the top of a dead elm right above where I stood. Such meetings were always of much the same form. The two birds above me rested within about five inches of each other without display of any kind and exchanged a rapid *jeek, jeek* vocalization.

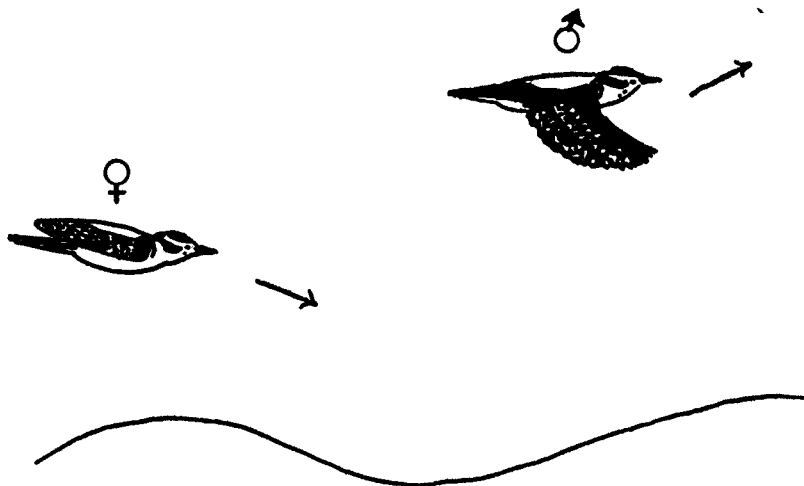


Figure 3. Duet flight of the pair of Hairy Woodpeckers HF-HM, which took place above the treetops, usually over the territory of HF.

*Display flights.* HF and HM usually launched themselves off on a display flight after their *jeek, jeek* greetings. I termed these performances duet flights. When standing in the center of the swamp, I could watch the two Hairy Woodpeckers, one rising and one falling as they swung great bounds and loops above the treetops of HF's territory, now one and now the other in the lead as if without apparent aim. These flights were not pursuits; HF and HM would alight peacefully, fairly close together, in pauses between flights. The duet flights centered, primarily, over the woods where the 1957, 1958, and 1959 nest excavations were all located (Figure 2).

HF performed a second type of display. I termed it the Floating Flight, and I had views of HF in these flights on six occasions between 1 November and 28 December 1958. A floating flight on 8 November 1958 was of special interest. HF had done much drumming, as described above, and had participated in many duet flights with her mate. At sunset, which was about 4:30 P.M., I was standing in the open swamp when HF, flying toward me in bounding flight, suddenly broke into a batlike flutter with alternations of floating with wings held motionless, at an angle of 45 degrees. She made *tweeck, tweeck* notes at the same time. I have not heard these notes from a Hairy Woodpecker on any other occasion. HF alit on a dead oak, drummed five or six bursts,



**Figure 4.** The female Hairy Woodpecker HF in a floating display flight.

then went off on a long flight up swamp, as I presumed, to roost for the night. These floating flights of HF always took place when she was flying to or away from a meeting with her mate. If male Hairy Woodpeckers have a similar display flight, I have not observed it.

*Tapping.* The tapping of the Hairy Woodpeckers came as a surprise, for it was done under different circumstances than those that I (1958) had observed for Red-bellied Woodpeckers (*Centurus carolinus*). The tapping of both species is at a countable rate of two to three taps a second. HF had drummed almost incessantly during the morning of 22 November when, at 11:30 A.M., she alighted on a small tree 30 feet from me. She now tapped 9 or 10 times, loud and clearly, paused, then tapped eight more series for a total of about 80 taps. I heard HF tap on four occasions between 9 November and 7 December. None of this tapping was associated with any obvious nest hole, but on 1 February 1959, I saw HM fly to a fresh excavation and tap three bursts just below it. I believed that HF was nearby for I heard *jeeks*. The excavation belonged to a pair of Red-bellied Woodpeckers, which nested in it the following May.

*Conflicts.* HF was facing a rival female at one of her territorial boundaries in each of the five conflicts that I observed between November 1958 and March 1959. A conflict on 17 January was representative. HF alit on a tree trunk above the intruder, pointing her bill upward and almost backward as she did a bill-waving dance, which involved jerking of her head and body as well as half-starting motions with her wings. Her rival posed as if frozen with her bill pointed straight forward. HF dropped to a lower position, then pursued her adversary up the trunk. Such dance displays are carried out by both sexes, but all conflicts I have observed have been between Hairy Woodpeckers of the same sex. Conflicts are silent affairs if only two woodpeckers are engaged. If a third bird, a mate of one of the participants, is nearby, one may hear vocalizations such as *chewi*, *chewi* or *jeek*, *jeek*. I heard both of these notes on 17 January. Skutch (1955) has given a good description of two male Hairy Woodpeckers dancing in conflict.

#### ACTIVITIES OF THE MALE

A lane, which served as a boundary between the territories of HF and HM (Figure 2), afforded me a wide view of the exchanges of visits between these two woodpeckers. The female HF made only occasional visits to HM's territory. I would hear an exchange of *jeeks*, but I never saw her drum nor did I witness any duet flights on his side of the lane. HM visited his mate's territory far more frequently, in response to her persistent drumming. He, however, sometimes took the initiative. I heard him begin to drum on a number of mornings during the fall and winter at times when HF was silent. He would move to drum trees successively nearer to her territory, and on 7

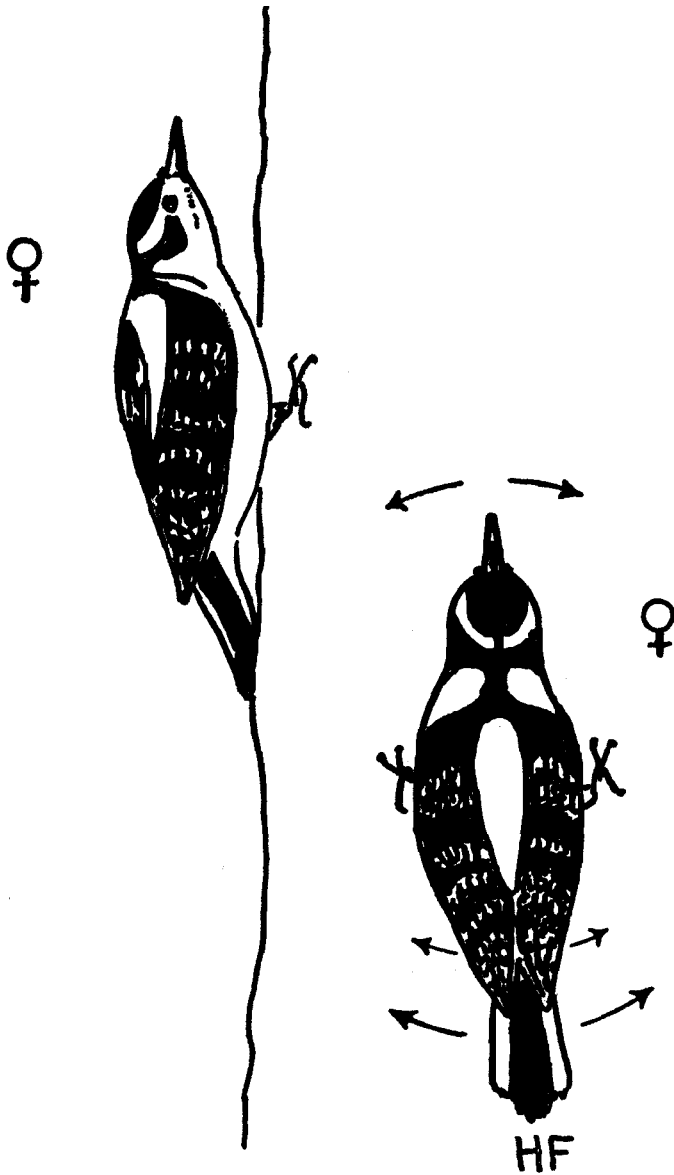


Figure 5. A conflict between two female Hairy Woodpeckers along the territorial boundary of HF. The owning female HF threatens by jerking her body about and waving her bill while the intruder (upper figure) has temporarily assumed a frozen pose.

December he finally alit on a dead limb by the lane. His head feathers were raised as he called a sharp *speck, speck*. I then heard *jeek, jeek* and watched him fly over the boundary to join HF on a bare treetop. Within a minute they flew off together in a duet flight.

The pair of woodpeckers had duets of drumming in which they appeared to be answering each other, although each remained within its own territory. An example was 13 December. I was standing in the lane at dawn when I saw HF fly to her China Tree at 7:28 A.M. She drummed at a rate of eight to nine times a minute for the next 22 minutes. HM began drumming after she had started, and, as in other duets, his drumming came at only half of her rate so that I heard two bursts from HF for every one burst from him. HM spent increasing periods of time in HF's territory as the winter progressed. He occasionally drummed there, but in a weak manner, on indifferent places, and he never used her main drum trees. I located him far up in HF's territory on 17 and 18 January. On each morning he ascended a number of trees, drumming at the bases of small, dead limbs as he did so at rates of up to nine times per minute.

#### NEST-HOLE EXCAVATION

The pair HF-HM became less demonstrative in late winter when the drumming and breeding activities of Downy (*D. pubescens*) and of Red-bellied woodpeckers became increasingly evident. HF continued to drum on her main China Tree but at a slower rate and in a more sporadic fashion. The last extensive drumming that I heard from her was on 7 April 1959, when she drummed for 40 minutes at a rate that varied from three up to infrequent periods of nine times per minute. HF and HM became increasingly difficult to locate. I was excited, therefore, on 25 April to discover that HF was excavating a nest hole in a living ash tree, 40 feet above the swamp and 50 feet from the nest hole of the previous year (Figure 2). HF did all of the excavating during the two mornings that I observed her. Her activities on 26 April were of particular interest. She was working out of sight, but she came up at intervals in order to throw sawdust from the entrance. She threw out 37 billfuls in one successive episode. Within a half-hour period she came out completely three times, flew to a main drumming tree nearby, and drummed briefly. It appeared that she wanted HM to visit her. When he arrived, which was usually within a few minutes, he might visit the excavation for a brief look, fly to her at the drum tree, and exchange a variety of notes ranging from *jeek* to *joick* and *chewi*. HM would then fly away, leaving his mate to excavate alone.



When a pair of Bluebirds came by to look into the excavation, the female Hairy Woodpecker flew at them without excitement. The situation changed when a Starling arrived. HF now displayed by uptilting and waving her bill while jerking her body and starting her wings; the same threat display she had used against territorial intruders of her own species. I never encountered HF after 26 April. There was never any sign of actual nesting during the next month, although the excavation was completed so far as I could tell by having my son explore it with a probe. I found HM back in his original territory but without evidence that he had a mate in May. It is possible that HF had been killed.

#### COMPARISONS WITH OTHER WOODPECKERS

The above observations were made on a single pair of Hairy Woodpeckers. Considering the wide territories covered by these birds, the shyness of the females, the difficulties of recognizing the sex unless the individual woodpecker has its back to the observer and is not too active, it would appear that a satisfactory life history of *D. villosus* may be worked out only by concentration on favorable situations such as I have described. The findings were not altogether unique. A second pair of Hairy Woodpeckers, located 1,000 yards farther down in Seneca Swamp and observed from 23 November until 6 December 1958, paralleled the pair HF-HM in the following respects: (1) The female was extremely shy and restless, taking long, bounding flights from one end of her territory to another. (2) She drummed at a fast rate of 8-11 times a minute, and she drummed more frequently than her mate who drummed at only one-half her rate. (3) The male was not only easier to approach, but his sharp call *speck, speck* made him less difficult to locate. His mate resembled HF in never making this vocalization under ordinary circumstances. Inaccessible terrain made a detailed study of this second pair nearly impossible.

In his studies on banded Hairy Woodpeckers, Shelley (1933) described two instances where females took the initiative in the selection of nesting territories. In one case the female also selected the nest site, and her mate rarely came near while she was excavating. He might, however, come to a tree 40 feet away where she would join him. "I should explain that with this species each sex has a separate territory, that of the male being close to but separate from the female's territory. The male occupies his territory exclusively during the winter. . . ." Shelley's note gives little description of methods of communication. It states, however, that when the male and the female of one pair came together in the spring "there was no active mating display." The pair

HF-HM likewise carried on little display at this season. My hypothesis is that Hairy Woodpeckers are more or less mated the year around and that performances associated with initial pair formation are not always observable in any one year in one locality. This may apply also to Pileated Woodpeckers (*Dryocopus pileatus*). In years of observations on this species, I have only once (1959b) encountered an individual actively seeking a mate. This particular woodpecker, a male, did a great deal of drumming within a territory 700 yards long, the length having been determined by the greatest distance between his main drumming tress.

The lead of the female in pair formation, which I have described for *D. villosus*, is also characteristic of some other species of the genus *Dendrocopos*. The Great Spotted Woodpecker (*D. major*) offers a close comparison to *D. villosus* if one considers the following information: (1) Pynnönen (1939) has described a duet flight (*Hintereinander-her-Jagen*) and a floating flight (*Schwebeflug*) in the courtship of this European species. Both sexes have red under tail coverts that are displayed in the *Schwebeflug*. Blume (1958a) has made an illustrative sketch of this performance. His term *flaternd-schwebenden Flugweise* is especially descriptive of the floating flight that I observed for *D. villosus*. (2) In further observations Blume (personal communication) found that two ringed females of *D. major* remained on their breeding territories the year around whereas the males changed. The drumming territories of this species are 400-500 meters long. (3) Blume (1958b) has also described the tapping and drumming of the Great Spotted Woodpecker. The circumstances attending the tapping parallel those found for *D. villosus*.

The Downy Woodpecker is, in my experience, the most difficult of eastern woodpeckers to study. Its activities take place with surprising quickness, and sex recognition, if one wants to make it in a matter of seconds, is not always possible. Shelley, however, as quoted by Bent (1939), stated that "the female selects the nest site on her winter or year-around territory."

In conclusion, it would appear that at least two patterns of early breeding behavior are recognizable among woodpeckers. In one of these, as represented by *Centurus carolinus* (Kilham, 1958) and *Melanerpes erythrocephalus* (Kilham, 1959), the male takes the lead in pair formation and tries to attract a mate to a potential nest site by his loud and repeated breeding calls. The attraction of a mate is different in some species of *Dendrocopos*. As illustrated by *D. villosus*, the female may take the lead in pair formation and attract a male to her winter

territory by repeated drumming. Neither the Hairy nor the Downy Woodpecker has a breeding call. A comparative study of the breeding behavior of these latter two species would be of considerable interest.

#### SUMMARY

1. The courtship and pair formation of a pair of Hairy Woodpeckers, in which the female attracted the male from his territory to hers, were studied from October until the time of nest excavation in the following April.

2. The courtship activities of the female were most intense in November and early December when she might drum 400–500 bursts in a day, at a rate of 10 bursts a minute. Such drumming might go on for 20 minutes at a time. The male might respond by drumming at a rate of four bursts a minute from his territory. Drumming ceased when he flew across to join her.

3. When the pair was in the territory of the female, the two birds usually (a) greeted each other with the vocalization *jeek, jeek*, and (b) rested within a few inches of each other, without display. (c) The pair might then have a duet flight over the treetops of the female's territory. The male often returned to his own territory after about 15 minutes.

4. The female sometimes displayed a floating, fluttering type of flight, accompanied by the vocalization *tweeck, tweeck*, when approaching or leaving a meeting with the male.

5. The female tapped intensively during the late fall. Tapping by the male was observed on only one occasion.

6. The fall-winter territory of the female was approximately 450 yards long, and its boundaries were marked by (a) the round of her drumming trees and (b) the zones of conflict with rival Hairy Woodpeckers at the periphery.

7. Of seven conflicts observed, five were between females and two were between males. All took place at the female's territorial boundaries. Both sexes did a bill-waving, body-jerking dance when in conflict.

8. The male spent increasing amounts of time in the female's territory during the spring. Drumming, vocalizations, and displays were all diminished at this season.

9. The female excavated a nest hole in late April in close proximity to nest holes used by Hairy Woodpeckers in two previous years. She appeared to do all of the excavating.

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