

REPRODUCTIVE BEHAVIOR OF DOWNY WOODPECKERS

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This paper describes the breeding behavior and communications of Downy Woodpeckers (*Dendrocopos pubescens*) on the basis of field studies made from 1951 to 1961 near Seneca, Maryland, and, to a less extent, at Tamworth, New Hampshire, and of observations on five hand-raised individuals in an indoor aviary, a pair of which carried on much of their breeding behavior and laid eggs in two consecutive years.

METHODS OF COMMUNICATION

Downy Woodpeckers are a relatively silent species, with vocalizations which are usually rapid and short.

VOCALIZATIONS

Sputter.—A *chick, chick, chick, chick, chrr-rr-rr* call given only once, without immediate repetition. It may be heard in all months of the year and it appears to be an assertion of dominance within an area.

Chip or kick.—A common expression of excitement from any cause. Greater alarm is expressed by a shrill, whistle-like *peep-peep-peep*.

Chirp.—This note, which is sparrow-like and frequently repeated, is an intimate greeting exchanged by the members of a pair. It is given in the fall as well as in the spring. My captive Downies exchanged *chirps* at daybreak, when they came close to each other after roosting.

Chrr.—A harsher note than the *chirp*, sometimes heard in conflicts between members of either sex.

Check, check, check, check.—At higher intensity this call sounds like *queek, queek, queek, queek*. This rapid series of notes may accompany courtship flights.

Vocalizations of nestlings.—Five young taken from a nest when they were approximately 10 days of age made musical twitters which suggested a flock of shore birds in their variety. These twitters continued for the next few weeks.

INSTRUMENTAL EXPRESSIONS

Drumming.—The rate and intensity of drumming varies with the circumstances. Drumming usually comes in bursts of 1½ seconds duration, delivered at a rate of 9 to 14 bursts a minute, but it may consist of as many as 24 shortened bursts a minute in intense situations. In other circumstances drumming may slow down to a distinct tapping. Downy Woodpeckers do little or seemingly no drumming from September until late in December; then they drum with increasing frequency during the winter and early spring. This drumming is interpreted in various ways. It appears, however, to be associated primarily with initiation and maintenance of the pair bond, dominance within a breeding territory, and search for a suitable nest site.

Tapping.—Either member of a pair may try to attract the other to a potential nest site by drumming, tapping, or drum-tapping. The latter is somewhat in between the other two in sound. A usual performance is for one bird to move over a stub, tapping as it goes, until it locates a spot suitable for an excavation. It then drums or taps and its partner flies over to inspect the spot. Tapping may be delivered in bursts of 9 to 10 taps each, at a rate of 4 taps per second.

Wing ruffle.—Downy Woodpeckers usually fly silently, but they can fly with a ruffle noise which appears to be expressive of excitement.

DISPLAYS

Crest-raising.—This may be performed alone or in association with other displays and is generally expressive of excitement.

Bill-waving dance.—When facing each other in conflict, two male or two female Downies jerk their heads, bills and bodies from side to side while making starting motions with their wings and fanning their tails. This display is occasionally used against unrelated birds when they are rivals for a nest hole.

Full wing threat display.—One Downy in conflict with another may raise its wings, outstretched, above its back, and fan its tail, as if trying to appear as large as possible.

Frozen pose.—In response to some immediate danger, such as a passing hawk, a Downy Woodpecker usually flattens itself against a trunk or limb, with bill pointed upward, and remains as if frozen.

Resting motionless.—The members of a nesting pair may rest motionless for minutes at a time, especially when their excavation is nearing completion and they are close to the time when copulation begins. This behavior pattern is also common to other species of woodpeckers.

Courtship flight.—This may be performed by either member of a pair. It ranges from floating on outstretched wings to a fluttering, bat-like flight high in the air. The flight is accompanied by *check, check, check* or *queek, queek, queek* vocalizations.

COMPARISON WITH HAIRY WOODPECKER

Downy Woodpeckers have a surprising range of vocalizations. Hairy Woodpeckers (*Dendrocopos villosus*) have a number of comparable notes including the sputter, the *kick*, and the courtship *jeek* or *queek*, as well as nearly identical displays (Kilham, 1960). It is virtually impossible, on many occasions, to distinguish the drumming or the tapping of the two species. Also both species carry on some degree of pair formation in the fall and individual recognition is facilitated by the patterns of black, white, and, in the case of the males, red markings at the back of the head and neck. *Dendrocopos villosus* and *D. pubescens* are remarkably different in other respects. The actions of Hairy Woodpeckers are nearly always vigorous and dramatic, their vocalizations and drummings having considerable carrying power. Downy Woodpeckers have nothing comparable to the duet or courtship flights of *D. villosus*.

FALL SEXUAL BEHAVIOR

Pair formation.—Three types of activity suggest that some degree of pair formation takes place among Downy Woodpeckers in the fall. First, it is common to find a male and a female moving along and feeding within two to 30 or so feet of each other in October and November but not in mid-winter. I witnessed one such situation, for example, on November 15, 1959. The two Downies were together for nearly 30 minutes with the exception of a flight of 100 yards which the female took to feed on poison ivy berries. On returning, she broke into a butterfly-like flight in the last three feet before landing, giving *check, check, check* notes as she did so. The male flew to the berries later, then returned in normal flight. I found the pair again, recognizing them by individual head markings, in the same patch of woods on November 21. The female flew away on one occasion, returning with the floating flight and giving *check* notes, and when she found something of interest under some bark, the male flew over and displaced her. Dominance of males at feeding places is usual among Downies.

Second, fall sexual interest was apparent in conflicts among Downy Woodpeckers of the same sex. In one such conflict, observed on November 22, 1958, three females were actively involved in bill-waving dances. The whole performance took place in a

bush five feet from the ground. Another conflict observed on November 9, 1959, was similar except that the two males involved finally grappled in mid-air with a noise suggestive of snapping bills. None of the above conflicts was accompanied by vocalizations.

Tapping was a third kind of fall activity. On November 16, 1958, for example, a male Downy flew to a hole and began tapping as a female alighted close by on the same stub. She left a minute later to engage in a conflict with another female, with alternations of bill-waving and frozen poses.

The fall sexual behavior of a pair of Hairy Woodpeckers observed in the same swamp (Kilham, 1960) resembled that of the Downies in the tapping, the bill-waving conflicts, and the moving about of the birds as a pair. Activities of both *D. villosus* and *D. pubescens* reached a peak in November, a significant difference between the two species being that the Hairy Woodpeckers did a remarkable amount of drumming.

OTHER FALL AND WINTER ACTIVITIES

Downy Woodpeckers excavate fresh holes in the fall for roosting in winter months. This excavating, as I have observed on 15 occasions, is done by either sex on an individual basis and is not connected with sexual behavior. Four Downies, for example, occupied our yard in the fall of 1957. It became easy to recognize these birds by their



Fig. 1. Head markings of Downy Woodpeckers (*Dendrocopos pubescens*) showing differences in individual birds. Males, left; females, right.

individual head markings (fig. 1), especially when they were feeding on suet. I fastened a number of slightly rotten logs in upright positions and a female Downy Woodpecker began an excavation in one of these on November 1. She spent the first night in her new hole five days later. A few months later she became interested in a fresh log and made a second excavation in eight days. There was little evidence of territorial behavior among these wintering Downies. In the winter of 1959–1960, for example, two females excavated holes in one ash stub and roosted within a few feet of each other, in peaceful fashion, for several months. The Downies were, however, quick to defend their individual roost holes. In December, 1958, a Hairy Woodpecker which alighted near the roost hole of a male Downy was pursued immediately. When a pair of Hairies came by on the following day, the male Downy drummed instead of attacking. This was unusual, for I had heard no drumming from Downies during the fall. It would appear that the smaller woodpeckers have reason to fear their larger relatives for, late one afternoon in the winter of 1957–1958, a Hairy Woodpecker appeared in the yard, enlarged the entrance of a Downy's roost hole with a few quick blows, then popped inside for the night.

RE-AWAKENING OF SEXUAL BEHAVIOR IN WINTER

Downy Woodpeckers start drumming in January and February on days when weather is favorable. On January 4, 1959, I heard the drummings of both Downy and Pileated (*Dryocopus pileatus*) woodpeckers coming from various directions, as well as the breeding calls of Red-bellied Woodpeckers (*Centurus carolinus*) on a morning of fresh snow and sunshine in Seneca swamp. One male Downy was especially active. In succession he drummed, chased a rival from the same tree, then rested on a dead portion where he gave 10 bursts of tapping. Each burst consisted of 4 to 5 taps. He returned

a few minutes later to tap three more bursts on the same stub, which had no hole but was of a size used by Downies for excavations. Other examples of winter activities were observed on the morning of February 17, 1957, when two males performed a number of bill-waving dances within a limited area. This conflict was intensified by the appearance of a female Downy. I also found two females engaged in a similar conflict in another part of the swamp. In this encounter, a male, drumming in a tree above, floated down on outstretched wings to land near the combatants, but he did not participate in the fighting. All of the winter activities just described appeared to be associated primarily with pair formation and defense of territory rather than with selection of a nest site.

NEST SITE LOCATION AND CONFLICT

Downy Woodpeckers, like other species of woodpeckers whose breeding behavior I have had occasion to observe (Kilham, 1959, 1961), usually locate their nest sites and proceed with actual nesting in a relatively quiet manner. When pairs are disturbed by rivals, however, much of their reproductive behavior is repeated many times and is intensified. The following examples illustrate this general situation.

Nest location.—A male Downy drummed two bursts on a dead portion of an elm in Seneca swamp, on March 27, 1960, and his mate drummed six bursts on the same spot shortly afterward. The nest hole of the pair was excavated subsequently at this drumming place. Activities on March 27, however, as well as those in succeeding weeks, were interrupted by intrusions of a rival male. On the morning of March 27, the female had drummed 38 times on the elm, at a rate of 12 bursts a minute, when the intruding male alighted below her. She moved away immediately, giving a series of shrill *peep, peep, peep* notes. The other encounters observed involved only the two rival males and took place low down, in bushes below the elm. The female drummed during one of the four conflicts; then she floated down in full threat display. The pair visited a number of alternate nesting sites in the course of the morning, and the male attracted his mate to one of these by tapping four times. The female was generally the more active partner. She drummed over 100 bursts in several hours as compared with two bursts by the male.

The two males had further conflicts on April 2. They moved about bushes and low trunks with tails outspread, jerking their bodies. At times they faced each other in frozen poses. Drumming of the female on the elm above seemed to intensify the conflict, for one male might assume a full threat display or the two might grapple beak-to-beak in mid-air. The pair inspected a number of alternate nest sites as they had done on the previous morning. The female was apparently the leader, for (a) she was the first to attract the male by drumming at a new site; (b) she drummed more than the male, a total of 70 bursts to his 20 in the period I watched; and (c) when the pair returned to the original elm, the female flew to the male in a courtship flight accompanied by *check-check-check* notes. Later, on April 24, I found both the male and the female taking turns at excavating a hole in the elm, and on May 22 I watched them bring food to their young. I saw one parent leave the hole with a fecal sac.

Conflict of females and defense of territory.—In mid-April, 1960, in Tamworth, New Hampshire, the courtship performances of a pair of Downy Woodpeckers were interrupted by intrusions of a rival female. On April 16, for example, the male kept returning to drum on a high maple while the two females fought in some low hemlocks below. They went through the whole gamut of bill-waving dances, grappling in mid-air, giving *peep, peep, peep* alarm notes, as well as a number of floating threat displays. An occasional floating flight was accompanied by *check-check-check* notes. This seeming intermingling of courtship and conflict apparently occurred because the male was

usually following the females about, although he did not participate in their encounters. At one time he floated downward for 60 feet or more in an irregular, bat-like flight, after drumming in the high maple. Conflicts between the females were still continuing on April 18. On this day the females engaged in long circular pursuits through the woods, some of which were accompanied by *queek, queek, queek* vocalizations when the male was following. The male drummed a number of times on an oak 165 yards from the maple. The oak was above a zone where his mate seemed to meet her rival and where the conflicts began. I observed no further conflicts after April 18.

On April 20 the pair of Downies flew to the same limb at 5:15 a.m. and rested within five to 10 inches of each other without display. The female then flew off to drum on a number of trees and the male went to drum on his high maple. This duet of drumming was ended when the male flew to the female well above the treetops, making *check-check-check* notes as he did so. I believed that the male was interested in a nest site near the maple, for he had flown to a nearby beech stub and tapped a number of times although the female had not responded.

The events just described had interest from several points of view. First, the male had drummed more than his mate in the course of four days, using two main drumming trees, and second, the wide-ranging pursuits and conflicts of the two females appeared to be associated with defense of territory rather than the finding of an actual nesting site.

NEST EXCAVATION AND COPULATION

Both sexes of Downy Woodpeckers excavate nest holes, but the females do the larger part of the work in most instances. Excavating is done primarily in the last week of April in Seneca swamp. Thus between April 25 and April 27, 1957, I located four fresh excavations by means of sawdust tossed out onto the ground below. Copulations took place as nest holes neared completion. On April 28, for example, I saw copulations of three different pairs. In all of these the female first invited copulation by perching crosswise on a limb near the nest hole. There were no other preliminaries. The male usually fluttered to the female and began copulation in a nearly vertical position. After copulating he fell away from the female gradually and to the left. In another episode, observed on May 21, 1958, in New Hampshire, the male was at an excavation when his mate came to a small limb close to and at a level with the entrance. The copulation which followed was somewhat bizarre. The male started copulating in the vertical position, but the female's grasp on the limb apparently loosened and the male was clinging horizontally and upside down by the time he fell away from the female. The female approached the excavation in similar fashion on the following morning. On this occasion, the male did not complete copulation.

NESTS AND YOUNG

Actual nesting activities, as observed for eight pairs of Downy Woodpeckers in Seneca swamp, occurred in the month of May. The Downies of one pair were excavating on April 26, 1959, and when my son climbed to the nest 34 days later, on May 30, all of the young except one had left the nest.

The nesting behavior of the eight pairs of Downies may be summarized as follows: (1) Both parents participated in incubation and in care of the young. There was no perceptible greeting when the male and female met at the nest. (2) One or the other parent remained on the nest in the week after the eggs hatched and did not leave until the arrival of its mate with food for the young. (3) At later periods, parents might come to the nest every two to three minutes with insects in their bills. Fecal sacs were carried out at less frequent intervals. (4) The young appeared at the nest entrance at the age of two weeks. One could hear their chittery notes within the nest. (5) Fledglings

were ready to fly within three to three and one-half weeks after hatching. (6) The male occupied the nest at night.

It is difficult to observe nestling woodpeckers in their natural surroundings. For study, five young Downy Woodpeckers, with eyes just beginning to open and with only a few pinfeathers on their bodies, were taken from a nest on May 23, 1959, and kept in a dark cabinet. When the nestlings were removed from the cabinet and placed in the light all five would cower down. Dimming the light or passing a hand in front of the young birds led them to stretch heads and necks upward in vigorous begging attitudes. They used their wings as props for their bodies. One method of feeding these nestlings was to approach from the side, brushing the fleshy knob at the base of the bill with a bit of food impaled on a toothpick. The young would open their bills and swallow the food readily. They could be induced to produce fecal sacs if prodded near the vent at this time. When the nestlings were returned to the dark cabinet, they would settle down, giving a variety of soft musical notes. Their first flights were on June 5, 13 days after removal from the nest.

BREEDING BEHAVIOR IN CAPTIVITY

The young Downy Woodpeckers acquired adult plumages in the first part of September. Activities relating to breeding behavior in two seasons, from 1959 to 1961, were as follows:

Sputter note and dominance.—There were two males in the aviary in 1959. The brighter colored bird was dominant over the other male at feeding places. In addition the brighter colored male mated with the single available female in the following spring. This dominant male (DM) was the only one to give the sputter note repeatedly. He usually gave his single sputters from the top of a pole or from a prominent log by the window, and these performances occurred with increasing frequency in October and November. Certain situations suggested that this sputter note was an assertion of dominance. For instance, DM gave many sputters during the fall of 1959 when the rival male was present, but he gave very few in a second year when a female was his only associate. On one occasion DM alighted on the back of the other male, giving a sputter as he did so. DM was dominant over his mate at feeding places, but this dominance did not involve sputters.

Drumming and tapping.—The mate of DM was a hand-raised female. This bird drummed for the first time on February 1, 1960, and she did all of the drumming, drum-tapping, and tapping during the first spring. I placed a nest log in the aviary on April 3, and the female immediately drummed 20 bursts by an excavation which had been the roost hole of one of our wintering Downies in the yard. A month later the female laid 4 eggs in this hole. She continued to take the lead in nesting activities in the intervening weeks and the male, DM, would fly to her when she drummed or tapped by the nest site. By the end of April, her efforts at attracting her mate were restricted to tapping alone. This was also true in the following year.

Vocalizations.—In comparison with pairs of other species of woodpeckers, which I have kept in the same aviary under similar circumstances, the two Downies were amazingly quiet, even at the height of their breeding activities. Almost the only vocalizations were *chirp*, *chirp* notes, exchanged when the two met at the hole or elsewhere.

Excavation.—DM began excavating inside the hole on April 9 and continued to do so in sporadic fashion throughout April. The female did almost no excavating in 1960. In 1961, however, when the hole provided required excavating, the female did almost all of the work, in concentrated fashion, at the end of April.

Resting motionless.—The female spent increasing amounts of time resting below or to one side of the nest entrance; sometimes she did so when her mate was resting on the

inside of the hole. She almost never entered the nest in April, 1960. On April 30, however, both Downies entered the hole and remained inside together for a few minutes.

Copulatory behavior.—The female invited copulation on April 28 by taking a pose with tail tilted somewhat upward, back low, and bill pointed up. The male got on her back, lost balance, and left. This pseudo-copulation also took place on the following day and I witnessed no complete copulation until May 1. On that date and again on May 5 the male mounted the female in a more secure fashion.

Incubation.—By May 5, 1960, DM was roosting in the nest hole at night as well as spending much of the day there. A first egg was possibly laid on this date for there were 3 eggs on May 8. Both Downies became unusually quiet. The male did practically all of the incubating in subsequent weeks while his mate spent much of her time resting on the outside of the nest hole.

Failure of eggs to hatch.—The female exhibited new patterns of behavior on May 23, which was 18 days after the first egg had presumably been laid. At this time she drummed for the first time in weeks, invited copulation by assuming what I called her water-thrush pose, and, on the following day she laid a fifth egg. I removed all 5 eggs at this time. The pair was placed in an outside cage and molted in June. Events in the breeding season of 1961 followed the same course as in 1960 except that only 2 eggs were laid. In both years the male, DM, did his first drumming of the season after the attempts at nesting had come to an end.

COMPARISONS

There appear to be no complete accounts of the breeding behavior of either the Downy or of the Lesser Spotted Woodpecker (*Dendrocopos minor*), which is its counterpart in Europe. An example of this is Bent's statement (1939:61) that he had "found in the books no mention of drumming by the female downy," although, as described previously, females drum as much and probably more than the males. This situation also applies to Hairy Woodpeckers (Kilham, 1960). Scattered observations in Bent's work (*op. cit.*) support some aspects of the present report. Thus L. O. Shelley (MS) wrote that two female Downy Woodpeckers, involved in a conflict on October 15, 1935, swayed their heads, "swinging them quickly down and up to one side, down and up to the other." Shelley's observations were on banded Downies in New Hampshire. He stated that "the female selects the nest site on her winter or year-around territory," although it would appear from my own observations that males also take an active part in the selection of a nest site. Shelley further noted that a male began drumming on February 3, 1934, and continued on succeeding days when the temperature was 18 below zero. Description of spring activities is unfortunately brief. Shelley did, however, observe the members of one pair "perching together and motionless for considerable periods of time."

Parallels in the behavior patterns of the Lesser Spotted Woodpecker, as taken from a number of accounts, relate to drumming and display. Pynönen (1939) reported the rate of drumming of *D. minor* to be from 12 to 14 times a minute. He stated that he only once found the main drumming tree of this species. By way of further comparisons, Bannerman (1955) quotes Labitte as stating that the female of *D. minor* drums more in spring than the male, and Tracy (1933) described a male which drummed at a fresh nest excavation and attracted his mate to it. Tracy (1933) has also described the tapping of *D. minor*.

Accounts of display flights are given by Pynönen (1939), Tooby (1943), Richardson (1948), and Bannerman (1955).

The Greater (*Dendrocopos major*) and Lesser Spotted woodpeckers bear much the same relation to one another as do the Hairy and Downy woodpeckers. In each case the

smaller species has reason to fear the larger one. Thus Tracy (1933) described an episode in which a Greater Spotted Woodpecker came to the nest excavation of *D. minor* and enlarged the opening, in spite of persistent attacks by the owner. In addition Howard (1920) has a frontispiece depicting such an encounter between the two species.

SUMMARY AND CONCLUSIONS

Downy Woodpeckers carry on limited sexual behavior in October and November. This is indicated by association in pairs, occasional display flights, tapping, and conflicts between members of the same sex. Drumming, however, is rare in the fall months. Excavations of winter roost holes are made on an individual basis, and Downies show little interest in each other on days of average winter weather.

Drumming, conflicts, and other signs of sexual behavior may start, in rather explosive fashion, on days of favorable weather in January and February. A more sustained phase of breeding behavior develops in late March when pairs search for suitable nest stubs within breeding territories and individuals drum or tap to attract their mates to potential sites. Females usually take the lead in these activities.

Territorial drumming as well as display flights and various forms of courtship behavior may be intensified in periods of conflict with rival Downy Woodpeckers.

Both sexes excavate nest holes but females may perform the greater part of the work as the time of copulation approaches.

Female Downy Woodpeckers invite copulation by assuming a pose on a limb close to the nest excavation. The male is in a nearly vertical position when he mounts the female and as copulation is completed he falls off the female to the left.

Members of pairs spend varying periods resting motionless during the time of excavation of the nest hole, and they become very quiet with the onset of incubation.

Both sexes incubate during the day and the male roosts in the nest at night.

Five young were removed from a nest in order to study the vocalizations, responses to stimuli, and general behavior of nestlings.

A pair of hand-raised Downy Woodpeckers bred in two successive years. Although the eggs laid in both years proved to be infertile, many aspects of breeding behavior were observed repeatedly and at close range.

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Lyme, New Hampshire, June 5, 1961.