

# WINTER FORAGING AND ASSOCIATED BEHAVIOR OF PILEATED WOODPECKERS IN GEORGIA AND FLORIDA

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PILEATED WOODPECKERS (*Dryocopus pileatus*) have close pair bonds the year round (Kilham 1959) and it would seem that the selective advantages involved must be related to their total way of life. Many (Kilham 1965, 1970; Selander 1966; Ligon 1968; Jackson 1970 and others) have emphasized sexual differences in the feeding behavior of woodpeckers, but only a few (Morse 1972, Ligon 1973) have studied species in which the sexes are alike in feeding. None, so far as I am aware, have dealt with species in this latter category having close pair bonds in foraging as well as in breeding behavior other than Tanner (1942) on the Ivory-billed (*Campephilus principalis*) and Kilham (1972) on the Crimson-crested Woodpecker (*C. melanoleucos*).

Previous accounts of the feeding behavior of *D. pileatus* (Bent 1939; Hoyt 1950, 1957) deal with conditions as seen in northern or mixed woods rather than in the south. None describe in detail behavior associated with foraging and in none do the students appear to have followed the woodpeckers for hours at a time. This latter is important if one is to note limits of foraging territories, the extent and frequency of conflicts with rivals, the frequency and circumstances attending pair-bonding behavior, and the degree of male dominance as well as the percent of time, roughly, spent at any one type of foraging. All of these aspects are needed, if one is interested in a meaningful account.

## STUDY SITES, METHODS, DEFINITIONS

I studied the Pileated Woodpeckers in two places. One was near the Archbold Biological Station at Lake Placid, Florida, where I stayed from February to May in 1958 and 1959, the other at the Marine Institute of the University of Georgia on Sapelo Island from January to March 1972 and 1974. Openness of terrain favored observations in both places. In Florida the site was one of pine woods (*Pinus ellioti*) and shallow swamps kept free of undergrowth by cattle, and at Sapelo, of groves of loblolly pine (*Pinus taeda*) and live oaks (*Quercus virginiana*) maintained as an estate.

My goals, once I had located a pair of Pileated Woodpeckers, were to follow them as long as possible, which might be from 30 min to 3½ h before they took flight. Studies were on one main pair in both Georgia and Florida, with notes on four neighboring pairs. I located the main pair at Sapelo by waiting each day at dawn below the male's roost hole. Observations were usually made at a distance of 20 to 25 m using 8 × 30 binoculars. In Florida, where the woodpeckers were less wary, I sometimes came within 3 to 10 m.

Previous publications describe methods of communication and other activities of

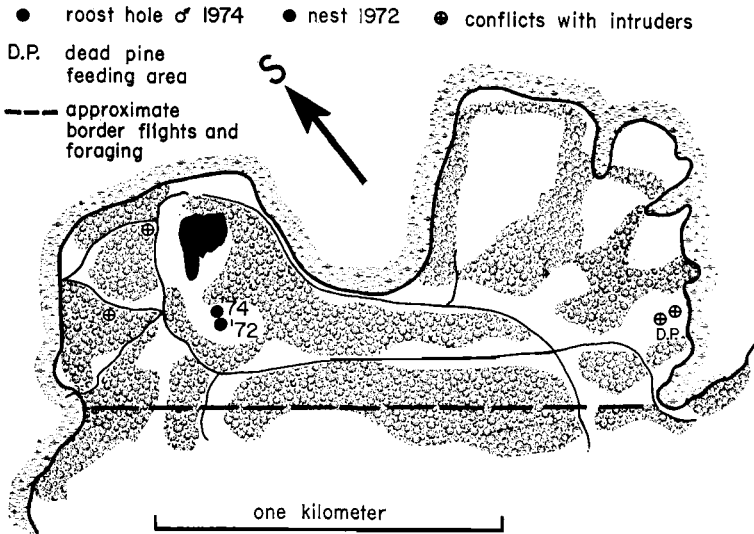


Fig. 1. Midwinter foraging territory of a pair of Pileated Woodpeckers on Sapelo Island, Georgia.

*D. pileatus* (Kilham 1959) as well as definitions of pecking, scaling of bark, and digging or excavating as I have used these terms in studying other species (Kilham 1965, 1970).

The action of the tongue of Pileated Woodpeckers is important in foraging. A hand-raised female I kept in an aviary for nearly 3 years explored my hand with the tongue, which projected up to 6 cm beyond the tip of the bill and darted in and out with such rapidity as to suggest the action of a flamethrower. It is this action that doubtless enables Pileateds to explore small holes and crevices as well as to draw prey from them, as Hoyt (1950) also described.

#### WINTER FORAGING

*Georgia*.—The foraging of Pileated Woodpeckers on Sapelo was largely confined to pines and live oaks covering the south end of the island (Fig. 1). The pines were divisible into (1) mature living trees where Pileateds worked on dead limbs, digging into one small area for 5 to 10 min before moving on to another limb or tree and (2) recently dead pines of 18 to 25 cm dbh (diameter at breast height) as well as larger ones of 30 cm dbh. These were the main foraging trees. The place where the woodpeckers worked for the longest periods was one where 40 pines about 20 m tall had died in a circle as though the agent killing the trees had spread outward from center. Pines at the center had lost terminal twigs and much of their bark, while those in a mid zone still retained bark, although it was easily peeled away. The

outer ring of pines had died most recently. These retained some needles and bark was firmly adherent. The Pileateds worked only on the pines with the loose bark in the mid and central zones and in such concentrated fashion that they moved about infrequently in the course of periods of up to 3½ h. They showed little variation in the way they fed. After alighting on the trunk of a pine, a Pileated would spend about 3 min knocking away bark with glancing blows, occasionally seizing a piece in its bill to pull it away, then run its tongue over the areas of brown, matted frass, open tunnels, and wood exposed. When I pulled away bark from similar places, I found numbers of termites (Isoptera) and no other insects. Thus these termites were probably their principal prey. After finishing with the bark, a woodpecker spent 10 to 15 min digging holes into the wood to a depth of roughly 2.5 cm. Although I was unable to find pitch tubes of bark beetles on any of the 40 pines, I did find them on a group of five dead pines where the woodpeckers worked for half an hour.

A third type of feeding ground consisted of small pines, 5 to 7 cm in diameter, killed as a result of crowding in young stands. These were well decayed, and the woodpeckers worked them over thoroughly. On one occasion a pine fell on the woodpecker working at its base.

When foraging on live oaks, the woodpeckers ascended trunks and large branches, exploring crevices in the rough bark and knocking away occasional pieces. They dug into small cavities, but rarely for as long as 5 min, and also worked on dead limbs and stubs that had died a long time previously. When feeding in this manner a woodpecker might spend 20 min in one tree, then move to another close by as though finding feeding places without difficulty. This was also true of the pines. Thus prey seemed so generally available that the Pileateds had little difficulty keeping together as they foraged throughout the day both in Florida and on Sapelo.

*Florida.*—I studied Pileated Woodpeckers in Florida in a pasture with scattered pines. Numbers of pine logs and stumps, left from lumbering, had become rotted and water-soaked where they lay on marshy ground. During observations that lasted from 15 min to an hour or more, I found the Pileateds foraging at ground level on rotting logs, stumps, or fallen pine branches on 19 of 25 occasions. On the other six occasions the woodpeckers worked higher up on the bases of trees. The other foraging places included a well-rotted maple stub where the male worked for over an hour digging, then turning and twisting its head as it fed. On one occasion, the female scaled bark and dug into the dead limb of a living pine. I saw no sign of ant tunnels where the woodpeckers fed and presumed they were foraging on wood-boring larvae.

*Fruits, berries, etc.*—Pileated Woodpeckers in both Georgia and Florida fed on fruits of several trees but possibly no more than once a day. On Sapelo they came almost exclusively to camphor trees (*Cinnamom camphora*) in midwinter, hanging upside down on terminal sprays to seize the fruit. The woodpeckers came to these trees at no special time, for I found them early in the day, at noon, and once just before roosting. On 5 February the female fed on a camphor tree for 25 and her mate for 15 min. These were the longest times. Common Flickers (*Colaptes auratus*) often fed on the trees at the same time and more persistently. On 10 February, in the course of feeding for 3½ h on recently dead pines, the female Pileated, soon joined by her mate, fed for 5 min on the fruit of a greenbriar (*Smilax laurifolia*). Hoyt (1957) lists fruits *D. pileatus* fed upon in other places.

#### TERRITORY AND INTRASPECIFIC CONFLICTS

The foraging territory of one pair of Pileated Woodpeckers, whose wanderings were limited in three directions by salt marsh at Sapelo is shown in Fig. 1. The greatest distances imposed by the limits of the marsh at which the pair foraged were 1770 m east to west and about 400 m north and south, making a total expanse of roughly 70 ha, of which nearly 20% was open spaces of no use to the woodpeckers.

I saw four territorial intrusions by other Pileated Woodpeckers (Fig. 1), all resisted by the resident male (RM). On 29 January RM gave "g-waick" (i.e. agonistic) vocalizations every minute or two while feeding on live oaks 2 m from his mate. I then saw a second male (M2) feeding close to the ground 25 m away. After 10 min RM flew to the intruder, striking down at him until both birds were facing each other on the ground. M2, turning away from his opponent, spread his wings over the grass. This maneuver made it difficult for RM to strike effectively. RM returned to the tree trunk and flew off. The second male then resumed feeding. From a high call heard at the time I believed his mate was nearby.

On 31 January, again deep within the territory of RM (Fig. 1), I witnessed a different type of encounter when an intruding male drummed six times on the top of a dead oak. RM alighted on a branch 4 m away and preened in a leisurely fashion for 8 min while his opponent, for the most part, simply rested, preening only momentarily, before flying away. It seemed possible that the lack of direct conflict between the males may have been due to an absence of females.

Two other encounters were alike. On each of two successive afternoons an intruding Pileated Woodpecker, sex undetermined, flew through the circle of 40 dead pines (Fig. 1) while the members of the resident

pair were feeding. RM immediately flew in pursuit. After an absence of 10 min, he returned to join his mate who had continued feeding.

#### INTRAPAIR RELATIONS

*Feeding together.*—The members of pairs of Pileated Woodpeckers both in Florida and Georgia remained together during the day, with few exceptions, from shortly after they left their roost holes at dawn until they returned to roost in the evening. This was in February before nest excavating had begun. On Sapelo the two birds, working on adjacent or nearly adjacent trees, were seldom as much as 30 to 40 m apart. Every so often one would fly to the other. On 7 of 17 occasions the female flew to the male, alighting 2 m away, then hitching to within 30 cm. She twice gave "woick" (i.e. low, intimate) vocalizations and once waved her bill (a courtship display) as she approached. The response of the male varied. Once, when he was preening, he waved his bill, with head thrown back, when she came near. When feeding at other times, he moved away and she fed where he had been. This behavior was also noted three times in Florida. On one occasion on Sapelo when the female took over what seemed to be a particularly good feeding place, he returned and retook it by striking at her. This was the only time I saw a male displace a female in this manner. On 2 of the 10 times that the male flew or moved close to his mate, the two simply came close, once almost touching bills, then separated. The eight other occasions were all on the group of 40 dead pines. Here it seemed that the straight trunks, close together and without foliage, enabled the male to see whenever his mate dug into a particularly good feeding place. If he happened to be without one at the moment, as was noted five times in the course of 5 h, he flew over and moved to her feeding spot without display of any kind as she gave way, usually with her crest raised. He would then feed for some time, turning and twisting his head as though finding prey. At the end of the afternoon on 10 February he displaced his mate three times in 3 min, waving his bill on two of these occasions, but he showed no particular interest in feeding after she left. After the last displacing he flew to his roost hole about a kilometer away. It might be noted in these episodes that when the male displaced his mate from places where he wanted to feed, he never waved his bill. It seemed, therefore, that the display was not agonistic as a similar performance is in Hairy Woodpeckers (*Dendrocopos villosus*) (Kilham 1969), but was, on the contrary, pair bonding in nature, as I have discussed elsewhere (Kilham MS).

The Pileated Woodpeckers in Florida fed closer together than in Georgia. They were often less than 8 m and sometimes only 30 to 50

cm apart. This closeness may have resulted from prey being concentrated in scattered logs and stumps. In these situations I saw the female displace the male five times and I never saw the male displace the female. The two occasions when the male displaced his mate were both when she was feeding on a dead pine stub. This was of interest in retrospect, for male displacings of females noted on Sapelo were also on upright dead pines.

*Flights.*—After feeding in one locality for periods of 20 min to 2 h or more, one or the other of a pair of Pileated Woodpeckers flew off to feed elsewhere. In Florida the male usually left first, soon followed by his mate, but on Sapelo either bird might be the first to leave and no sexual differences or dominance appeared to be involved. This situation agrees with Tanner's (1942) observation on Ivory-billed Woodpeckers that "In traveling and feeding through the woods, the pair would follow each other; neither sex consistently took the lead."

*"Cuk" vocalizations.*—Foraging Pileated Woodpeckers were sometimes quiet for hours, for the sound of their slow, intermittent pecking does not carry far when they are working on decayed wood. At other times the birds burst out with "cuks" that varied over a wide range of both rate and intensity. Times when the woodpeckers started giving "cuks" were often unpredictable. On the morning of 29 January on Sapelo, for example, I noted that the female gave "cuks" with nearly every move, either from one live oak to another, or even from one branch to another, while the male, who moved about to an equal extent, remained silent. That this was no sexual difference was indicated a few days later when the female remained silent and the male made the calls. On several occasions both woodpeckers gave loud "cuks" continuously during long flights over the treetops. Yet on similar flights on other days I heard nothing.

On occasion however the outbreaks of "cuks" seemed predictable. The most striking of these was when the birds fed on fruit of any kind, whether of greenbriar or camphor tree, and I have noted the same phenomenon with Pileated Woodpeckers feeding on wild grapes in New Hampshire and Maryland. They give "cuks" every few minutes and at times almost continuously. When two Pileated Woodpeckers "cuk" simultaneously the clamor sounds like the cackling of several hens that have just laid eggs.

A second occasion when the Pileated Woodpeckers started "cuking" was on seeing a hawk. On 3 February 1958 in Florida a pair of Pileateds fed quietly by the edge of a swamp until a Green Heron (*Butorides virescens*) suddenly flew by, closely pursued by a Red-shouldered Hawk (*Buteo lineatus*). Both woodpeckers immediately started giving "cuks"

and kept up the noise for some minutes. I have also noted this in relation to Sharp-shinned (*Accipiter striatus*) (Kilham 1958), Cooper's (*A. cooperi*), and Red-shouldered Hawks in both New Hampshire and Maryland.

#### DISCUSSION

The foraging and associated behavior of Pileated Woodpeckers is comparable to that of other large picines that include the Ivory-bill (Allen and Kellogg 1939, Tanner 1942), and the Crimson-crested and Lineated (*Dryocopus lineatus*) Woodpeckers (Kilham 1972). Members of pairs of all these species travel together throughout the day. Tanner states of the Ivory-bill "that mated birds usually travel and move closely together at all times except during incubation" and this was the situation I found in the related Crimson-crested in Panama. One wonders why these large species should have such close pair bonds, closer on a year-round basis than any I have read about or been able to find in smaller picines, except for the Red-cockaded Woodpecker (*Dendrocopos borealis*), which forms a special case. Before speculating on why Pileated Woodpeckers should forage together, three aspects of behavior presented above should be reconsidered.

*Displacings.*—Displacings of the female by the male might be regarded as behavior disruptive of the pair bond except for two circumstances. One is that in a reciprocal type of behavior noted on Sapelo and in Florida, the female sometimes flew to within about 2 m of the male when, as she slowly approached, he moved away and she fed where he had been. This yielding of a feeding place to the female is a form of behavior not described, so far as I am aware, for other species of woodpeckers and would seem related to the closeness of the pair bond in *D. pileatus*. A second consideration is the need of male dominance (Lorenz 1970). From this point of view, occasional displacings of the female by the male may serve to maintain a relation needed if the two birds are to maintain a close pair bond.

*Territory.*—A territory according to Noble (1939) is any defended area. The feeding range of the central pair of Pileated Woodpeckers on Sapelo (Fig. 1) was a territory in this sense because the male defended it on four occasions. Three of these encounters were mild and none took place on what could be considered a territorial border. It may be that such encounters are sufficient to space out Pileateds in relation to winter foraging. Once the breeding season of *D. pileatus* is well advanced, the conflicts are of a different nature, involving at times the four woodpeckers of two pairs along a small stretch of common boundary (Kilham 1959) or the pair and an intruder by a nest hole (Kilham 1973).

A feature of conflicts among Pileated as among Crimson-crested Woodpeckers (Kilham 1972) is that they strike at each other directly. This is in contrast to the prolonged bill-waving displays that characterize encounters of Hairy as well as Downy (*Dendrocopos pubescens*) Woodpeckers in the early breeding season (Kilham 1962, 1969, 1974a). It may be that the large picines, if subject to greater predator pressure, cannot afford prolonged conspicuous displays. Brief encounters could therefore have a selective advantage. Birds with such powerful bills as Pileated Woodpeckers could possibly injure each other seriously, but I have noticed that these woodpeckers have two strategies of escape. One is for the bird getting the worst of a conflict to fly to a terminal branch and hang upside down, and a second, as noted on Sapelo, is for it to present its back to an adversary while spreading its wings over the ground.

*"Cuk" vocalizations.*—Foraging Pileated Woodpeckers can be relatively noiseless over long periods or make woods resound with loud "cuks." Some occasions elicit these "cuks" regularly. One is when feeding on fruit, and here conceivably the habit of giving "cuks" is related to fear of predation. Pileateds are conspicuous birds, and especially when they are reaching out for fruit in exposed positions. A question is could "cuks" that make them even more conspicuous have survival value?

An idea that "cuks" could serve to divert predators came to me in Panama. For example I noted that chachalacas (*Ortalis garrula*) repeatedly set up an almost deafening clamor whenever a hawk flew by. This noise, startling to the human ear, might be sufficient to divert a hawk or cause it to fumble an attack. It is noteworthy that feeding on fruit and seeing a hawk sets up a similar type of response in Pileated Woodpeckers. No claim is made that "cuks" serve only this purpose. They appear to be vocalizations serving many contingencies, among them flying to roost or nest holes as described elsewhere (Kilham 1974b).

Having reviewed the nature of the intraspecific conflicts of Pileated Woodpeckers, the loud vocalizations given at times of feeding on fruit or on seeing a hawk, and the nature of the pair bond preserved while foraging, one can ask whether all of these may not be effects of related selection pressures. An hypothesis advanced is that larger species of woodpeckers may be exposed to greater danger from hawk predation than smaller species. Pileated Woodpeckers can, for example, be attacked by Cooper's and Sharp-shinned Hawks (Kilham 1958) both of which, though usually attacking smaller prey, may prefer larger species that are more conspicuous. In any case it seems likely that among the strategies large woodpeckers have developed for survival is that of



staying close to each other while foraging. A woodpecker engaged in knocking away chunks of bark or excavating a hole into wood is not always in a position to see an approaching hawk, and two pairs of eyes and ears can be better than one. Year-round pair bonds doubtless have value in promoting an early start in actual nesting, but this does not rule out their having other survival values. This situation seems particularly true in the south and in the tropics where a sufficiency of prey enables members of pairs to forage in close association with each other in all seasons of the year.

It should be emphasized in conclusion that it is difficult to gather extensive data on species such as the Crimson-crested and Pileated Woodpeckers that are thinly distributed in wooded country. More factors may be involved that I have stressed. Although size is, I feel, worthy of consideration, more stable environments of the south and of the tropics may serve to support closer social units, whether of large species or of smaller ones such as those of the Red-cockaded Woodpeckers (Morse 1972). The ideas expressed in this communication, therefore, are all open-ended and would, no doubt benefit from further exploration.

#### SUMMARY AND CONCLUSIONS

Pairs of Pileated Woodpeckers, followed for hours at a time in coastal plain habitats of Georgia and Florida in a midwinter study of foraging and associated habits, showed no sexual differences in feeding habits. Abundance of prey made it possible for the members of pairs to feed relatively close to each other throughout the day. Pair-bonding behavior included periodic short flights of one member of a pair to the other with "woick" vocalizations and occasional bill-waving. Seemingly unique among woodpeckers was that when the female approached the male, he sometimes yielded his feeding place to her. At other times, especially when the Pileateds were feeding on upright trunks where the male could see where his mate was feeding, he displaced her. Such displacings where the male asserts a dominance essential to the maintenance of the pair bond were not interpreted as a sign of intrapair hostility.

Pileated Woodpeckers may forage in silence over long periods. Although "cuk" vocalizations were given unpredictably at times, they were given in an explosive manner when the birds fed on fruit on terminal branches or on sighting a hawk.

The winter foraging of one pair of *D. pileatus* was over an area of approximately 70 ha. The resident male defended it against other males in conflicts that were deep within the territory rather than along a boundary. Behavioral mechanisms for avoiding injuries are discussed.

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