

FORAGING BEHAVIOR OF MALE BLACK-BACKED AND HAIRY WOODPECKERS IN A FOREST BURN

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Abstract.—During December 1988–June 1989, in a small forest burn area composed mainly of White Pine (*Pinus strobus*), male Hairy Woodpeckers (*Picoides villosus*) tended to forage on smaller diameters and at greater heights than male Black-backed Woodpeckers (*P. arcticus*). Males of both species still overlapped greatly in their foraging heights and diameters. In all ($n = 22$) interspecific contacts, Black-backed Woodpeckers stopped foraging and moved to a more distant tree when Hairy Woodpeckers approached within 10 m.

CONDUCTA DE FORRAJEJO DE INDIVIDUOS MACHOS DE LOS CARPINTEROS *PICOIDES VILLOSUS* Y *P. ARCTICUS* EN UN ÁREA FORESTAL QUEMADA

Sinopsis.—Durante el período de diciembre de 1988 a junio de 1989, en un área forestal quemada compuesta principalmente de *Pinus strobus*, el carpintero *Picoides villosus* mostró una tendencia a forrajear a mayor altura y en árboles de menor diámetro que individuos de *P. arcticus*. Hubo solapamiento en la altura y diámetro de los árboles en donde forrajearon los machos de ambas especies. Sin embargo, en todos los contactos interespecíficos ($n = 22$), cuando los *P. villosus* se acercaron a una distancia menor de 10 metros a individuos de *P. arcticus*, los últimos dejaron de forrajear y se movieron a otro árbol.

Black-backed Woodpeckers (*Picoides arcticus*) and Hairy Woodpeckers (*P. villosus*) occur only in the Nearctic region and are broadly sympatric throughout their range in Canada (Godfrey 1986). Hairy Woodpeckers are found in a variety of forest habitats from northern Canada to southern Panama, while Black-backed Woodpeckers occur primarily in northern and montane coniferous forests (American Ornithologists' Union 1983, Bock and Bock 1974). In the eastern part of their range Black-backed Woodpeckers have been recorded as far south as the northern New England states (American Ornithologists' Union 1983), and forage preferentially in burned forests at these localities (Blackford 1955, Bourdo and Hesterberg 1951, Gresser 1974, Mayfield 1958).

Morphological and behavioral differences associated with foraging are often found among congeneric species of sympatric woodpeckers (Austin 1976, Gamboa and Brown 1976, Jackson 1970, Kilham 1970, Ligon 1968, Peters and Grubb 1983, Selander 1966, Williams 1975). Since Black-backed and Hairy Woodpeckers occur closely together only in burn

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areas, we hypothesized that there would be differences in foraging heights and diameters utilized by males of these species in a small forest burn. This study is, to our knowledge, the first to document and quantify the foraging behaviors of Black-backed and Hairy woodpeckers in a forest burn.

STUDY AREA AND METHODS

The study site was located in a burn area near Quyon, Québec, Canada (45°31'N, 76°14'W), 70 km northwest of Ottawa. In June 1988, a 54-ha area of forest consisting primarily (90%) of White Pine (*Pinus strobus*), Eastern Hemlock (*Tsuga canadensis*) and Trembling Aspen (*Populus tremuloides*), was burned. All trees remained erect but were killed by fire. From December 1988 through June 1989, individual birds were located throughout the day and observed for as long as possible. Length of time between first contact and loss of a bird was considered a single observation unit (n = number of observation units, in a given season). Foraging behavior was recorded on a cassette tape. For reasons unknown, females were rarely observed at this site and were not included in the analyses.

We documented the following data for each observation unit: 1) foraging height in the tree, 2) diameter of foraging substrate, and 3) foraging technique. Times for all observation units (n) within each season were grouped and analyzed using Mann-Whitney U -tests.

Six foraging zones were defined: GR (dead wood on the ground), Z1 (lower trunk portion), Z2 (upper trunk portion), Z3 (base of crown to one half the height of the crown), Z4 (half the height of the crown to the top of the crown but not the periphery, and Z5 (peripheral branches at top of crown).

The diameters of limbs and trunks used as foraging substrates were categorized as: S1 (1.5–3.5 cm), S2 (3.5–7.5 cm), S3 (7.5–15 cm), S4 (15–25 cm) and S5 (>25 cm). The birds, assumed to be of relatively constant size, were used to estimate the sizes of the branches and trunks.

Two foraging techniques were defined: pecking, in which birds delivered blows to the substrate and/or removed bark, and excavating, in which a bird dug holes of various depths in the wood.

During foraging bouts we recorded interspecific displacements. We define a displacement as the movement of an individual of one species to another tree when an individual of a second species approached to a nearby tree (<10 m) or landed on the same tree.

After excavating holes, birds were observed feeding on large white grubs, which we presumed were the larval stage of an insect species. We collected these non-randomly from various White Pine trees only in zone 1 simply as a means of identifying possible prey species. We did not conduct feeding tests but the larvae collected were similar in appearance to those the birds were observed to feed on, and therefore were probably prey items.

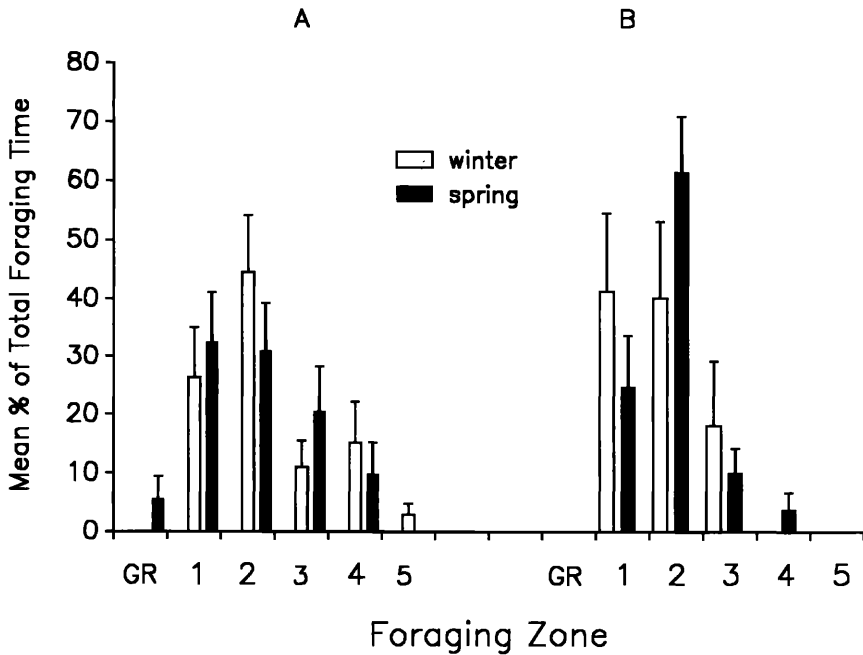


FIGURE 1. (A) Mean percentage of time spent at six different heights with Standard Error about the mean for *Picooides villosus*. (B) Same as 1A for *Picooides arcticus*.

RESULTS

A total of 7 h 54 min of foraging observations were made on Black-backed Woodpeckers (229 min on 6 Dec. 1988, 14 Dec. 1988, 3 Feb. 1989 in winter; and 244 min on 20 Mar. 1989, 27 Mar. 1989, 26 Apr. 1989, 19 May 1989, 18 Jun. 1989 in spring) and 7 h 22 min on Hairy Woodpeckers (212 min and 230 min in winter and spring, respectively) on the same days as above. Hairy Woodpeckers foraged 95% of the time on fire-killed White Pine and 5% on Eastern Hemlock, whereas Black-backed Woodpeckers searched for food 97% and 3% of the time on the same species, respectively. Insects collected by us were almost exclusively the larvae of the Whitespotted Sawyer, *Monochamus scutellatus* (Say).

Foraging height and substrate diameter.—During winter, Black-backed Woodpeckers spent significantly more time (100%) foraging on the trunk, than Hairy Woodpeckers (56%) ($U = 174$, $n = 12$, $P < 0.01$). In spring Black-backed and Hairy Woodpeckers were observed 94% and 84% of the time on the trunk respectively ($U = 265.5$, $n = 18$, $P < 0.05$). Foraging zones 4 and 5 were little used by either species (14.5% of the time by Hairys and 2% of the time by Black-backs). Hairys foraged on the ground rarely and only in spring, whereas Black-backed Woodpeckers were never observed foraging on the ground (Figs. 1A, B).

During both winter and spring, Hairy Woodpeckers foraged in sig-

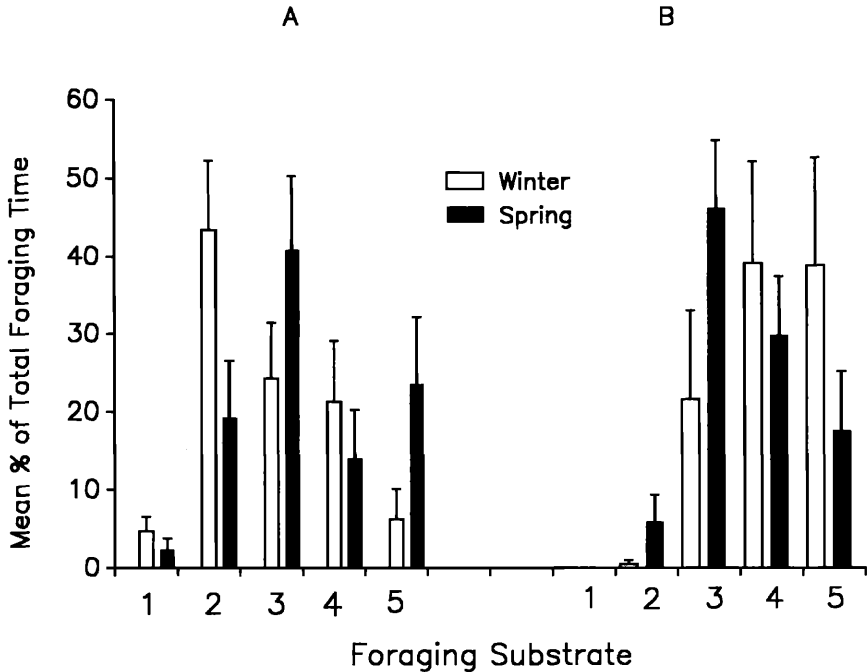


FIGURE 2. (A) Mean percentage of foraging time at five different diameters with Standard Error about the mean for *Picoides villosus*. 1) 1.5–3.5 cm, 2) 3.5–7.5 cm, 3) 7.5–15 cm, 4) 15–25 cm, 5) >25 cm. (B) Same as 2A for *Picoides arcticus*.

nificantly higher zones than Black-backed Woodpeckers ($U = 144$, $n = 18$, $P < 0.05$ and $U = 275$, $n = 18$, $P < 0.05$, respectively). In winter, Hairy Woodpeckers foraged significantly more often on smaller limbs in the S1 and S2 range ($U = 150$, $n = 18$, $P < 0.05$ and $U = 188$, $n = 18$, $P < 0.01$, respectively) than Black-backed Woodpeckers which were observed on larger limbs in the S5 range ($U = 148$, $n = 12$, $P < 0.05$). In spring Black-backed Woodpeckers spent more time on limbs in the S4 range than did Hairy Woodpeckers ($U = 299$, $n = 18$, $P < 0.01$) (Figs. 2A, B).

Intraspecific seasonal differences.—During winter Hairy Woodpeckers spent significantly more time foraging on diameter S2 compared to other diameters ($U = 301$, $n = 18$, $P < 0.01$) than in spring. During spring Black-backed Woodpeckers spent significantly more time foraging on diameters S3 ($U = 170$, $n = 18$, $P < 0.01$).

Foraging technique.—In winter there was no significant difference in foraging technique between the two species ($U = 132$, $n = 12$, $P > 0.1$). In spring Black-backed Woodpeckers excavated significantly more often than Hairy Woodpeckers (37% and 23%, respectively; $U = 273$, $n = 18$, $P < 0.05$). Hairy Woodpeckers excavated significantly more in winter than in spring ($U = 311.5$, $n = 18$, $P < 0.01$), whereas no difference in

excavating time between seasons was detected for Black-backed Woodpeckers ($P > 0.05$).

Displacements.—In a total of 22 interspecific contacts observed (six in winter and 16 in spring), individual Black-backed Woodpeckers always moved to a new tree when individual Hairy Woodpeckers approached. In four contacts (18.2%) Black-backed Woodpeckers stopped foraging and flew to a new tree when Hairy Woodpeckers approached and perched on a nearby tree (<10 m). In 18 cases (81.8%) Hairy Woodpeckers were in close proximity (<2 m) of Black-backed Woodpeckers on the trunk of the same tree, and several seconds after this contact Black-backed Woodpeckers flew to another tree. Individual Hairy Woodpeckers then spent an average of 2.4 min foraging near (11 observations), and 1.1 min at the same place (seven observations) that Black-backed Woodpeckers had been foraging.

DISCUSSION

In our study males of both species spent the majority of their foraging time on tree trunks, perhaps reflecting the greater availability of insect prey in this area (Parmelee 1941, cf. Richmond and Lejeune 1945). In winter male Hairy Woodpeckers spent 50% of their time foraging on branches compared to male Black-backed Woodpeckers, which spent 100% of their time on the trunk. This difference may help reduce interactions between males of these species. Foraging by Black-backed Woodpeckers on larger substrates may also be related to their larger size and poor climbing ability relative to Hairy Woodpeckers (Kisiel 1972, Spring 1965). Forest burn areas are rich in insect prey. Adults of the insect (*M. scutellatus*) are attracted to smoke from burning wood (Gardiner 1957) and larvae begin to infest trees shortly after a fire (Richmond and Lejeune 1945).

Males of both Black-backed and Hairy woodpeckers excavated more in winter than spring, perhaps because *Monochamus scutellatus* larvae are found deeper in the wood during winter (Gardiner 1957, Richmond and Lejeune 1945). As Black-backed Woodpeckers are larger, they may be able to excavate slightly deeper holes (Spring 1965). Although deep excavation requires a greater expenditure of energy, such holes should yield larger larvae (Woods 1984). This may explain why Hairy Woodpeckers often foraged in the same hole that Black-backed Woodpeckers excavated before being displaced.

Displacements between Hairy and Black-backed woodpeckers may be common at our study site because the woodpeckers are attracted to a relatively small burn area rich in insect prey. In areas outside of forest burns, dead trees are widely dispersed in space and time and individuals of these species rarely come into contact. We have demonstrated that males of both bird species had height and diameter foraging preferences, but also that there was a great degree of overlap. This may indicate that interactions between the two species have not been frequent enough in the past for very distinct structuring of foraging zones to have evolved.

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