

TABLE 3

NUMBER OF YOUNG FLEDGED BY RED-COCKADED WOODPECKERS DURING 2 BREEDING SEASONS FOR PAIRS WITH AND WITHOUT HELPERS

Year	Number of pairs		Fledglings per pair (mean)		Fledglings per pair (range)	
	Without helpers	With helpers	Without helpers	With helpers	Without helpers	With helpers
1976	3	5	1.3	1.6	0-2	0-4
1977	8	8	1.9	2.4	1-3	1-3

ence of helpers, but his sample size was too small for a conclusive comparison. Our data on the effects of helpers on reproductive success are also still inconclusive.

Over the 2 breeding seasons reported in this study, 1976 and 1977, we have collected data on clutch-size, hatching success, and fledging success from a total of 24 nestings involving clans of known size. Eleven of the nestings were by breeding pairs and 13 were by pairs plus helpers. In both years, clans with helpers had an average fledging success higher than pairs alone (Table 3). Reproductive success, however, is affected by factors other than the mere presence of helpers, such as interspecific competition for cavities, nest depredation, habitat quality, and possibly intraspecific social interactions. Until we can better assess the effects some of these additional factors have on reproductive success, and determine possible interrelationships between selected factors such as clan size and habitat quality, we do not feel the effect of helpers on reproductive success can be clearly distinguished from other possible influences.—MICHAEL R. LENNARTZ AND RICHARD F. HARLOW, *U.S. Dept. of Agriculture, Forest Service, Southeastern Forest Experiment Station-Dept. of Forestry, Clemson Univ., Clemson, South Carolina 29631. Accepted 18 May 1978.*

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**Three-week vs 4-week nestling periods in *Picoides* and other woodpeckers.**—A striking fact about the nesting of Downy Woodpeckers (*Picoides pubescens*) is that their nestling period is of 3 (Lawrence, Ornithol. Monogr. 5:1-156, 1967) instead of 4 weeks (or thereabouts) as it is for the 4 other woodpeckers with which they are sympatric, namely the Hairy (*P. villosus*) (Lawrence, op. cit.) and Pileated (*Dryocopus pileatus*) (Hoyt, Auk 61:376-384, 1944) woodpeckers, the Common Flicker (Sherman, *Wilson Bull.* 22:135-171, 1910) and the Yellow-bellied Sapsucker (*Sphyrapicus varius*) (Kilham, *Wilson Bull.* 89:310-324, 1977a). Why should this be?

One might say it is a matter of the downy being able to develop faster because it is of smaller size. That this is unlikely is shown by data given for 4 central European species also of the genus *Picoides* (Table 1). Of these 3, the Lesser (*P. minor*), the Middle (*P. media*) and the Greater (*P. major*) Spotted woodpeckers all have, like the downy, a 3-week nestling period, although *P. major* is of the same approximate size as *P. villosus*. Furthermore if size made a difference, why should the Pileated Woodpecker and its

TABLE 1

EIGHT SPECIES OF WOODPECKERS USED TO ILLUSTRATE THE HYPOTHESIS THAT THOSE WITH A 3-WEEK NESTLING PERIOD NEST IN DEAD AND DECAYING TREES (RELATIVELY UNSAFE) WHILE THOSE WITH A 4-WEEK NESTLING PERIOD NEST IN TREES WITH TOUCHER WOOD THAT OFFER BETTER PROTECTION (FOR COMPLETE DISCUSSION SEE TEXT).

	Species	Length nestling period (days)	Body length <sup>1</sup> (cm)	Type of nest tree preferred	Source
	<i>Picoides pubescens</i>	19-22	16.5-17.8	Dead, decayed	Lawrence 1967 Kilham (ms) Hadow 1976
American	<i>P. borealis</i>	26-29	21.7	Living (with heart rot)	Ligon 1970 <sup>2</sup>
	<i>P. villosus</i>	28-30	21.7-26.7		Lawrence 1967, Kilham 1968
	<i>Sphyrapicus varius</i>	26-28	20.4-21.6	Lawrence 1967 Kilham 1971, 1977a	
	<i>P. minor</i>	18-21	14.7	Dead, decayed	Westerfrolke 1955 <sup>3</sup> Witherby et al. 1943 <sup>4</sup>
European	<i>P. medius</i>	22	21.7		Steinfatt 1940 <sup>5</sup>
	<i>P. major</i>	21-22	23		Pynnönen 1939
	<i>P. leucotos</i>	27-28	25.5		Pynnönen 1939 Ruge and Weber 1974

<sup>1</sup> Taken from Peterson (A Field Guide to the Birds, Houghton Mifflin Co., Boston, 1947) and Peterson et al. (A Field Guide to the birds of Britain and Europe, Houghton Mifflin Co., Boston, 1934).

<sup>2</sup> Auk 87:255-278, 1970.

<sup>3</sup> Vogelwelt 76:185, 1955.

<sup>4</sup> The Handbook of British Birds, H. F. and C. Witherby Ltd., London, 1973.

<sup>5</sup> Beta zur Fortflanzungsbil. der Vogel 16:93-99, 1940.

European counterpart, the Black Woodpecker (*D. martius*) (Pynnönen, Ann. Soc. Zool. Bot. Fennica Vanamo 7:1-166, 1939), have the same 4-week nestling period as the smaller hairy or the sapsucker?

Before discussing the length of nesting periods in terms of selection, Hadow's ideas (North Am. Bird Bander 1:155-164, 1976), expressed in relation to Lack (Ecological Adaptations for Breeding in Birds. Methuen and Co., London, 1968), on the longer nestling periods of woodpeckers as compared to those of passerines with open nests are worth repeating. What Hadow states is that "since nest holes are relatively safe from predation there is little selection pressure to get away from the nest early" and, second, that the longer period allows nestlings to become more mature and hence better able to look after themselves at time of fledging.

A key point I would make is that although nest holes are relatively safe from predators, some types are more safe than others. Woodpeckers with stronger bills can build nests in living trees that have heart rot due to fungal action at the center. Species building nests of this type are the Red-cockaded (*P. borealis*) (Steirly, Atl. Natur. 12:280-292, 1957) and Hairy (Kilham, Wilson Bull. 80:286-305, 1968) woodpeckers as well as the Yellow-bellied Sapsucker (Kilham, Wilson Bull. 83:159-171, 1971) and the White-backed (*P. leucotos*) Woodpecker (Pynnönen, op. cit.). All of these species have 4-week nestling periods (Table 1).

Seemingly less secure nests, in terms of wind damage or of predators chewing their way in, are those built in dead, decaying wood by species with weaker bills. These, as shown in Table 1, all have 3-week nestling periods.

An objection is that Hairy Woodpeckers and sapsuckers sometimes nest in dead, decaying stubs. But from years of watching both species (Kilham 1968, 1971 and 1977a) I believe that they do this not by choice but by necessity. Lawrence (op. cit.) also notes that the hairy prefers to nest in living trees. As far as the White-backed Woodpecker of Europe goes, I hazard a guess that the same situation holds, for Ruge and Weber (Vogelwelt 95:138-147, 1974) point out that this species has the strongest bill of all the native *Dendrocopos* (*Picoides*) species. While they describe it as nesting in dead trees in the Alps, Pynnönen (op. cit.) describes 2 of 4 pairs as nesting in living trees in Finland.

Although species of all sizes use dead trees affected by heart rots (Connor, Miller and Adkisson, Wilson Bull. 88:575-581, 1976) the downy, in the experience of Connor et al. (1975) still selected trees that were softer, i.e., more rotted than those used by the hairy and pileated. The important factor is the actual hardness of the wood. Expressed in this way, woodpeckers with strong bills can build more secure nests, whether in living trees or dead ones that are still comparatively hard.

A further point is that a small woodpecker with a relatively weak bill will be less able to defend its nest holes against predators. As described elsewhere (Kilham 1968), a hairy, even though nesting in a well decayed birch stub, was able to defend its nest against a raccoon (*Procyon lotor*). It seems doubtful if a downy could have survived under similar circumstances.

A difficulty in discussing evolutionary problems concerning woodpeckers is that the virgin forests in which their evolution took place have been replaced with the woods of different composition in which we study them today. In spite of these difficulties, I feel that the 3-week vs the 4-week nestling period is a problem worthy of study. I have arbitrarily selected only a few species to discuss, mostly on the basis of their being in the genus *Picoides*. Other genera with other adaptations meet problems in other ways. Red-headed Woodpeckers nest in dead stubs (Kilham, Wilson Bull. 89:164-165, 1977b)

in open situations, but they are aggressive birds and hence able to survive in situations where hairies and downies might not.

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**Breeding activities of Waved Woodpeckers in Surinam.**—Species of the essentially neotropical woodpecker genus *Celeus* range from Mexico to northern Argentina (there is 1 Asian representative, *Celeus brachyurus*). Due to generally sparse distribution, shyness, and relatively non-vocal habits, and for some species, a deep forest habitat, this group is 1 of the least known of neotropical picid genera. Nests are known for the Pale-crested Woodpeckers (*C. lugubris*) (Short, Amer. Mus. Novitates 2413:1–37, 1970; Short, Bull. Amer. Mus. Nat. Hist., 152:253–364, 1973b) and the Chestnut Woodpecker (*C. elegans*) (French, A Field Guide to the Birds of Trinidad and Tobago, Livingston Press, Wynnewood, 1970:270); for these and all other species only casual observations of biology and behavior have been published.

I studied Waved Woodpeckers (*C. undatus*) from 20 March to 15 May 1977 at the Raleigh Falls Nature Reserve, a 56,000 ha area on the Coppename River about 100 km south of its termination on the Atlantic coast of Surinam. Most observations were made on the southernmost tip of Foengoe Island, a small island within the reserve mostly covered with “high river bank forest” and partially cleared for houses and a grassy airstrip. The canopy layer of the forest was typified by a *Mouriri* sp., with emergents *Jacaranda copaia*, *Inga alba*, and *Ceiba petandra*, and understory dominated by the spiny palm *Astrocargum sciophilum*. Second growth of the disturbed areas around the forest edges was dominated by *Cecropia surinamensis* and *C. sciadophyllus*.

Surinam’s climate is tropical, and heavy rains begin between mid-April and mid-May and extend to August. Hatching of the young I studied seemed to have been synchronous with the onset of the rainy season.

I made observations at a Waved Woodpecker nest for 4–6 h a day for 47 days from about 20 m away, using 7 × 35 binoculars. Sightings of Waved Woodpeckers in the forest were otherwise rare because of their tendency to forage high in the dense forest canopy.

*Vocalizations.*—The 1 vocalization heard continually from the Waved Woodpeckers was a very distinctive disyllabic call: a rising, liquid note followed by a descending, more guttural one, the entire call approximately 1.25 sec in duration. The physical process involved in vocalizing could be seen as each of the woodpeckers leaned out of the nest hole to call its mate. The first part of the call was accompanied by a lurching forward and raising of the crest, and the second syllable brought a relaxation of this swelling movement. Another vocalization, heard but once, was a chattering given in alarm during a brief encounter with a woodcreeper (*Dendrocolaptes* sp.).

Although both male and female Waved Woodpeckers reportedly drum (Haverschmidt, Birds of Surinam, Livingston Press, Wynnewood, 1968), the difficulty in sighting them prevented observation of their drumming. From time to time I heard drumming which may have been of this species in the vicinity of the nest excavations.