

## Horsehair Fungus, *Marasmius androsaceus*, Used as Nest Lining by Birds of the Subalpine Spruce-fir Community in the Northeastern United States

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We examined 54 nests of 10 species on Mt. Mansfield and Mt. Equinox, Vermont and Plateau Mountain, New York in the subalpine Red Spruce (*Picea rubens*) - Balsam Fir (*Abies balsamea*) forest bird community in the northeastern United States in 1994 and 1995. Forty-six nests (85%) were found to contain fine, black, hair-like strands as lining material. This material was defined as the rhizomorphs of Horsehair Fungus (*Marasmius androsaceus*) and represents the first documented use of this material by North American breeding bird species. We believe that many earlier descriptions of nest lining materials used by boreal and subalpine bird species may refer to mis-identified Horsehair Fungus. Our finding that 85% of nests in montane spruce-fir forests of the northeastern United States contained copious amounts of rhizomorphs suggests that this material is an integral component of nest construction in this habitat.

Key Words: Horse Hair Fungus, *Marasmius androsaceus*, nest material, birds, subalpine spruce-fir forest.

Several pieces of mushrooms in the genus *Marasmius* are known to produce copious amounts of thin, black and wiry rhizomorphs as a means of colonizing twigs and leaves (Redhead 1989; Seaver 1994; Singer 1986). The use of marasmioid rhizomorphs in the construction of bird nests has not been documented for any species breeding in North America. There are several reports of marasmioid rhizomorphs used as nesting material in China (Desjardin, personal communication *vide* Mu Zang), Cameroon (Desjardin, personal communication), and Brazil (Sick 1957). In Argentina, Golden-winged Cacique (*Cacicus chrysopterus*) and Red-rumped Cacique (*Cacicus haemorrhous*) construct their nests principally of rhizomorphs from *Marasmius crinisequi* (Wright and Ferraro 1986). Hummingbirds collect the rhizomorphs of *Marasmius nigrobrunneus* in Ecuador for use in nest construction (Hedger 1990). In this paper we report the first documented use of Horsehair Fungus (*Marasmius androsaceus*) rhizomorphs as nest lining material by several North American breeding bird species.

During demographic studies of the subalpine Red Spruce (*Picea rubens*)-Balsam Fir (*Abies balsamea*) forest bird community in the northeastern United States in 1994 and 1995 we examined 54 nests of 10 species at three different sites: Mt. Mansfield and Mt. Equinox, Vermont and Plateau Mountain, New York (Table 1). Forty-six nests (85%) were found to contain fine, black, hair-like strands as lining material. While collecting microhabitat data around nest sites in 1994 we found large amounts of this material on live Balsam Fir trees and dead wood in the understory. These strands, which were found to have small basidiomes, were compared with those occurring in the nests and found to be identical. Close examination

of the strands in the nests revealed that some also had small, dried basidiomes.

Samples of the hair-like structures and caps were sent to the North American *Marasmius* expert, Dennis Desjardin, Director of H. D. Thiers Herbarium, San Francisco State University, for identification. The hair-like structures were identified as rhizomorphs of the Horsehair Fungus (*Marasmius androsaceus*). The species is saprotrophic on needles, leaves and twigs and parasitic on some ericaceous plants in mesic and boggy situations (Gilliam 1976; MacDonald 1949; Redhead 1989). Horsehair Fungus is considered common in North America found across the boreal zone and south along the Rockies, Coastal Mountains and the Appalachians (Redhead 1989; Map Fig. 9). *Marasmius androsaceus* belongs to a group of closely related species, all of which produce numerous rhizomorphs. *Marasmius pallidocephalus* also occurs in the Northeast (Gilliam 1976; Redhead 1989) and could be used by birds in nest construction too (Desjardin, personal communication). Various species of the lichen genus *Alectoria* may resemble black, hair-like structures and could also be used.

Many published descriptions of avian nesting material that contain references to hair-like material or fine rootlets may actually represent the rhizomorphs that we identified. Wallace (1939) conducted life-history studies of Bicknell's Thrush (*Catharus bicknelli*) on Mt. Mansfield, Vermont, and thoroughly described the construction of the nest. However, he was unable to identify the inner lining of "fine, black rootlets," and stated, "they are unquestionably rootlets of some sort ... resembling horsehair, but where the birds get them is a mystery." The Bicknell's Thrush, formerly a subspecies of the Gray-cheeked Thrush (*Catharus minimus*),



TABLE 1. Number of bird nests in the subalpine spruce-fir forest found to contain *Marasmius androsaceus* rhizomorphs used as nest lining.

	Mt. Equinox, Vermont		Plateau Mountain, New York		Mt. Mansfield, Vermont	
	Horsehair Fungus in Nest Lining					
	Present	Absent	Present	Absent	Present	Absent
Yellow-bellied Flycatcher ( <i>Empidonax flaviventris</i> )	-	-	-	-	1	0
Brown Creeper ( <i>Certhia americana</i> )	0	1	-	-	-	-
Bicknell's Thrush ( <i>Catharus bicknelli</i> )	-	-	-	-	15	0
Swainson's Thrush ( <i>Catharus ustulatus</i> )	-	-	2	0	2	0
Magnolia Warbler ( <i>Dendroica magnolia</i> )	1	0	-	-	-	-
Yellow-rumped Warbler ( <i>Dendroica coronata coronata</i> )	2	0	1	0	4	0
Blackpoll Warbler ( <i>Dendroica striata</i> )	1	0	1	0	16	0
White-throated Sparrow ( <i>Zonotrichia albicollis</i> )	0	1	-	-	0	4
Dark-eyed Junco ( <i>Junco hyemalis</i> )	-	-	-	-	0	1
Purple Finch ( <i>Carpodacus purpureus</i> )	0	1	-	-	-	-

"-" indicates no nests found at that site.

has recently been given full species status (Ouellet 1993; American Ornithologists' Union 1995). Bent (1949) reported several nest descriptions of *minimus*. In each case it appeared that the nest lining was composed predominantly of fine grasses, with one nest containing a few dried leaves and rootlets.

Bent (1953) described the Magnolia Warbler's (*Dendroica magnolia*) nest as "...lined invariably with fine black rootlets, which closely resemble horse-hairs. The lining of black rootlets is present in these and in all other nests of the Magnolia Warbler that I have seen, it seems to be characteristic of the species and will distinguish the nest from those of other warblers." However, we and several other authors have described the use of this material in large quantities by other warbler species.

Similarly, Bent (1953) reported that the Yellow-rumped Warbler (*Dendroica coronata coronata*) nest was {"...firmly interwoven with black horsehair, or perhaps moose hair, and finer rootlet..."} Brewster (1882) described a nest of the Blackpoll Warbler (*Dendroica striata*) in the Magdalen Islands, Gulf of St. Lawrence, as having a lining "...of slender, black moss-stems (which curiously resemble horse hair)."

Bent (1942) related nest descriptions of Yellow-bellied Flycatcher (*Empidonax flaviventris*) from several people. In each case the lining material was described as a dark or black hair-like rootlet. Most notable was a description by Fendire, "...the black and shining rootlets of, apparently, ferns, closely resembling horsehair." Bent (1949) similarly presented Swainson's Thrush (*Catharus ustulatus*) nest descriptions, including one from Maine where the lining was described as containing "...black, thread-

like parts of the roots of decayed cinnamon ferns." Finally, Bent (1968) noted that the nest lining of the Purple Finch (*Carodacus purpureus*) contained "...finer rootlets and horsehair."

We believe that many of these earlier descriptions of nest lining materials used by boreal and subalpine bird species referred to mis-identified Horsehair Fungus. Our finding that 85% of nests in montane spruce-fir forests of the northeastern United States contained copious amounts of rhizomorphs suggests that this material is an integral component of nest construction in this habitat.

A number of *Marasmius* species have been shown to produce antibiotic agents that inhibit the growth of *Staphylococcus* (Melin et al. 1947). However, the species, *Marasmius androsaceus*, was practically inactive upon *Staphylococcus* cultures (Melin et al. 1947). While it is possible that *Marasmius androsaceus* rhizomorphs may be an effective agent against nest pathogens and parasites of subalpine birds in the Northeast, this is not known. Alternatively, these rhizomorphs may simply provide the best of most easily obtainable material in this habitat for lining nests.

A voucher specimen of the fungus has been deposited in the H. D. Thiers Herbarium. Bicknell's Thrush, Swainson's Thrush, Blackpoll Warbler, and Yellow-rumped Warbler nests with rhizomorph lining are stored at the Vermont Institute of Natural Science.

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