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MIST NETTING BIRDS FROM CANOPY PLATFORMS

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ABSTRACT. A useful method is reported for deploying mist nets horizontally from canopy platforms. In a preliminary study of migrant birds in a central Massachusetts forest, more individual birds were netted in the canopy than in the understory during the autumn migration, and the species captured also differed by height. In a previous study without nets, some winter residents also showed height preferences for high vs. low bird feeders. The mist netting technique allows direct comparison of bird abundance in vertical strata with minimal disturbance to vegetation.

Traditionally, mist netting is done from ground level to a height of 3 m, but many researchers have noted the failure of ground-level mist nets to provide a sample of entire forest avifauna. G. H. Parks (1960), while banding in Maine, lamented that "It soon became frustratingly apparent that most of the migrants were moving through, or above, the tree canopy which carried the birds far above our mist nets". Karr (1981) noted that the rate of capture of birds in mist nets is proportional to the percent of activity by the species in the sample space (within 3 m of the ground).

To overcome this problem, nets have been raised on extendable poles (Meyers & Pardieck 1993), and hauled up on pulleys and lines shot over tall trees (Humphrey *et al.* 1968, Whitaker 1972, Munn 1991). These methods can require restringing of nets (changing the long axis from horizontal to vertical), removal of numerous branches, or the placement of nets in forest gaps, which may contain a different assemblage of bird species than mature forest canopy (Orians 1969, Pearson 1971). Fitzgerald *et al.* (1989), using nets raised from ground level, described the vertical distributions of 14 species of birds in New Zealand using nets stacked one above another. With the advent of elevated platforms and walkways, these nets can now be more readily deployed in the forest canopy.

Here we report on the development and use of a technique that deploys nets horizontally from platforms in the forest canopy, with results from a pilot study of habitat use by neotropical migrant songbirds during migration.

Installation of these canopy nets requires climbing trees near the platform that are suitable for attachment of the hardware. The hardware includes eyebolts that anchor a fixed, or static, support cable, while other eyebolts anchor a small pulley and support the control cord. The system works very much like drapery, combined with an old-fashioned clothesline pulley (FIGURE 1). The nets are supported by the fixed cable, and are moved along the cable by pulling the control cord from the platform. The net pole that slides out and back is connected to the support cable using a detachable metal ring (i.e., carabiner). The net itself is attached to the cable by a short length of string threaded through smaller O-rings (i.e., notebook binder rings). At the platform end of the net is a spindle (we use an aluminum downspout); the spindle hangs from a swivel attached to the cable, which allows it to wrap and unwrap the extra net mesh as it slides to and from the platform. When birds are captured, the net is rolled to the platform, and the birds are removed as they arrive within reach.

In the Autumn of 1994, a pilot study was conducted from the walkway at Hampshire College in Amherst, Massachusetts, using mist nets to study fall migration of small forest birds. The study site is located in the Connecticut River valley of west-central Massachusetts (42 N; 71 W). The site is a 2 ha fragment of mature forest, with a canopy consisting mainly of Northern Red Oak (*Quercus rubra*), maples (*Acer* spp.), and Black Birch (*Betula lenta*). Understory species include Canada Hemlock (*Tsuga canadensis*), Black Birch, and Mountain Laurel (*Kalmia latifolia*). There are two platforms connected by a bridge (Bouricius & Lowman 1994), at an average height of 22 m.

Nets were deployed from 27 August to 4 October, to coincide with the southward movement of neotropical migrants. Three standard 12 m (36 mm mesh) mist nets were suspended in the canopy and were paired with same-sized nets on the ground, to sample canopy and understory

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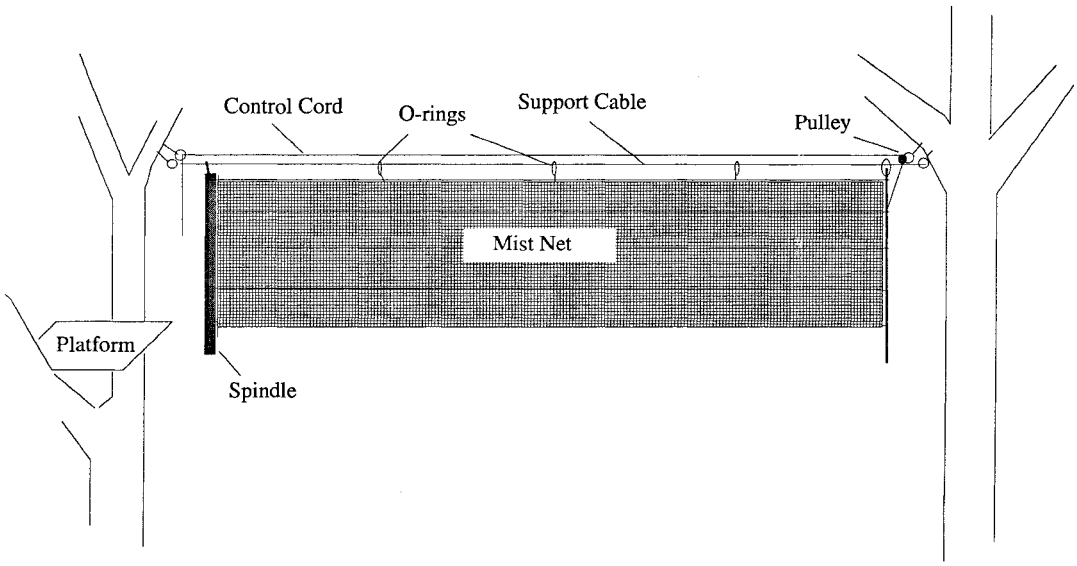

FIGURE 1. Diagram of mist net rig showing platform, spindle, support cable, control cord, pulley, and O-rings.

simultaneously. These understory nets were placed along a similar orientation as canopy nets, and were placed in a suitable location within 15 m of the space directly below the matching canopy nets. After two weeks, we added an extra set of three ground nets in order to increase capture rates in the understory. Nets were open from 45 min after sunrise to 6 hr after sunrise. Set-up time for the canopy nets was approximately 20 min, not including time needed to climb to the platform. We removed the birds from the nets, lowered them to the ground, and took them to a banding station 100 m away from the nets.

During this pilot project, 35 birds of 16 species (including residents as well as migrants; see APPENDIX 1) were caught during 451 net hours (nh) in the canopy, or 7.76 birds per 100 nh. In the understory, 18 birds of 9 species were caught in 786 nh (the total net hours differ because of the extra set of understory nets), or 2.3 birds per 100 nh. Thus significantly more individual birds were captured in the high nets ($\chi^2 = 20.0$; df = 1; $p < 0.0001$). In approximately 200 hours of net observation, ten birds bounced off the canopy nets without becoming entangled; five birds also escaped while the nets were being rolled to the platform. We did not monitor the escapes from ground nets. No birds were injured during netting or the rolling in of the canopy nets.

The capture in canopy nets of more birds and more species in fewer net hours than in understory nets suggests that results from traditional sampling methods may be biased. Furthermore, little is known about the use of stopover habitats by neotropical migrants (Moore *et al.* 1993, Winker *et al.* 1992), and vertical distribution (i.e., niche partitioning) of birds in forests may play a large part in the suitability of these areas to migrants.

Vertical partitioning of habitat is known for breeding birds (e.g., MacArthur 1958), and we have found that some winter residents may also show preferences for the canopy. In an earlier study (March 1994), we placed bird feeders at six locations in the canopy (at ca. 20 m in height) and six at a height of two m, and noted the presence of foraging birds in ten sets of observations at each feeder from March 3 to 10, 1994. Some species showed significant preferences for higher feeders. Downy and Hairy Woodpeckers (*Picoides pubescens* and *P. villosus*) were present in observations at a ratio of 14 (high) vs. 2 (low) feeders ($\chi^2 = 9.00$, df = 1, $p = 0.003$) and White- and Red-breasted Nuthatches (*Sitta carolinensis* and *S. canadensis*) in 24 vs. 7 ($\chi^2 = 9.32$, $p = 0.002$). However, Black-capped Chickadees (*Parus atricapillus*) and Tufted Titmice (*P. bicolor*) did not show winter height differences (31 vs. 28 and 6 vs. 5 respectively).

The netting methods used in this project allowed direct comparison of bird abundance in vertical strata with a minimum of disturbance to vegetation. With increasing availability of canopy platforms, new netting techniques can be used for other studies as well. This technique will allow banders to sample canopy species in mature forest, as opposed to edge and scrub habitats.

This mist netting study of migrating neotrop-

ical songbirds in mature forest canopies is apparently the first of its kind in North America. We will be continuing these studies to gain a better understanding of the vertical distribution of migrants in the Spring and Fall of 1995. A more complete picture of habitat use by these birds during migration is needed to fully assess habitat requirements and develop effective conservation plans (Bairlein 1992, Moore *et al.* 1993).

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Appendix 1

All species of birds captured in nets during the Fall of 1994, by net height. Non-migrant species are noted with asterisks.

Species captured only in canopy nets
- Downy Woodpecker (*Picoides pubescens*)*
- Hairy Woodpecker (*Picoides villosus*)*
- Eastern Wood-Pewee (*Contopus virens*)
- Black-capped Chickadee (*Parus atricapillus*)*
- Red-eyed Vireo (*Vireo olivaceus*)
- Tennessee Warbler (*Vermivora peregrina*)
- Northern Parula (*Parula americana*)
- Black-and-white Warbler (*Dendroica magnolia*)
- Magnolia Warbler (*Dendroica magnolia*)
- Black-throated Green Warbler (*Dendroica virens*)
- Blackpoll Warbler (*Dendroica striata*)
- Scarlet Tanager (*Piranga olivacea*)
- Chipping Sparrow (*Spizella passerina*)

Species captured only in understory nets
- Blue Jay (*Cyanocitta cristata*)*
- Wood Thrush (*Hylocichla mustelina*)
- Veery (*Catharus fuscescens*)
- Swainson's Thrush (*Catharus ustulatus*)
- Ovenbird (*Seiurus aurocapillus*)
- Common Yellowthroat (*Geothlypis trichas*)

Species captured in nets at both heights
- Tufted Titmouse (*Parus bicolor*)*
- White-breasted Nuthatch (*Sitta carolinensis*)*
- Black-throated Blue Warbler (*Dendroica caerulescens*)