A Mobile Target-netting Technique for Canopy Birds

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INTRODUCTION

Mist-netting of birds is a well-established and much-used method for capturing birds for banding, taking blood, feather, or tissue samples, attaching radio transmitters or light-sensitive geolocators, and other purposes (Karr 1981, Dunn and Ralph 2004). Mist-nets are typically ground based, with individual nets stretched between poles and extending 2.6 m high. Captures in ground-based mist-nets tend to be biased against canopy-dwelling species; however, (Pagen et al. 2002, Mallory et al. 2004) to compensate for this bias, numerous bird and bat researchers have developed methods to get nets higher into forest canopies.

Canopy-Netting Techniques. – Netting in the canopy is nothing new; multiple techniques have been developed over the years. Most canopy netting has focused on community sampling, which typically involves repeated sampling from a fixed net location. Such techniques may not be applicable to target-netting, however. Because target-netting seeks to capture specific individual birds that are usually territorial, it requires repeated relocation of the net assembly to specific territories and, consequently, would benefit by having a net apparatus that is lightweight, mobile and rapidly deployed.

Perhaps the most common canopy technique is to raise nets high onto interconnected or telescoping poles, often using pulleys at the pole tops to facilitate raising of the net (e.g., Mease and Mease 1980, Meyers and Pardieck 1993, Albanese and Piaskowski 1999). The vertical extent one can reach using this method is limited, however, as stability and pole integrity quickly becomes an issue at greater heights (>10 m: Albanese and Piaskowski 1999). This method allows for some mobility and has been used successfully for target-netting of Cerulean Warblers (*Setophaga cerulea*) (T. Boves, pers. comm.).

Various researchers have used nets either suspended from horizontal poles, similar to a square-rigged sail, or strung between two vertical ropes. Typically a long but narrow net is hung from a top pole with tension maintained using a bottom pole. The assemblage is raised via a pulley over a branch (e.g., Greenlaw and Swinebroad 1967, Humphrey et al. 1968, Munn 1991). One problem with this approach is that the net can twist, making netting within a forest problematic. Suspending a net between vertical ropes requires a somewhat complex system of pulleys as well as climbing into the canopy to attach rope blocks (Whitaker 1972), or suspending them from opposing cliff faces (Dejonghe and Cornuet 1983). While effective for sampling communities in the canopy, the complexity of deployment makes such a method inappropriate for a target-netting system.

An entirely different approach has been to set up platforms in the forest canopy, from which nets are raised and checked (Albanese and Piaskowski 1999, Stokes et al. 2000). This has proven quite effective for creating a permanent netting station in the canopy, but the infrastructure involved and its lack of mobility prevent this method from being useful for target-netting.

Our Approach — As part of ongoing research projects, we needed to color-band a population of Cerulean Warblers *(Setophaga cerulea)* to help determine demographic rates of fecundity and survival, and more recently to attached light-sensitive geolocators to both Cerulean Warblers and Scarlet Tanagers (*Piranga olivacea*) to identify migration routes and wintering grounds (Buehler et al. 2008, Bridge et al. 2013, Stoleson 2014, Boves et al. 2015). To obtain adequate sample sizes for robust analyses requires catching relatively large numbers of birds. However, both target species rarely come down out of

the upper forest canopy. Male Ceruleans can be lured successfully into ground-based nets using audio lures and decoys, but their responsiveness declines rapidly through the breeding season (personal observation), which limits the number that can be caught using ground-based nets unless one invests significant money into multiple banding crews.

To maximize sample sizes, we needed to get our nets into the forest canopy. We considered all of the methods described above but found them either too complex or too immobile to be useful for target netting of Cerulean Warblers and Scarlet Tanagers. Instead, we developed a new apparatus where we placed a double-high mist net in a frame and raised the entire assembly into the forest canopy.

METHODS

Net Assembly.— We tied two 6 x 2.6 m, 30 mm mesh mist nets together top-to-bottom to create a 6 x 5.2 m net (Fig. 1). End loops were tied to a black nylon string to maintain a consistent amount of distance within trammels when the net was deployed. We built a 3-sided frame of 2.5 cm diameter (1 inch) PVC tubing, measuring 6.3 x 3.1 m. The top section consisted of two 3.04 m (10 ft) pieces joined by a heavy-duty 3.18 mm (1/8 in.) thick PVC connector. To maintain rigidity of the top we inserted a 1.9 cm (3/4 in) steel conduit in each end. We screwed an eyehook into the connector and in the distal ends of both arms. Ropes clipped via spring links to eyehooks in the distal ends of the top piece (Fig. 2A) ran up to and through a carabiner and down to the single eyehook in the center of the connector (Fig. 2B, C). We adjusted this rope to equalize tension between the distal pole ends and the center piece, thus minimizing bowing, then secured each end with a figure-8 loop with a stopper knot. End loops of anchor lines (3.18 mm parachute cord) were secured to the bottom ends of the frame sides with clevis pins run through holes in the PVC tube (Fig. 2D). These anchor lines allowed us to guide the net up and down through gaps in the canopy as it was raised or lowered, and to anchor it to ground structures (e.g., logs, rocks) while raised to prevent spinning. The use of clips and carabiners for connections throughout facilitated the rapid assembly and disassembly of the apparatus.

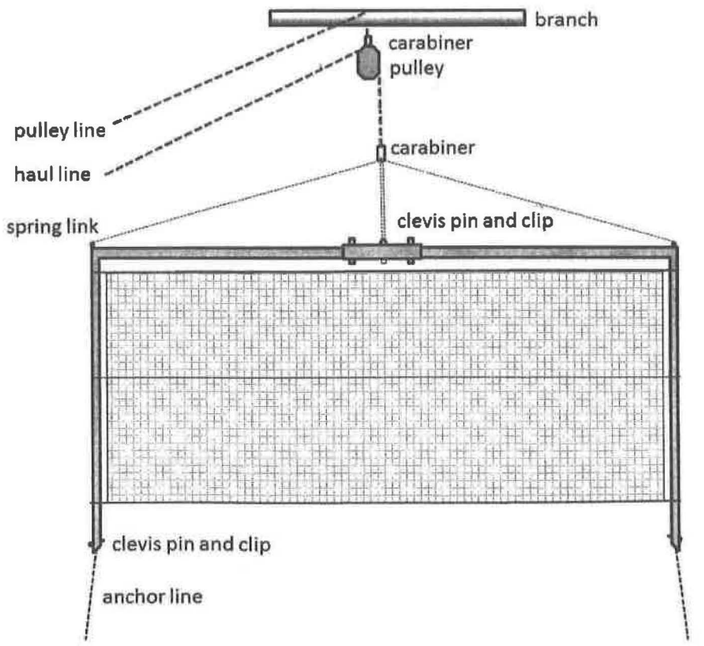
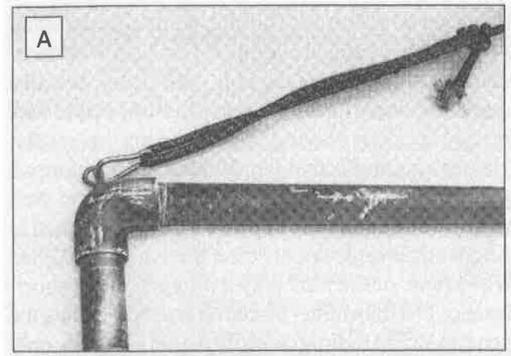


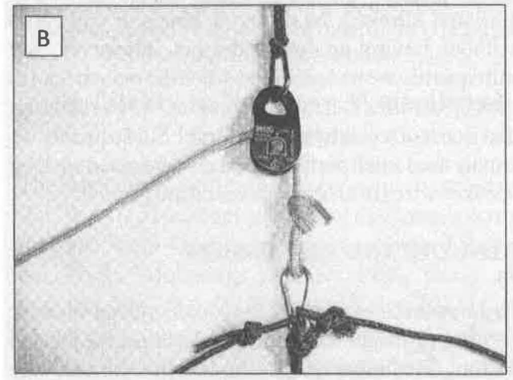
Fig. 1. Diagram of entire canopy net assembly, with important components labeled.

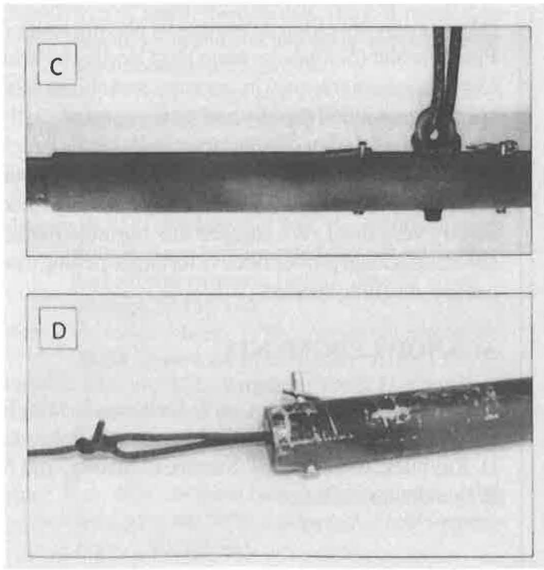
Fig. 2. Photographs of details of assembly, showing:

(A) distal end of top pole showing elbow joint and spring clip attachment of rope;



(B) center of assembly top showing center piece attachment to two top poles with clevis pins and rope arrangement;





(C) connection of assembly to pulley, showing pulley line (top dark cord), haul line (white), tension ropes (lower 3 dark) carabiners and pulley; and

(D) bottom end of side pole showing clevis pin attachment of anchor rope.

To attract target birds to the net, we attached a small wooden decoy painted like a male Cerulean Warbler or Scarlet Tanager to the top pole with string. We also attached an audio lure: we first tried an mp3 player with internal speakers playing a cerulean song repeatedly. Although quite effective, the playback began before we raised the net, causing some males to respond well before the net was fully in position, which seemed to increase their reluctance to enter the net. We switched to a system of the mp3 player plugged into a short-distance FM transmitter placed on ground, sending the signal to an FM radio attached to the net assembly only after the net was in place. This approach worked fairly well and allowed for changing songs or call types without having to lower the net. However, not infrequently we had problems when the radio began to pick up commercial radio stations at >15 m elevation that were not received at ground level. Subsequently we simply used small portable speakers connected via long speaker wires to an mp3 player on the ground.

RESULTS AND DISCUSSION

Deployment. —Once an unbanded Cerulean Warbler or Scarlet Tanager was identified as a target, we located a strong live limb well up in the canopy with adequate open space below it somewhere within the target bird's territory. We used a bow and arrow to shoot a small diameter nylon (ice-fishing) line over the branch. We modified the arrows by blunting field tips for safety, adding extra weight inside the arrow to facilitate dropping through foliage, and by drilling a hole in the nock in which we attached a small swivel with a split ring to compensate for arrow spin. We found that using a half-length spin casting fishing rod facilitated line control and retrieval, avoided tangles, and transported easily. We used the fishing line to successively pull 2 lines of increasing diameter over the branch, the second ending in a pulley (32 kN capacity). Before raising this second (pulley) line, a 0.95 cm (3/8″) diameter double-braided nylon rope (haul line) was run through the pulley and clipped onto the top of the net assembly using a carabiner. We raised the pulley line up to where the pulley hung just below the supporting branch and secured the distal end to a tree. The net assembly was then raised using the haul line and guided by the anchor lines, all of which were secured to trees or logs when the net was in position. Once a bird was captured in the net, we lowered the assembly rapidly to near ground level, where one of us could remove the bird for processing while others disassembled the apparatus for deployment elsewhere. This apparatus required at least two people to assemble and raise; it was significantly easier and faster with three or more.

We found this canopy net assembly to be very effective at capturing male Cerulean Warblers and Scarlet Tanagers. We captured 18 Ceruleans in 2008 while we developed and tweaked the technique, 39 in 2009, and 53 in 2010. In addition, we caught one female each in 2009 and 2010. Capture success in the latter two years was approximately 85% of the territorial males we attempted; we caught a similar proportion of the tanagers we targeted. For successful attempts, the top of the net ranged from 4.6 to 27 m above the ground (mean = 15.8 m) as measured with a laser range finder. Time to capture tended to decrease while likelihood of capture increased with increasing net height. Nets that we raised above 18 m generally caught their target bird in less than 10 minutes (often <one minute), enabling us to catch numerous individuals per day. We found a high canopy net frequently succeeded in capturing a target bird after multiple attempts when ground-based nets failed, particularly after the bird was feeding nestlings.

We tested how effective this net assembly might be for other canopy-dwelling passerines by playing songs of Pine Warbler (*Setophaga pinus*) and Northern Parula (*Setophaga americana*) in appropriate habitat. Both species responded rapidly and were captured easily. Overall, the number of non-target individuals caught was very small, averaging about one bird per 15 netting sessions, probably because netting sessions were mostly very brief. We suggest this portable netting apparatus should prove effective for target-netting most canopy-dwelling species.

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Site fidelity in Northern Waterthrush in California

The Northern Waterthrush (*Parkesia noveboracensis*) (NOWA) is a Neotropical migrant that breeds across northern North America, but migrates primarily east of the Rocky Mountains (A.O.U. 1998, Dunn and Alderfer, eds 2006, Whitaker and Eaton 2014) to its wintering grounds from Mexico and the Caribbean Islands (Reitsma et al 2002) to northern South America (Loftin 1977). Not unexpectedly, most of the work on the Northern Waterthrush overwintering biology has been done in the eastern part of the US (e.g.,. McNeil 1982, Warkentin and Hernandez 1996).

Although many species of Neotropical migrants are found in winter in the US, little is known about their fidelity to wintering areas (Somershoe, et al. 2009). Although the Northern Waterthrush is rare across the western half of the US (Sibley 2014), individual migrants are regularly found overwintering in coastal southern CA (A.O.U. 1998). Here I report the regular occurrence and site fidelity of Northern Waterthrushes at a small coastal wetland at the mouth of Zuma Canyon in southern CA. The upper part of the wetlands is freshwater and riparian with a dense stand of willow (*Salix* sp.) mixed with an assortment of non-native vegetation. The lower part of the wetland forms a small estuary with cattails (*Typha* sp.) and bulrush (*Scirpus* sp.). Freshwater continuously flows from Zuma Creek into the small estuary from groundwater and irrigation from upstream residences. When the barrier beach is breached, the estuary becomes saline.