A Mist Net Design for Capturing Marbled Murrelets

Peter W. C. Paton*[1], *C. John Ralph and ***Jeff Seay***
USDA Forest Service
Redwood Sciences Laboratory
1700 Bayview Drive
Arcata , CA 95521

Abstract

We used a mist net elevated 45 m into the forest canopy to capture Marbled Murrelets (*Brachyramphus marmoratus*) in northern California. Three murrelets were captured in 17 mornings and one evening. Radio tags were attached to the captured birds, but no birds returned to nests. This mist net design could be used by researchers interested in capturing other species high in the forest canopy.

Research interest in Marbled Murrelets has increased in recent years because of their close association with old-growth forests in the Pacific Northwest (Marshall 1988). Attempts to capture Marbled Murrelets have focused on birds on the ocean using gill nets, dip nets, night lights, and net guns (Quinlan and Hughes 1984). These techniques required expensive equipment (e.g. inflatable boats, powerful motors, and net guns) and calm seas. We needed a method that was neither as costly nor as dependent on weather conditions.

Marbled Murrelets tend to fly relatively high, 25-150 m above the ground, where we were working in the forests of northern California (Paton and Ralph 1988). Therefore, conventional ground-level netting systems were inappropriate, but we believed that mist nets elevated into the forest canopy might be effective. We used a rigging system which combined features of systems designed by Humphrey et al. (1968) and Dejonghe and Cornuet (1983). Since the net was placed over a road constantly used as a hiking trail, our design required easy removal of the net after each morning's use to minimize vandalism. We report here on a netting system which met these requirements.

METHODS

The net was placed 7 km inland in the Lost Man Creek drainage in Redwood National Park, Humboldt County. Two redwood (*Sequoia sempervirens*) trees, approximately 75 m tall and spaced 30 m apart, were used. This area had one of the highest murrelet detection rates reported for California, up to 172 detections per morning (Paton and Ralph 1988, Ralph et al. 1990). Murrelets were frequently observed flying below the forest canopy along Lost Man Creek, using the gap in the forest canopy created by the creek as a flight corridor (pers. obs.).

Materials. We used five mist nets (18.3 m X 2.1 m, 6 cm mesh, 110d/2 ply), with the top and bottom of adjacent nets sewn together to form one large net; 18.3 m wide and 10.5 m high with 20 shelves. This net was suspended from a 0.64 cm diameter, 50-m long steel cable (Fig. 1). Other materials included: 150 m of 1.3 cm diameter nylon rope for each end of the vertical net pulley system, 60 m of 1.3 cm diameter rope for the horizontal pulleys, four rope pulleys designed for 1.3 cm diameter rope, two carabiners, eight 3.3 m sections of PVC pipe (1.5 cm diameter), four cable clamps for the steel cable, 42 metal shower curtain rings, and 42 small hose clamps. All materials were readily available at local hardware stores, with the exception of the mist nets.

Attaching the rigging. We had two professional tree climbers (A and B for the chronology listed below) scale two redwood trees simultaneously (Fig. 1). Once in position 45 m high, climber A hoisted his end of the steel cable and wrapped the cable twice around the tree trunk. The cable was then secured with two cable clamps. Then, climber A attached a pulley (for the horizontal system) to the secured section of steel cable with a carabiner. Next, the ground crew placed the following pieces of rigging on the dangling, looped end of the steel cable: two vertical system pulleys separated by 18.3 m of rope, 150 m of rope threaded through each of the two vertical system pulleys, and 60 m of rope attached to each vertical pulley. Climber A then threw down a line and pulled up the 60 m rope for his side of the horizontal pulley system. He threaded this 60 m rope through the pulley attached to the tree trunk and threw the free end to the ground. Climber B. then used his throw line to hoist up both the steel cable and the other 60 m horizontal pulley rope simultaneously. Climber B pulled the cable tight and secured it with two cable clamps after

wrapping it twice around his tree's trunk. Enough slack was left in the steel cable to allow for tree movement during wind storms. Then, climber B attached a pulley to his looped cable end with a carabiner and fed the 60 m of rope through the pulley. Finally, the ground crew placed four 3.3 m sections of PVC pipe on each side of the 150 m of rope and knotted the rope at the bottom to prevent the PVC pipe from slipping. The PVC pipes already had the shower curtain rings attached with hose clamps at 36-cm intervals (Fig. 1).

Placing and use of the net. Once the rigging was in place, the net was attached and operated for each morning's use by a crew of 2-4 people. The large net was put on top of a plastic tarp measuring 20 m X 3 m. The tarp prevented debris from becoming tangled in the net. We had at least one person on each end of the net to attach the shelf loops to the shower curtain rings. The net was raised gradually with the vertical pulley system until all loops were attached. After all shelf loops were attached, the net was hoisted to the desired height and positioned centrally with the horizontal pulley ropes. The net was secured by tying the rope to tree roots or saplings. Netting sessions were conducted during the high activity periods, 60 minutes before to 60 minutes after sunrise (Paton et al. 1990a). At the end of each netting session, the net was lowered on top of the tarp and shelf loops removed from the curtain rings. The plastic tarp was folded twice along its length and rolled up, with the net still in the center of the tarp. During subsequent netting sessions, the tarp was simply unrolled and the net reattached.

RESULTS

We fastened the net to the pulley system in the dark before each morning's use, which took approximately 15-30 minutes. When a murrelet was captured, the net was lowered to the ground in <30 seconds. Once a bird was removed from the net, the net was raised in <1 minute for other capture attempts. Care had to be taken to insure that both ends of the net were raised and lowered simultaneously to avoid tangling the net.

A total of three murrelets and one Vaux's Swift (*Chaetura vauxi*) were captured in 17 mornings and one evening from 30 June to 26 July 1989. On two additional occasions, murrelets were initially caught but escaped as the net was being lowered to the ground. Murrelets were generally active from 30 minutes before sunrise to 60 minutes after sunrise in this area (Paton and Ralph 1988), yet capture times ranged from 17 minutes before to 1 minute after sunrise (04:33 to 04:51 PST). The mornings when we captured birds were foggy, when murrelets were generally more active and tended to fly closer to the ground. No birds flew into the net on 47% of the mornings the net was set (8 of 17). On the days when birds flew into the net, we captured birds 25% of the time (3 of 12 hits). No birds flew into the net on the one evening we used the net.

Our success was greatest during the initial days of trapping, when birds hit the net on six of the first nine mornings and only hit the net three of the last eight mornings. However, this difference was not statistically significant ($G^2 = 1.5$, 1 df, $P > 0.2$), suggesting murreletsdid not avoid the net during the fatter stages of the netting period.

On 3 July, one murrelet bounced out of the net and dropped a northern anchovy (*Engraulis mordax*) (weight = 10.0 g, length = 113 mm) to the ground. The anchovy was bent in a 90° angle by the murrelet carrying the fish clamped in its bill.

Murrelets were weighed, blood samples collected, banded (note: band size listed in North American Bird Banding Manual [3B] was too large; size 3A bands were used). Radio tags (2.5 g) were glued to the birds' back (Quinlan and Hughes 1984). Birds immediately flew to the ocean after their capture. Tagged murrelets were tracked from the ground and by fixed-wing aircraft for one to five days before their radio signals were lost. None of the tagged birds was detected away from the ocean after their initial capture, with birds tracked up to 20 km from the capture site (Paton et al. 1990b).

DISCUSSION

This was the first successful attempt to capture Marbled Murrelets flying into a forest stand. The pulley system was easy to use once the net was in place. The net could be raised and lowered rapidly by a minimum of two people, although Humphrey et al. (1968) designed a system that could be operated by just one person. Our system allowed us to easily take the net off the rigging at the end of each trapping session, which reduced net wear (e.g. rain and sun damage) and prevented vandalism of the net. The major problem we faced was murrelets bouncing out of the net, resulting in low capture success (3 of 12 hits). Neither Humphrey et al. (1968) or Dejonghe and Cornuet (1983) mentioned problems with birds bouncing out of net; however, they were not trying to catch birds as large and as fast as Marbled Murrelets, which fly at speeds in excess of 75 km per hour. Modifications which might have increased our capture success include reducing the distance between shelf loops to deepen the pockets, using a stake system as proposed by Humphrey et al. (1968) to increase tension on the net, and only using the net on foggy mornings.

We were unsuccessful in tracking murrelets to potential nest sites by catching murrelets flying to or from a nest.

None of the birds we captured with this netting system was located inland after their initial capture. We do not know if our inability to track the tagged murrelets was due to transmitter failure, attachment failure (i.e. the glue failed), birds leaving our tracking area, or bird mortality. Radio tags have been used once successfully to find a murrelet nest. Quinlan and Hughes (1984) in 1984 caught 17 murrelets on the ocean in southeast Alaska and followed one radio tagged bird 1.2 km inland to a nest tree. They used a 10 g radio tag package, when light weight tags, such as our 2.5-g radio tag, were not available. Further research needs to be done on the potential adverse impacts of radio tags on murrelets and attachment techniques.

Finally, we believe the forest canopy netting system we designed could be successful for other researchers interested in capturing murrelets. We believe this system could be used in forests where the trees have more branches than redwoods (see Humphrey et al. 1968). Disadvantages with this system include (1) having to find qualified tree climbers to initially rig up the nets, (2) difficulty in moving the nets to other locations once in place, and (3) uncertainty of a murrelet captured inland with a radio tag returning to a nest. However, this net design certainly could be used to catch birds to gather blood samples and to band birds. In addition, researchers interesting in capturing other types of birds (or bats) in the forest canopy could use this system in combination with different net mesh sizes.

ACKNOWLEDGMENTS

We thank N. Blair, T. Flanagan, J. Lusa, J. Verner, and G. Williams for help with net design and placement; D. Craig, S. Miller, W. Miller, B. O'Donnell, Scott Sillett, and Steve Sillett for help in capturing murrelets; and USDI Minerals Management Service, California Department of Fish and Game, and Redwood National Park for contributing to this work. C. T. Collins, R. C. Tweit and G. C. West provided useful comments on the manuscript.

LITERATURE CITED

Dejonghe, J.F. and J.F. Cornuet. 1983. A system of easily manipulated, elevated mists nets. *J. Field Ornithol.* 54 :84-88.

Humphrey, P.S., D. Bridge, and T.E. Lovejoy. 1968. A technique for mist-netting in the forest canopy. *Bird-Banding* 39:43-50.

Marshall, D.B. 1988. The Marbled Murrelet joins the old-growth forest conflict. *Am. Birds* 42:202-212.

Paton, P.W.C. and C.J. Ralph. 1988. Geographic distribution of the Marbled Murrelet in California at inland sites during the 1988 breeding season. Calif. Dept. of Fish and Game, Nongame Bird and Mammal Section Final Rept. Sacramento, Calif.

_____ and _____ 1990. Distribution of the Marbled Murrelet at inland sites in California. *Northwest. Natur.* 71:72-84.

_____,H.R. Carter, and S.K. Nelson. 1990a. Surveying Marbled Murrelets at inland forested sites: a guide. USDA For. Serv. Gen. Tech. Rep. PSW-120.

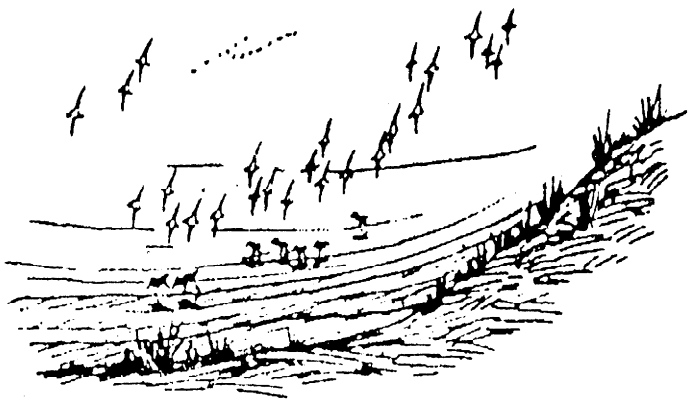
_____, J. Seay, and C.J. Ralph. 1990b. Testing of capture techniques and radio transmitters. *in* C.J. Ralph, S.L. Miller, N.L. Naslund, B. O'Donnell, P.W.C. Paton, J. Seay, and S. W. Singer. Marbled Murrelet research during 1989 in northern and central California. Calif. Dept. Fish and Game, Nongame Bird and Mammal Section Tech. Rept. 1990-8.

Quinlan, S.E. and J.H. Hughes. 1984. Use of radiotagging to locate Marbled Murrelet nest sites. Alaska Dept. Fish and Game Tech. Rept., Anchorage, Alaska.

_____ and _____ 1990. Location and description of a Marbled Murrelet tree nest site in Alaska. *Condor* 92:1068-l073.

Ralph, C.J., P.W.C. Paton, A. Zakis, and G. Strachan. 1990. Breeding distribution of the Marbled Murrelet in Redwood National Park and vicinity during 1988. *in* C. van Riper Ill, T.J. Stohlgren, S.D. Veirs, and S.C. Hillyer, eds. Examples of resource inventory and monitoring in National Parks of California. U. S. Natl. Park Serv. Trans. Proc. Ser. No. 8.

[1]curr. address: Utah Cooperative Fish and Wildlife Research Unit, Utah State University, Logan UT 84322



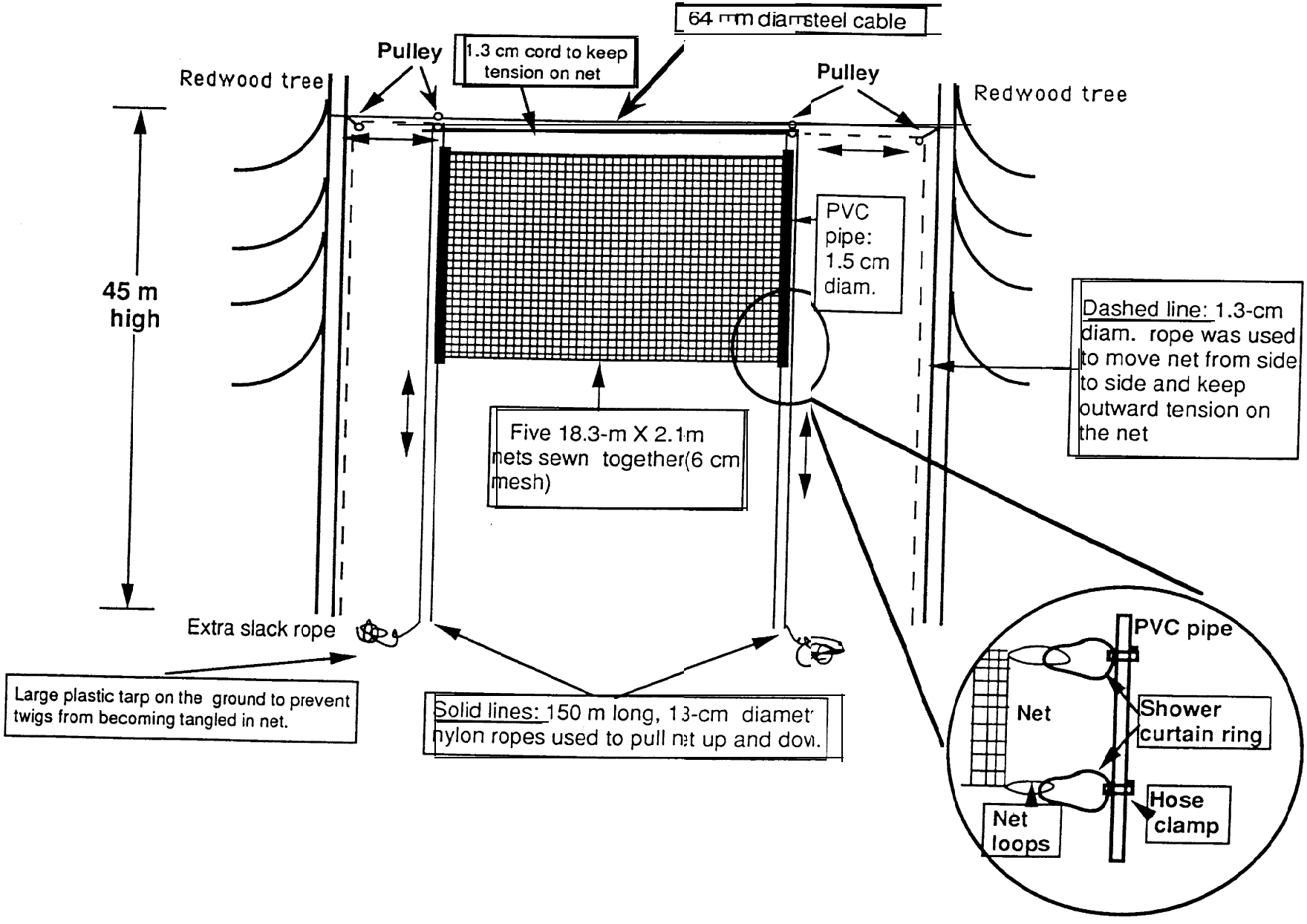


Figure 1. Schematic diagram of mist net design used to capture Marbled Murrelets in the forests of northern California. Branches were on all sides of both trees and not removed, but are not included in this drawing for simplicity. Diagram is not drawn to scale.