Using Mist Nets to Capture Western Purple Martins Breeding in Inaccessible Nesting Cavities

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ABSTRACT

We report on techniques and results of using mist nets to capture western Purple Martins (*Progne subis*) in three different nesting situations: a marine pier in Puget Sound, Washington (WA), bridges in Sacramento, California (CA), and montane aspen parklands in Colorado (CO). Improved capture techniques are needed for martin populations, which often nest in inaccessible sites and are of conservation concern. We successfully used 12 x 3-m 4-tier 30-mm and 60-mm nets mounted on both fixed and hand-held poles. Capture rates for mist nets ranging from 600 birds per 100 net-hours (b/100nh) in a brief netting effort in WA to 140 and 170 b/100nh in CA and CO, respectively. In both CA and CO, capture rates for mist nets were nearly twice those for hand-held hoop nets placed over nest holes. Martins were able to see and avoid mist nets under many circumstances. Mist nets worked best at sites that supported many nesting birds, were shaded from direct sunlight, provided a dark background, and had structural supports or vegetation that camouflaged the nets and people holding poles. Using distress calling of captured birds as live decoys enhanced capture rates. Our results show that mist nets can capture Purple Martins safely and effectively. Mist nets appear to be more efficient than hoop nets, although the combination of both methods may be more efficient than either alone. Additional technique refinements are needed to improve capture efficiency and reduce learned net-avoidance.

INTRODUCTION

Purple Martin *(Progne subis*) populations in western North America are small and have declined and, therefore, are of high conservation concern in contrast to relatively abundant eastern populations (Levad 1998, Horvath 2000, Kostka and McAllister 2005, Darling et al. 2005, Airola and Williams, in press).The species' precarious status in many western states and provinces has prompted a variety of research projects to understand factors that limit populations and to develop management strategies to maintain and recover populations. A number of these studies have required capture of martins, including color banding to provide information on life history and demographic characteristics, such as annual mortality rates, movement patterns, age-specific nesting patterns, and biometrics, (Airola et al. 2003, Airola and Kopp 2005, Airola and Kostka in prep.), as well as blood sampling for genetic analysis of martin systematics (Darling et al. 2005, A. Baker, in prep) and disease monitoring (Leeman et al. 2003).

Martin populations in the Pacific Northwest have largely adopted nest boxes (Horvath 2000, Darling et al. 2005, Kostka and McAllister 2005), and thus most are readily accessible for banding studies. Other western populations nest in tree holes, bridges, and other cavities that are less accessible (Airola and Grantham 2003, Gillihan and Levad 2002). Effective capture techniques are critical to

supporting banding needed to provide status and management information for these populations.

During 2003-2005, Airola and Kostka used hoop nets strung with mist netting and mounted on single poles to capture breeding martins when they emerged from their nest holes in the undersides of bridges in Sacramento, CA (Airola et al. 2003). The hoop net consisted of a 0.7-m diameter wire loop strung with a 0.6 m deep net bag constructed of mist netting material mounted on an 8-m telescoping pole. This technique involved watching until martins entered nest holes, then raising the hoop net to cover the nest hole and capture birds when they exited.

During martin trapping in 2006, we found the hoop nets to be less effective than in previous years. We suspect that wariness of birds banded in previous years likely reduced their susceptibility to capture. We worked at some of the same capture sites in 2006 as in three previous years, and pre-capture band reading indicated that 3 - 41% of the 2006 populations at each of these sites had been captured and banded previously.

D. Garcia, an experienced bander who first participated in martin capture in Sacramento in 2006, suggested that we try using conventional mist nets, based on her and Kostka's brief experience mist netting martins in Washington. We also consulted experienced Master Bander Stan Wright, who had assisted in capturing Sacramento martins for three years. We then mist-netted birds at Sacramento colonies.

We informally communicated techniques and results of our 2006 mist netting efforts to R. Levad, who then experimented with mist nets in Colorado to capture martins for blood sampling for a genetics study. We incorporate observations from this mist-netting effort here.

This paper reports on methods and results of our efforts to use mist nets to capture Purple Martins at inaccessible nesting areas in Washington, California, and Colorado.We also include additional observations on use of hoop nets in Colorado, to augment previous reports of their use in Sacramento (Airola et al. 2003).

Study Areas

Mist netting was conducted within three dissimilar study areas: marine areas on the Puget Sound, urban Sacramento, and montane forest and meadow habitats in Colorado.

Puget Sound. The Puget Sound basin currently supports a recovering annual population of approximately 400 known pairs of martins. More than 90% of pairs use nestboxes and gourds attached to offshore marine pilings, while <10% use historic breeding structures such as maritime structures, trees, and buildings (Kostka and McAllister 2005). Managed nestbox colonies can be large, supporting up to 24 pairs; whereas colonies in other substrates are smaller, with one to six pairs (Kostka, unpubl. data). Mist netting was conducted in 2003 at a colony under an abandoned pier on Hood Canal in Jefferson County that supported three pairs.

Sacramento. Sacramento annually supports approximately 160 pairs of martins in 10-12 colonies that nest in elevated freeways and overpasses ("bridges") in a highly urbanized area (Kostka et al. 2003, Airola and Kopp 2005). This population is a remnant of a more widespread California Central Valley population that has been greatly reduced, presumably by competition from European Starlings (*Sturnus vulgaris*; Airola and Grantham 2003, Airola and Williams, in press). Martins nest within internal chambers of steel and concrete box-girder bridge structures, which they access through "weep holes" located on the undersides of the structure. Colonies range in size from one - 39 pairs. Mist-netting in 2006 was conducted at five martin colonies that each supported five - 18 nesting pairs, for a total of 62 nesting pairs at these sites (Airola and Kopp, in press).

Colorado. In Colorado, Purple Martins are known to nest only in mature aspen (*Populus tremuloides*) forest in the western part of the state (Levad 1998, 2003). Most nests are in holes excavated by Northern Flickers (*Colaptes auratus*). Nests generally are located at the edge of a stand near open parkland and often within a few hundred m of open water, usually a beaver- (*Castor candensis*) or stock-pond (Gillihan and Levad 2002).

Colonies are small, mostly supporting fewer than five pairs, and the largest known colonies are of approximately 10 pairs. We mist-netted martins at two of the larger colonies: one on Haycamp Mesa in Montezuma County and the other near Groundhog Reservoir in Dolores County.

METHODS AND RESULTS

Puget Sound. In order to recover a banded martin of unknown origin, we set nets to capture birds that flew routinely under both sides of the pier, to enter and exit from nests and in passing flights. The nets were set during low tide, when no standing water was present beneath the pier. We set a 12 x 2.6-m, 4-tier, 30-mm mesh mist net underneath and parallel to a pier below three martin nests placed atop one of the pier beams. The net covered most of the 3-4 m of vertical airspace between beach and bottom of pier.

Our presence beneath the pier elicited typical alarm calling by several birds. Once the net was set, we retreated far enough away until alarm calling stopped. Although the mist net was shaded from direct sunlight, it apparently was easily visible to the martins. Initially, investigating birds flew up to the net, hovered briefly, and retreated. After 20 minutes, a martin hit the net, became entangled, and began distress calling. Immediately, two other martins dove under the pier and were also caught in the net. Some, but not all, netted birds made distress calls in the net.

Obstruction of most of the flyway beneath the pier by the mist net appeared to result in a high capture rate. Only once did a martin traverse the airspace under the pier and avoid the net by going over it.

Overall, we made nine captures over 1.5 hr, for a rate of 600 birds per 100 net-hours (b/100nh). Multiple captures occurred twice, both of which appeared to be triggered by the distress calling of netted birds. Six different martins were captured, with two captured twice, and one captured three times. The banded individual that had been previously sighted perched atop the pier on two occasions was not captured. After the net was removed, martins returned to nests within 20 minutes.

Sacramento. We mounted a 12 x 2.6-m, 4-tier, 30-mm mesh mist net on 9 m telescoping aluminum poles using tape, and hand-held it within areas that martins used as flight routes to nest sites beneath the bridges. Our presence beneath colonies elicited typical alarm calls ("*Zweet*" call of Brown 1997) and mobbing behavior by martins. While this behavior had tended to discourage success of hoop netting previously (because adults were reluctant to enter or exit nest cavities when mobbing occurred; Airola et al. 2003), this disturbance enhanced capture in the mist net by increasing the number of birds in the trapping area and possibly by distracting them.

Using the hand-held mist net, we captured 13 martins in approximately nine hours of netting (140 b/100nh) compared with a capture rate of 12 martins in 16 hrs (75 b/100nh) for hoop nets. Martins sustained no injuries in either net type, and the nets were not damaged by martins. We limited the period of netting at any one site to less than 1.5 hrs, and moved between different parts of larger colonies to avoid disrupting feeding of nestlings for an extended period. Effectiveness of capture at any one site also tended to decrease over this period of time.

Several times we caught multiple birds in one set of the mist net. We once caught four birds simultaneously at one site. We also found that we could sometimes catch more than one bird by leaving the first captured bird in the net for about 5-15 sec before lowering the net. In contrast, during four seasons using hoop nets, we captured two birds simultaneously only once in 97 captures.

The mist net worked best at sites that supported many nesting birds, were shaded from direct sunlight, provided a dark background, and had structural supports or vegetation that camouflaged the nets and people holding poles. Not surprisingly for an aerial insectivore, martins appeared to be able to see and avoid the net readily at some less shaded areas. Some successful sites had strong contrast between bright exterior areas and shaded areas beneath bridges which may have made the net less visible.

Use of hand-held poles allowed us to adjust our net location rapidly. This flexibility was especially important at times when martins were clearly seeing the net in one position. We could then adjust the net location to make it less visible and surprise the birds before they re-acclimated to the presence of the net. Hand-held poles also made it possible to adjust net location and orientation quickly in response to changing wind direction. The presence of humans holding net poles, however, sometimes discouraged martins from approaching. Netting appeared to be more successful when the telescopic poles could be extended and propped up to fit snugly between the ground and the underside of the bridge structure, allowing netters to retreat from the net area. Where poles could not be propped, success tended to be greater when holders hid behind the bridge support columns or within vegetation, or sat and hid their faces. Martins here also returned to feed young at nest holes within a short period after we ceased netting activity.

Colorado. Banding in Colorado utilized both pole-mounted hoop nets and mist nets. The hoop nets were constructed from 0.5-m diameter fish landing nets mounted on 8-m telescoping surveyors rods. We bent the net opening to a 23-cm width, replaced the fish-netting with mist netting salvaged from a damaged net, and attached a 15-cm wire to the top of the loop to hold the net away from the nest hole.

For mist netting, we used two 12-m x 3-m mist nets (60-mm mesh), which were raised on 7-m poles (two 3.3-m x 2-cm aluminum electrical conduit sections joined with 0.6-m x 2-cm steel forming stakes). We tied five 7.5-cm diameter loops spaced 50 cm apart in an 18-m x 3-mm nylon cord and attached an S-hook to each loop. We threaded the poles through the loops, attached the net trammels to the S-hooks, and ran the cords through I-bolts mounted at the top of each pole.This assembly enabled us to raise the nets up to 7 m easily and lower them quickly to remove captured birds.

At Haycamp Mesa, we erected mist nets in the colony grove at sunrise and played a tape of a Purple Martin distress call. Although we caught one bird quickly, and the birds showed interest in the taped calls periodically, they clearly could see the nets and generally avoided them. We could reach only two nests with the hoop nets and the birds were not visiting the nest holes frequently, but we managed to capture two birds at nest cavities. During the day, we experimented with placing a plastic owl in front of the nets and wooden Purple Martin decoys in the nets; the bird appeared to ignore both replicas. We believe that we were too early in the nesting period to elicit interest.

Two weeks later, we made a second attempt near Groundhog Reservoir, where we were able to reach three nest holes with the hoop nets. The birds were visiting the nests frequently to feed nearly grown young, and we captured four adults at the holes before setting up the mist nets in the colony's aspen grove. When the mist nets were up, one of our party stood beneath the nets holding the last of the four martins captured by the hoop net as high as she could reach and allowed the bird to beat its wings vigorously while emitting a loud distress call. Almost immediately, four martins appeared and flew at the live decoy and were captured in the mist nets. After processing those four, we repeated the decoy operation and soon had two more in the nets. Between the two captures, martins were flying into and out of the nest area and obviously were able to see and avoid the nets. Only when the decoy bird took their attention did they hit them. Overall, we captured a total of 18 martins in these attempts, including 12 in 7 hr (170 b/100nh) of mist-netting and six in 9 hr (67 b/100nh) of hoop-netting.

DISCUSSION

Our initial results show that mist nets can be a safe and effective technique for Purple Martin capture. We emphasize the need to keep trapping periods short and limit use of live decoys to the immediate release periods. Mist netting is especially important to foster studies in areas where martins use nest cavities that are difficult to access for trapping and banding martins (e.g., tree cavities, bridges, pilings).

Mist nets had about double the capture rate of hoop nets, and thus appear to be more efficient for general study of survival and movements. Hoop nets, however, are more effective as a tool to

investigate breeding status and philopatry, since capture at nest cavities demonstrates with reasonable certainty that the martin was a breeder at the colony and cavity. Conventional mist-net capture enables neither of these determinations, since martins are highly attracted to conspecifics and may regularly visit nearby colony sites, especially when attracted to alarm calling. For example, all Sacramento colonies are within 13 km of each other, with the closest separated by 1 km (Leeman et al. 2003).

Based on our four years' experience with hoop nets in Sacramento, we expect that if mist nets are used regularly at a site, trapping success will decline. Possibly, the use of an alternating sequence of hoop and mist netting approaches would reduce martin acclimation to each trapping technique and enhance overall success.

In Colorado, many nests are in tree cavities more than 8 m high, so hoop net capture opportunities are limited. Therefore, if trapping at a site in consecutive years proves unproductive, alternative approaches may include moving the banding operation periodically and experimenting with yet untried techniques (including longer poles and more realistic owl decoys).

Although we did not try it, we also suggest that setting up mist nets pre-dawn may be a successful variant on the technique that may allow capture of martins when they emerge from their nest holes in low light conditions.

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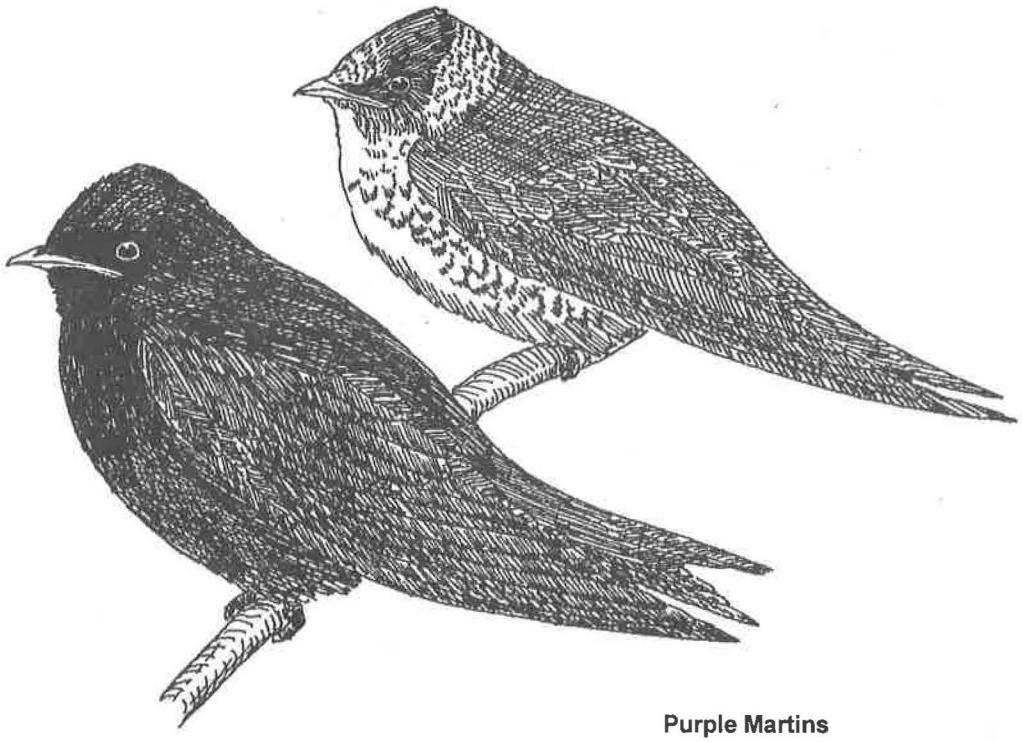

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