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RESPONSE OF ENDANGERED CAPE SABLE SEASIDE SPARROWS (*Ammodramus maritimus mirabilis*) TO NEST EXCLOSURES

Rebecca L. Boulton[1, 2] and Julie L. Lockwood[2]
[1]*Centre for Ornithology, School of Biosciences, Birmingham University, Edgbaston, B15 2TT, United Kingdom*

E-mail: rlboulton@gmail.com

[2]*Department of Ecology, Evolution, and Natural Resources, Rutgers University, New Brunswick, New Jersey 08901*

Habitat protection and restoration are often the first step in endangered species management. While habitat preservation may prevent short-term extinction risk, in many circumstances, further conservation action is required. Avian conservation routinely implements the use of lethal predator control and nest protection as management tools owing to high nest predation rates suffered by many species. Lethal control practices, although effective in some situations (e.g., Innes et al. 1999, Powlesland et al. 1999, Moorhouse et al. 2003), can evoke a negative public response, particularly when the predator itself is native or threatened (e.g., Roemer and Wayne 2003). A common, non-lethal method employed to reduce nest predation is the protection of the nest site via cages, barriers, or electric fences (Post and Greenlaw 1989, Johnson and Oring 2002, Murphy et al. 2003, Isaksson et al. 2007).

The federally Endangered Cape Sable Seaside Sparrow (*Ammodramus maritimus mirabilis*) suffers high nest predation, especially late in the breeding season when nests rarely succeed (Baiser et al. 2008). These late-season nests are important for population recovery (Lockwood et al. 2001), so investigating management practices that may assist sparrow nest survival seem critical in helping conserve this species. Here, we examine the willingness of Cape Sable Seaside Sparrows to accept predator exclosure fences positioned around nest sites and their effectiveness as a management tool to increase sparrow nest survival.

Methods and Results.—During April and May 2008, we searched for sparrow nests in the 0.5 km^2 Dog Leg and Alligator Hammock plots within sparrow subpopulation B, Everglades National Park, Florida (for a further description of the sites see Pimm et al. 2002). We attempted to assign fences to nests randomly; however, a nest's distance from the road (placing the exclosure required carrying heavy equipment in the prairie) and nesting stage sometimes determined assignment. We monitored control nests on adjoining territories to test the effectiveness of the fences at increasing nest survival.

We modified a fence design originally described by Post and Greenlaw (1989) for use with another race of the seaside sparrow, *A. m. peninsulae*, in Florida salt marshes. We constructed fences from 0.6 m × 15 m rolls of White & Brown Aluminum Trim Coil (Amerimax Home Products, Lancaster PA), which we cut in half, resulting in a fence with a diameter of approximately 2.4 m (~7.6 m circumference) and 0.6 m height. We drove the fences 5-6 cm into the ground and further stabilized them with 5-6 wooden stakes (2.5 cm diameter) on their inner sides. An L-bracket was screwed to the top of

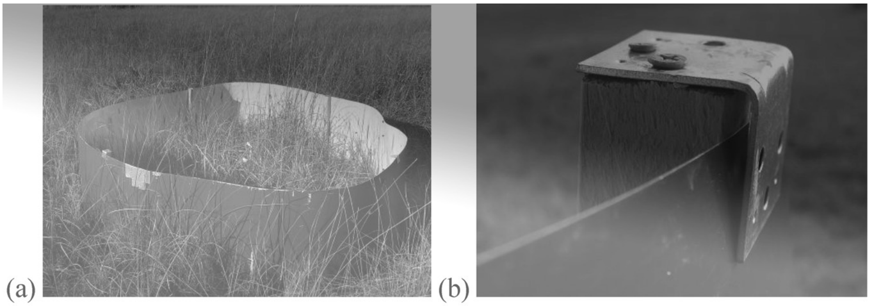

Figure 1. (a) Small-ground predator exclosure fences made from aluminum flashing to protect Cape Sable Seaside Sparrow nests in the Florida Everglades 2008, and (b) L-bracket attached to wooden stake to hold down aluminum flashing during high winds.

each stake to help hold down the aluminum flashing. We used duct tape to seal the joint where the ends of the fence material met, and flattened any vegetation that could serve as a predator bridge on the outside of the fence.

Before we put fences around active sparrow nests, we tested whether the aluminum flashing significantly increased the temperature at the nest site, possibly due to the obstruction of wind or heating of the aluminum. We recorded ambient temperature inside and outside the fence using Thermochron iButtons (Maxim Integrated Products, Sunnyvale CA). The average temperatures recorded from iButtons within the fence were similar to those from outside, confirming that the aluminum flashing would not adversely affect nest temperatures.

We attempted to establish predator exclosure fences around six sparrow nests, one containing day-old nestlings and five with eggs. To allow females to habituate to the structure we positioned the fence within 2-50 m of their active nest for one day. All females tolerated this initial attempt at habituation. The next day we positioned the fence around the nest, but left a gap (0.3 m) and the vegetation undisturbed, to allow the birds to enter the nest by walking on the ground, which is a common behavior for this species. At this stage only one female entered the structure; she returned to the vicinity of the fence within 5 min of construction, and 25 min later dropped inside it from a nearby grass stem, without using the gap. The following day we closed the gap in the fence around her nest. The other five females (and the male in two cases) generally reappeared within 15 min of the initial enclosure of their nests (with the gap left open), but did not enter the fence, though they sat relatively close to it and sometimes flew over it. After one hour the parental birds had still not returned to the nest and continued to show signs of stress (alarm calling, panting), so we removed the fence as quickly as possible and immediately left the area. Four of the females returned to their nests after we removed the fence. We were unable to confirm if one female returned to her nest because the nest had failed when we checked its contents the following day. Of the other four nests, three successfully fledged and one failed six days after the fence experiment ended. The fully fenced nest fledged 14 days later whereby we removed the fence to allow the fledglings' easier mobility.

Conclusion.—The unwillingness of females to accept exclosures around their nests hampered our ability to examine the success of this method. Throughout the experiment, we changed fence positioning in a number of ways, attempting to understand which aspects of the structure the female disliked. However, because only one female accepted the fence, it is difficult to evaluate what these were. We suggest that acceptance was more likely dependent on an individual female's willingness to tolerate the structure. We do not recommend that nest exclosures be pursued further in the management of this species due to extremely low acceptance rates, and the amount of time and labor involved in deploying the structures. Finally, we do not know if the fences are capable of protecting a nest from predators because the single nest that fledged was during a period of high nest survival regardless of being fenced.

Considering the documented acceptance of similar fences by *A. m. peninsulae,* we had not anticipated such an adverse reaction by *A. m. mirabilis*. Our experiment highlights the need for stringent contingency plans when working with endangered species and the need to test thoroughly any management action that has the potential to modify individual behavior.

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