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The Ka'ena Point Natural Area Reserve Ecosystem Restoration Project: A Predator Exclusion Fence

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ABSTRACT: The Hawaiian Islands' first predator exclusion fence project is planned for spring 2010 at the Ka'ena Point Natural Area Reserve, on the Island of Oahu. The Reserve hosts one of the largest seabird colonies in the main Hawaiian Islands and is home to threatened and endangered Hawaiian plants. Both avian and plant species in the Reserve are impacted by non-native mammalian predators. Although predator control operations have been ongoing for over a decade, predator ingress into the Reserve is continual and results in the annual loss of up to 15% of fledgling seabirds. It is projected that the planned predator exclusion fence and subsequent mammal removal will be more cost effective and provide an impervious means of keeping mammalian predators out of the Reserve, thus preserving and improving critical habitat. Because non-native mammalian predators cause biological damage to many of Hawai'i's fragile avian and plant species in almost every ecosystem island-wide, this project will lead the way in further developing a new management strategy for the protection and preservation of island ecosystems.

KEY WORDS: ecological restoration, exclosures, fences, hand broadcast, Hawai'i, Oahu, predator removal, rodent control

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KA'ENA POINT NATURAL AREA RESERVE

Ka'ena Point Natural Area Reserve is a 31.6-hectare coastal reserve that was established in 1983. The Reserve contains one of the last intact dune ecosystems and hosts one of the largest seabird colonies in the main Hawaiian Islands. Federally protected species such as the wedge-tailed shearwater (*Puffinus pacificus*) and the Laysan albatross (*Diomedea immutabilis*) nest at the point each year. The point is also regularly visited by endangered Hawaiian monk seals (*Monachus schauinslandi*) and contains endemic and endangered species of plants including *Sesbania tomentosa* and *Chamaesyce celastroides* var. *Ka'enana*.

Non-native mammalian predators including dogs (*Canis familiaris*), cats (*Felis catus*), mongoose (*Herpestes javanicus*), rats (*Rattus rattus*), and mice (*Mus musculus*) are one of the largest threats to the Reserve's native plants and animals. All of these species are known to prey on the ground-nesting birds and/or their eggs. Rats and mice are also believed to have a large impact on native plants through seed predation (Chimera 2004, Erwin and Young 2010, Sugihara 2002). The State of Hawai'i's Department of Land and Natural Resources, Division of Forestry and Wildlife, Natural Area Reserve Program has implemented predator control operations for

over a decade within the Reserve. These management actions have been shown to have a positive impact on native species, with shearwater populations increasing from 0 in 1994 to 3,000 in 2009, and albatross from 0 in 1994 to 365 in 2009 (L. C. Young, pers. observation). Although successful, predator control operations are labor intensive, do not provide 24-hour protection, and are fully dependent on continual funding from the state budget. Working cooperatively, the Natural Area Reserve Program, U.S. Fish and Wildlife Service, and the Western Section of The Wildlife Society have put into motion plans to create a permanent and complete protection for the Reserve through the installation of a predator exclusion fence across the point, to block predator access into the core of the Reserve. This fence technology, although fairly common in New Zealand, will be one of the first of its kind in the Hawaiian Islands.

PRELIMINARY MONITORING

A major component of the Ka'ena Point Ecosystem Restoration Project will be to remove rodents from the enclosed area within the fence, once the fence is complete. For larger mammalian predators, this process will be fairly straight-forward. However, rodent removal will be more complex and variable. In order to facilitate

the best control results, a preliminary rodent monitoring was conducted in 2008 and 2009. The purpose of this monitoring was to gain a better understanding of rodent abundance, spatial variation, and home range sizes. Four seasonal (February, April, July, and November) samplings of rodent populations were conducted across the Reserve, targeting both mice and rats. This preliminary monitoring concluded that the number of mice caught per trap-night was twice that of rats, and relative abundance of both species peaked in April and was stable during the other seasons (Figure 1). This suggests an early spring reproductive period. Home ranges were estimated at a 10-15 m radius for mice, and a 50-m in radius for rats, confirming previous estimates.

Figure 1. Ka'ena Point seasonal rodent catch per trap-night during four seasons, April 2008 - February 2009.

Figure 2. Schematic of predator-proof fence design (from Xcluder Inc.).

FENCE CONSTRUCTION

The predator exclusion fence that will be used to create the enclosure will be constructed and installed by Xcluder Pest Proof Fencing Company (www.xcluder.co.nz) of Rotorua, New Zealand. The fence will be built approximately 2 m high with a rolled hood at the top, fine mesh between the fence posts, and a skirt buried

underground (Figure 2). All of these features will prevent animals from jumping, climbing, squeezing through, or digging their way around the fence and into the protected enclosure. This design has been thoroughly tested in New Zealand in coastal and forested areas, as well as in Hawai'i on the slopes of Mauna Loa. The fence corridor will be approximately 4 m wide and 622 m long. The fence alignment largely follows a World War II-era roadbed that skirts along the bottom of the hill behind the point, above the sand dunes. By following this track at the base of the slope, the alignment allows for enclosing the greatest area, while minimizing interference with view planes and avoiding further disturbance to the delicate habitat.

Access doors will be incorporated at locations where the fence crosses existing trails at both the Mokulē'ia and Wai'anae entrances, and a third door will be located above the Leina a ka 'Uthane to allow access to a fishing ko'a (shrine). To minimize the opportunity for predator incursion if doors are propped open, a double-door system is planned, where both doors cannot be opened at the same time. Instead, a person accessing the Reserve must wait for the first door to close before the second door may be opened. The doorway area will be large enough to fit up to 9 people at a time, or someone with a bicycle or a fishing pole.

POST-FENCE MAMMALIAN PREDATOR REMOVAL

Immediately preceding the fence construction, standard predator control operations (using cage traps, padded leg-hold traps, and shooting) will be intensified. The intent of this surge will be to eliminate any remaining feral dogs and cats within the fence enclosure. This will also help to reduce the mongoose population.

Rodent Removal Strategy Phase I: Bait Box Grid

Three phases are planned for the removal of rodents from the Reserve (Figure 3). The first phase of the rodent control effort will entail the use of plastic bait stations baited with Ramik diphacinone bait bars (Hacco Inc., Randolph, WI) to target both rats and mongoose. The bait stations will be placed at 80 grid points (Figure 4) spread apart at 50-m intervals, with bait stations will be fully baited for 4 weeks. Bait stations will be checked 3 times per week for the first week, and then check intervals will be adjusted for subsequent weeks, based on level of bait consumption. We expect the interval will be once per week. During this first phase, our intent is to reduce the rat population so that the second phase, hand broadcast baiting, has the best chance controlling mice. Our concerns is that if the rat population is not suppressed prior to hand broadcast, rats may out-compete mice for available hand- broadcasted bait, thus reducing mouse control. In addition to bait stations, each 50-m grid point will also be fixed with a tracking tunnel/pad to collect data for permanent rodent presence vs. absence monitoring. The bait boxes or bait tunnels used will be large enough to allow access for animals up to the size of

Figure 3. Phases of rodent removal strategy.

Figure 4. Map of Ka'ena Point Natural Area Reserve, Oahu, Hawai'i.

mongoose. We have not yet decided how often to check and re-ink the tracking tunnels, or what bait to use in them.

Phase II: Hand Broadcast of Diphacinone

The second phase of the control effort will be to hand broadcast one 2.5-g diphacinone bait pellet (Diphacinone-50, USDA APHIS, Riverdale, MD) evenly every ~1.34m across the entire exclosure. This hand broadcast will be completed twice, approximately 7 - 10 days apart. At each broadcast application, we will utilize the maximum legally allowable amount of bait, distributing 13.8 kg/ha.

Phase III: Rolling Front of Snap Traps

The third phase of rodent removal will be a “rolling front” of snap traps. This phase will require approximately one month of effort, but this will depend on actual catch rates. Traps will be checked daily during the

first week and then likely 5 days/week for the duration, depending on catch rates. This rolling front will start at the tip of the point, spanning the full width of the Reserve (~400 m) and move towards the fence, spanning a distance of 600 m. The trap spacing will be 10 m apart and 100 - 150 m deep (10-15 trap lines deep). Trap lines will be moved forward after 3 - 7 days of no mice being caught. A 2-line buffer of rodent-free lines will be maintained on the end to ensure that no rodents are left behind the line. As with all other phases of the removal process, the full grid of monitoring points with ink-tracking tunnels will be maintained and monitored.

CONCLUSION

With up to 8 months until the rodent eradication process begins, the ecosystem restoration project seeks final advice, comment, and suggestions from the vertebrate pest management community, in order to

create the greatest likelihood of success. By ensuring a successful large-scale rodent removal, a foundation for similar future projects in Hawai'i and the United States will be laid. If you have any comments, suggestions, or insights, please feel free to contact the Ka'ena Point Ecosystem Restoration Project Coordinator, Lindsay Young, at (808) 741-9479 or by email at <lindsay@pacificrimconservation.com>.

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