Eradication of introduced mice from San Benito Oeste Island, México

Preliminary Report

Conservación de Islas

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San Benito's biological importance

The San Benito Archipelago (SBA) is located in the Pacific Ocean, off the central portion of the Baja California peninsula. It comprises three islands: San Benito Oeste (SBO, 400 ha); San Benito Medio (SBM, 45 ha); and San Benito Este (SBE, 146 ha). These islands have a remarkable biodiversity. They support 51 species of plants —three of them endemic— and 80 vertebrate species, including one reptile, four marine mammals and 75 birds. Regarding this last group, the SBA has a crucial ecological importance for seabirds in the region. Every year, its islands host more than two million seabirds from 13 different species that breed there, making it the largest and most species-diverse colony in all the US and Mexico Pacific islands. This means that 74% of all breeding seabird individuals in the whole ecoregion concentrate in these three small islands. These include the Black-vented Shearwater; Leach's, Black, and Least Storm-petrel; Brown Pelican; Double-crested and Brandt's Cormorant; Heermann's and Western Gull; Guadalupe, Scripps', and Craveri's Murrelet; and Cassin's Auklet.

Aerial view of the San Benito Archipelago.

Scripps's Murrelet.

Cassin's Auklet.

Least Storm-petrel.

Leach's Storm-petrel.

Black Storm-petrel.

Black-vented Shearwater.

The problem

After GECI eradicated rabbits, donkeys and goats in 2003, the islands of the SBA were pest-free. However, in 2006 the presence of exotic rodents on SBO was reported. In 2007, GECI confirmed the presence of the Cactus Mouse, *Peromyscus eremicus cedrosensis*, which was accidentally introduced from the nearby Cedros Island. In a short period of time, the mouse population became abundant and widespread. Negative impacts of mice over native fauna were soon confirmed: bird bones and feathers were found on mouse burrows, while bird remains such as feathers and eggshells were found on mouse stomachs. The most threatened seabird species were the auklets and the storm-petrels due to their nesting habits (on or under the ground) and the size of their eggs and chicks. These observations, along with the known negative effects of mice on seabirds on islands all over the world —especially *Peromyscus* species on nocturnal seabirds— were sufficient proof to take action by eradicating the mice from San Benito Oeste. This would protect not just 40% to 50% of all the SBA seabirds that nest on this particular island, but the remaining seabirds that nest on the other two islands where the risk of invasion was high.

The solution

Eradicating the introduced mice from San Benito Oeste was the most cost-effective measure in terms of return of investment given the high (seabird) biodiversity value of the whole archipelago. Base line studies and systematic research of both native and exotic fauna were carried out for over five years (2008-2013). During this time, the planning and fundraising of the eradication campaign also took place. Of particular importance throughout this period were the contributions of the Packard Foundation and the Marisla Foundation, as well as the in-kind support of the local fishing cooperative “Pescadores Nacionales de Abulón”, which comprises about 400 fishermen and their families, who sustainably harvest lobster and abalone since 1942 on the waters surrounding Cedros Island and the San Benito Archipelago.

Finally, after building rapport and getting the support of the local community and after years of planning and fundraising, in late 2012 GECI received confirmation from the National Fish and Wildlife Foundation for a grant to execute the eradication campaign. This grant was complemented with matching funds coming from the Packard Foundation and the Marisla Foundation.

Between November and December 2013, the mouse eradication campaign was completed. Like in previous occasions, it was a success due to the strong collaboration amongst different institutions, national and international. The local fishing cooperative, Pescadores Nacionales de Abulón, backed up the project and provided in-kind support on both San Benito and Cedros islands. The Navy Ministry (SEMAR) facilitated operational logistics by transporting bait, fuel, water, equipment and personnel from Ensenada to San Benito Oeste, providing for the operation an oceanic vessel, the Bretón, with hangar and helicopter platform. The National Commission of Natural Protected Areas (CONANP), as well as the ministries of Interior (SEGOB), Environment and Natural Resources (SEMARNAT), Communications and Transport (SCT), and National Defense (SEDENA), supported the project and facilitated the required permits. Bell Laboratories, Inc. provided the special rodenticide. Tracmap and HeliOtago offered advice on DGPS functionality, and Tracmap kindly lent a DataLogger to acquire information of each bating session.

The eradication campaign consisted in the aerial broadcast of special bait over the whole area of the island using GECI's sowing bucket (HeliOtago™) attached to a helicopter. The first baiting took place on 27 November, while the second bating took place on 4 December. The helicopter from the California-based company Aspen Helicopters Ltd. used a differential GPS (TracMap™) which accurately guided the pilot throughout the baiting operation. The data from the DGPS was downloaded and analyzed by GECI's GIS specialists to confirm that the broadcast of bait went according to plan, and most importantly, that there were no gaps without bait on the ground. Also, for estimating bait density on the ground, a new and highly accurate application developed by GECI on Matlab® software was used. No mice or their tracks have been detected so far. All the radio-collared mice were found dead due to bait consumption. These indicators suggest that the campaign was a success and that San Benito Oeste Island is now free of invasive rodents, benefiting the marine birds and the insular ecosystem as a whole. During the coming months, GECI will validate the success of the eradication by confirming the absence of mice using a spatial-survey model (Samaniego-Herrera et al. 2013)[1].

Next steps

After the eradication, enforcement of biosecurity measures is the most important strategy to ensure that the San Benito Archipelago remains mammal-free. Over these past years, the island users —fishermen from the cooperative Pescadores Nacionales de Abulón— have come to understand the importance of island biosecurity. They have committed to implement simple but crucial measures to prevent the reintroduction of the Cedros Cactus Mouse, or a new incursion of any other mammalian pest such as black rats or cats. Nonetheless, GECI will continue to collaborate with the local community to consolidate their biosecurity strategy.

Furthermore, GECI will be monitoring the ecological outcomes derived from the mice removal. Population dynamics of murrelets (e.g. reproductive success) and storm-petrels (e.g. reproductive success, chick growth patterns and feeding rates, individual adult provisioning, diet analysis) is being assessed. Populations of terrestrial birds such as the Savannah Sparrow are also being researched.

Acknowledgements

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[1] Samaniego-Herrera, A., D. P. Anderson, J. P. Parkes, & A. Aguirre-Muñoz. (2013). Rapid assessment of rat eradication after aerial baiting. *Journal of Applied Ecology*, *50*: 1415–1421. doi:10.1111/1365-2664.12147


Figure 1. Loading of bait, fuel, food and GECI's aerial bucket to the Navy Boat "ARM Bretón", for their transport from Ensenada to San Benito Oeste Island.

Figure 2. Aerial unloading of materials and equipment to San Benito Oeste Island.


Figure 3. The bucket "team" preparing to load bait (left). Bait loading into the bucket (right).


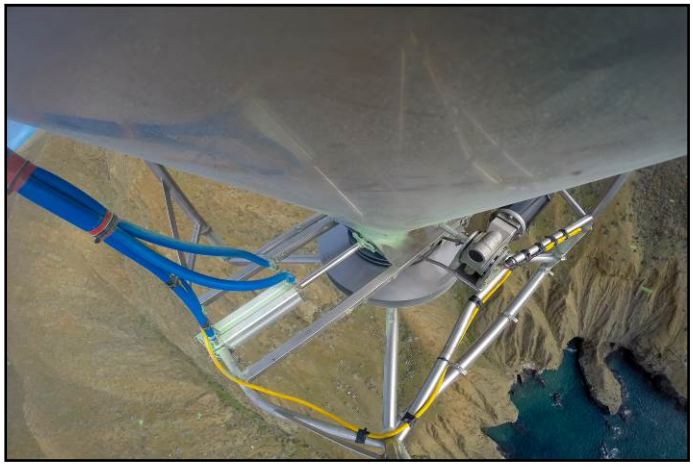

Figure 4. Helicopter broadcasting bait over San Benito Oeste Island (left). A closer look to the bucket while it was operating (right).

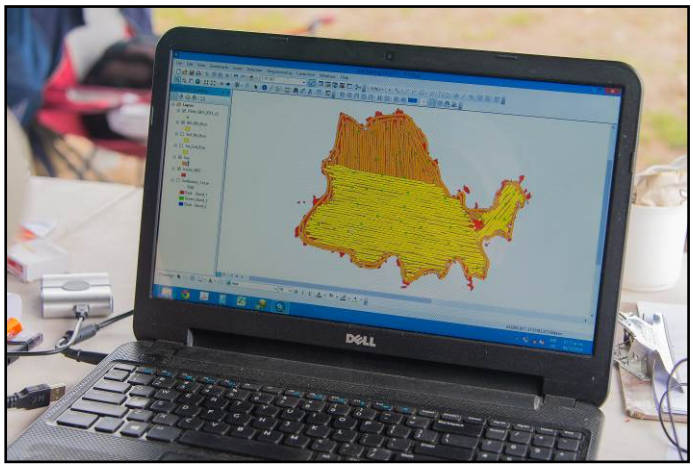

Figure 5. Project Manager, Federico Méndez, and Project Coordinator, Karina Ramos, verifying the data downloaded from the DGPS to assure 100% coverage of the whole island (left). Outline of San Benito Oeste Island showing the progress of the second baiting (yellow polygons) in the GIS Software (right).

Figure 6. GECI Staff celebrating the successful eradication of mice from San Benito Oeste Island.