Island Rodent Eradications: Little Things Make Big Things Happen

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ABSTRACT: Island rodent eradication is often a prerequisite for ecological restoration. These operations have been scaling up in size and complexity, and typically revolve around the thorough distribution of rodenticides in bait stations, by hand broadcast, by helicopter-borne spreading buckets, or by combinations of these methods. Many of the requirements of an eradication can be met by simply purchasing the right materials and following published best practices. However, intangible factors such as training and mindset of personnel are equally critical, and less commonly understood. We briefly review these factors and highlight issues such as the limited pool of experienced eradication practitioners, the increasing complexity of eradication projects (in scale, number of species to be eradicated, nontarget species, and integration with resident human populations), and potential for human error. We close by making recommendations for addressing some of these less-tangible factors and conclude that the "little things" can influence the outcomes of rodent eradication projects.

KEY WORDS: best practices, ecological restoration, human dimensions, human error, personnel experience, rodenticide, scaling up

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THE ISSUE

The need for removing invasive rodents from islands as a prerequisite for their ecological restoration is well documented (e.g., Graham et al. 2018), with benefits usually surpassing expectations (e.g., Jones et al. 2016, Russell and Broome 2016). The >500 islands that have been cleared of invasive rodents (DIISE 2018) include remarkable records such as the rat eradication on South Georgia Island (108,700 ha; Martin and Richardson 2019), the mouse eradication on Antipodes Islands (2,100 ha; Horn et al. 2019), and the multi-species eradication on Macquarie Island (12,800 ha; Springer 2018). This was possible thanks to the development of both eradication methodology (e.g., the use of helicopters, specialized spreading buckets, and GPS) and eradication principles (Cromarty et al. 2002), which allowed treatment of large and rugged areas and guided eradication strategies maximizing the likelihood of success (Howald et al. 2007, Garden et al. 2019).

Best practice guidelines, which aim to ensure eradication principles and high standards are met, have been developed in New Zealand for each of the three rodent eradication techniques: 1) aerial broadcast (Broome et al. 2017a,b), 2) hand broadcast (Broome et al. 2011b), and 3) bait stations (Broome et al. 2011a); and also for special situations, for example for targeting mice (Broome et al. 2017b) or operating on tropical islands (Keitt et al. 2015). The Resource Kit for Rodent and Cat Eradication (PII 2011) is also an excellent source of advice. All these guidelines highlight the importance of proper planning and use of quality products (e.g., bait), devices (e.g., bait buckets or bait stations), and experienced personnel as crucial components. In practice, the importance of tangible factors, for example the source of the bait or the type of GPS, is relatively easy to communicate; however, the significance of intangible factors such as training and mindset of personnel is harder to understand and measure, and hence commonly underestimated and underperformed (Samaniego et al. unpubl. data). Here we focus on the latter. This is a reminder to conservation managers and stakeholders that a trained and motivated team is as crucial as having the right bait.

THE IMPLICATIONS

A Larger Pool of Experience is Needed

Globally, the number of simultaneous operations is increasing as more and more countries and territories get involved in rodent eradications. For example, in 2020, at least three major projects were scheduled to be implemented roughly at the same time: Gough Island in the South Atlantic, Midway Atoll in the tropical Pacific, and Tetiaroa Atoll in French Polynesia (although all were postponed due to the COVID-19 pandemic). Unfortunately, the number and frequency of projects varies greatly over time, so unless people work for one of the few organizations dedicated to this field it is difficult to make a career in it. Therefore, future projects are likely going to continue recruiting inexperienced people. This points to the importance of training, as many tasks required for successful eradication implementation can be simulated and practiced prior to personnel deployment.

Challenges are Growing

Given the recent trajectory of project size, complex rodent eradications on larger and/or inhabited islands are expected to become increasingly common. As a result, timelines for feasibility studies, community engagements, and planning are likely to increase in duration, which requires continuity with the implementation and post implementation (e.g., biosecurity) phases (Brown et al. 2013). In addition, implementation will require the use of multiple eradication techniques, for example ground methods for the inhabited area or where native species are kept in captivity temporarily, and aerial treatment for the rest of the island. The mouse and rat eradication on Lord Howe Island, implemented in 2019 and currently being

confirmed, took over a decade to develop and used a multi-technique approach, requiring operators to be both technically and socially skilled (Harper 2020). Even if settlements can be aerially treated, the fact that human structures require baiting on the inside means larger teams are required to complement the aerial treatment. In addition, strict regulations in some countries or difficulties of certain habitats (e.g., mangroves; Samaniego et al. 2018) may require hand-baiting of some coastal areas to ensure there are no baiting gaps while minimizing bait entering the ocean. Finally, multi-species and multi-island eradications, particularly on tropical islands where there is less tolerance for errors (due to the high diversity and abundance of bait competitors; Samaniego et al. 2019), are also on the rise.

Human Error Can Impact Any Aspect

Just as we hope all doctors, nurses, and assistants in the operating theatre are clear on the goals and have experience and high standards, all personnel involved in an eradication operation require quality training and pairing with experienced people. Positions like helicopter pilot or GIS analyst obviously require expertise beyond the scope of a specific project, but all positions require some training on the particularities of the island and the project. Many crucial aspects depend on each person doing excellent work. Examples for ground operations include setting accurate baiting grids, thoroughly baiting every single point despite obstacles, identifying non-target bait consumers, and reporting issues. Examples for aerial operations include working safely around helicopters and making sure the bait bucket is never completely empty after sowing. These projects usually necessitate working long days in difficult conditions (e.g., extreme heat or cold) and living in confined spaces for extended periods, as well as operating in multi-national/cultural contexts.

RECOMMENDATIONS

- Ensure the team has experience on the type of island, the specific island, the methods to be used, and the target species.
- Ensure there is continuity in the management and operations personnel, from planning to post-operation biosecurity.
- Set up a management structure allowing for external expert advice and review.
- Conduct thorough planning identifying all expertise and layers of training needed for each position, as well as clarifying when, where, and how the training will take place. If pertinent, include "working in a multi-cultural environment" as part of the training.
- Make your high standards explicit and clearly indicate why it is crucial to comply.
- Expect that baiting certain microhabitats, such as cliffs, intertidal zones, and human structures will become its own subproject. It is important to get familiar with the island beforehand.
- Develop systems to record who is doing what and when. Use them to identify issues and solutions.
- Report progress constantly to maintain cohesion and motivation among the team. Cross-sector communication is critical. Encourage and listen to feedback.
- Provide or create materials (e.g., field guides) to help identification of potential bait competitors and non-target species in general. Keep in mind, not all people have a biology background.
- Record and communicate recommendations and lessons learned after each project.

CONCLUSION

Island rodent eradications are highly complex operations (PII 2011). Many things need to go right and on time to make them happen, but it only takes one thing to go wrong for the project to fail. Advice and recommendations on all aspects are available in the form of best practice documents. This is a call to take all recommendations seriously and to not underestimate the key role of experienced and trained personnel. These "little things" can influence the outcomes of big projects.

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