CASE STUDY

Determining the success of eradication – feral pigs on Santa Cruz Island, California, USA

The general issue

Managers of all eradication attempts are faced with the problem of knowing whether all individuals of the target population have been removed, and thus when to declare success and stop the expensive management activities.

One approach commonly used when rats are targeted using aerial baiting is simply to use the best techniques, then stop and wait and see whether the offspring of undetected survivors become obvious as the population recovers. This approach is justified when the costs to detect, locate and deal with possible survivors exceeds the costs to wait and try again.

For many invasive species the methods available rarely (or never) kill 100% of the individuals in a single management event. Uncertainty caused by potentially undetected survivors and the absence of 'stop rules' are key problems in managing risk.

The challenge on Santa Cruz Island

The Nature Conservancy (TNC) and the Channel Islands National Park are restoring Santa Cruz Island off the coast of Santa Barbara, California by first removing key invasive animals. The 25,000 hectare island reserve is home to a diverse array of native plants and animals, including 12 endemic species.

A large population of non-native feral pigs was uprooting rare plants, disturbing the soil and helping to distribute weeds, and damaging archaeological sites. The availability of piglets as prey also attracted golden eagles (which are not native to the island) from mainland California that then also threatened the viability of small native animals such as the endemic island fox.

TNC engaged a specialist pest control company, Prohunt Ltd, under a fixed-sum performance-based contract to eradicate the pigs.

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A trap used to catch feral pigs, Santa Cruz Island

The contractor's final payment depended on their success in achieving eradication, so it was in their interest to succeed as efficiently and quickly as possible. TNC's problem was that they needed a fair, transparent and timely method to validate the contractor's claim of success.

TNC consulted Landcare Research because of our international reputation for developing such risk management decision systems.

Our approach

Between March 2005 and May 2006 just over 5000 pigs were removed from the island and the contractor could find no more despite extensive aerial and ground searching. The helicopters used for aerial hunting, the ground hunters and their dogs, and some feral pigs carried GPS devices so that the search patterns and hunting or monitoring intensities could be plotted against the known numbers of pigs remaining in any area, and the home ranges of pigs estimated.

We used a Bayesian modelling framework using these data to answer four questions:

- What was the probability that no pigs remained given none were detected at the end of the hunting programme?
- How much additional monitoring would be needed to increase this probability to some level at which TNC was comfortable with the residual risk of being wrong?
- Where on the island should this additional monitoring be conducted?
- What monitoring method would be most effective for this additional effort?

The outcome

The last pig was killed in May 2006. Subsequent monitoring by Prohunt up to March 2007, and then by TNC has failed to detect any survivors. Thus it appears the eradication operation was successful.

Our analysis suggested success could have been validated, given the lack of detection of any pigs soon after May 2006. It also provided TNC with a spatially explicit prescription of how much extra monitoring was required to achieve their desired level of certainty before completing their contract with Prohunt. Essentially, the level of comfort has to be determined by the managers. In this case a high probability of success was required, determined in part by the high costs of reinstating the control, and in part by the 'political' costs of falsely declaring success.

The approach we developed for the Santa Cruz project has wider applications for eradication projects and some questions in relation to sustained control projects where eradication is not possible (e.g. where immigration is certain, but where managers wish to reduce the pest population to zero and manage the immigration risks).

We have applied modified versions of the process to inform other projects targeting feral pigs in TNC reserves in Hawaii, as well as for stoat control projects in New Zealand.

References

Ramsey, D.S.L.; Parkes, J.; Morrison, S.A (2009). Quantifying eradication success: the removal of feral pigs from Santa Cruz Island, California. Conservation Biology.

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