

GENETIC BIOCONTROL OF INVASIVE RODENTS

Seeking innovations to prevent extinctions on islands



Tuamotu Sandpiper (*Prosobonia parvirostris*)

IUCN Status: **ENDANGERED**

Location: French Polynesia

Photo: Madeleine Pott

Tuamotu Sandpiper (locally known as Titi) This rare bird was driven to the brink of extinction by invasive rodent predation and competition. It now survives thanks to a 2015 rodenticide-based eradication that doubled the Titi's safe habitat on five French Polynesian islands. Could new innovations enable greater numbers of similar island interventions without the challenges posed by traditional toxicants?



Non-native, damaging (invasive) species are the leading cause of extinctions on islands. They threaten our world's island communities, plants, and wildlife.

Rodents have invaded nearly 90 percent of our world's island groups. Invasive species' impact and control efforts are estimated to cost five percent of the world's annual economy.

Yet, there is hope. Five-hundred successful invasive rodent removal projects on islands demonstrate that eradication is one of the most impactful conservation interventions available to prevent extinctions.

Today, rodenticides are the only effective tools for removing or controlling invasive rodents on large islands. Application of such toxicants are limited by social, ethical, ecological, and financial constraints. To match the magnitude of the global island invasive species crisis, we must seek new, innovative tools.

Gene drives may, one day, prove to be such a tool.



WHAT ARE GENE DRIVES?

Gene drives are found in the genomes of many of our world's species and can override typical 50/50 (mendelian) inheritance. The drives can bias inheritance of a particular gene to make it a dominant feature in a population. Scientists have learned how to utilize this by hitching specific genes to a specific drive.

THE GENETIC BIOCONTROL OF INVASIVE RODENTS (GBIRD)

GBIRD is a partnership of geneticists, biologists, social scientists, ethicists, and conservationists from research universities, government agencies, and other not-for-profit organizations. We are cautiously investigating the feasibility and suitability of using gene drives to save island species.

Our step-wise, values-based, scientific, ecological, social, and ethical investigations and risk-assessments aim to answer the following key questions in the coming decade:

Could we create a self-limiting gene-drive modified mouse that biases future generations to be all male (or female) only, thereby achieving eradication by attrition? If so, should we do it? Under what conditions?

COULD WE DO IT?

The technical investigation requires time, expertise, and collaboration. Research has yet to demonstrate whether gene drives could work for conservation applications on islands.

SHOULD WE DO IT?

Other important questions must also be answered. Thus, we are engaging society and investigating the ethical and ecological implications of gene drives for island restoration. Careful risk assessments must proceed contemplation of any field trial.

HOW WILL THIS PROCEED?

This is a deliberate, step-wise process that will only proceed with public alignment, as recommended by the world's leading gene drive researchers from the Australian and US National Academy of Sciences and many others. We will only consider trials when we can answer: Could we? Should we? Under what conditions?

OUR GUIDING PRINCIPLES

- 1 Early, sustained, and consistent engagement with stakeholders / communities
- 2 Proceed cautiously, deliberately, with step-wise methods / measurable outcomes
- 3 Engage early / often with researchers, regulators, communities, and stakeholders
- 4 Maintain uncompromising commitment to biosafety, existing regulations, and protocols as minimum standards
- 5 Use and participate in developing best practices
- 6 Operate only in countries with appropriate regulatory capacity
- 7 Transparency with research, assessments, findings, and conclusions



Desecheo Island, Puerto Rico:

Once host to tens of thousands of nesting seabirds, Desecheo Island was nearly barren after a century of destruction by invasive species. Invasive mammals were finally removed in 2017 using traditional lethal eradication methods (hunting, trapping, and rodenticides). If we could safely implement more humane eradication methods, should we? Under what conditions?

Together, we can determine if, when, and how we might consider proceeding with this technology. Learn more, sign up for updates, or contribute your thoughts at www.geneticbiocontrol.org

