

Tetiara Holistic Ecosystem Workshop Report

UC Gump Station, Moorea, 2-3 November 2018



Summary	2
Key Findings	2
Action Items	3
Managing Coconuts on a post-rat atoll	3
Monitoring the Effects of Rat Removal	3
Tetiara Observatory: Sampling Protocols and Data Management	3
Climate-proofing Polynesian coral reefs through invasive rat removal	3
Participants	4
Sponsors	4

Summary

The workshop considered how to use Tetiaroa to pioneer a systems approach that harnesses scientific understanding to maximize harmonious interactions among nature and society. In particular, it helped plan the **Tetiara Holistic Ecosystem Experiment** (THE Experiment) leveraging the removal of invasive species (notably rats and mosquitoes) as an extraordinary opportunity to apply novel technologies for conservation (e.g., genetic control of invasive species; drones for deployment/surveillance), test hypotheses of ecological function (e.g., nutrient cycling and food web dynamics), and develop innovative decision support tools (e.g., IDEA scenario-based planning platform). The workshop (see [Program](#)) took place over two days at the [UC Gump South Pacific Research Station](#) on Moorea. It took advantage of those who were in French Polynesia on other projects, as well as a few invited participants who had particular experience to share. Not all the expertise needed for the eventual program was in the room; the purpose was rather to advance a plan that the broader community can subsequently refine.

Key Findings

- There was unanimous agreement that eliminating rats should be a key management priority in the Tetiaroa CASUP and that the resulting habitat response (notably restoration of seabird populations) would likely increase the ecological resilience of the atoll's marine (coral reef) as well as its terrestrial ecosystems.
- There was also agreement that the eradication of rats on Tetiaroa would make the atoll an important sanctuary allowing the potential introduction of endangered native land-bird species, such as the tuamotu Sandpiper, Polynesian Ground Dove, and Blue Lorikeet.
- A significant opportunity was identified to make Tetiaroa a pioneer in the use of drones (coupled with machine learning and artificial intelligence) in a full-scale rat eradication. Such a breakthrough would enable other atolls to eliminate invasive rats at dramatically lower cost while increasing the efficacy and environmental safety of these operations
- Participants recognized that integrating research into management actions is a challenge, but the trade-offs (that sometimes occur between science vs conservation outcomes) were relatively low on Tetiaroa where “research through management” (and perhaps ‘management through research’) is a significant opportunity. Given its substantial scientific and technical capacity, Tetiaroa is one of the very few atolls in the world where sustained whole-ecosystem holistic research can conceivably be done.
- Work from Palmyra ([Lafferty et al. 2018](#)) and the Indian Ocean ([Graham et al. 2018](#)) inform hypotheses that could be tested on Tetiaroa to advance general scientific understanding of ecological function - most especially the *coupling of marine-terrestrial ecosystems* through seabird mediated nutrient flows
- The workshop clearly demonstrated the interest of close collaboration between Palmyra and Tetiaroa and their associated scientific and conservation management communities

as two atolls in the emerging 'Pacific Transect Collaborative' (a research and conservation program linking Tahiti and Hawaii). Areas of future collaboration include continued intellectual exchange and development of common tools and procedures in data management and sampling protocols.

- At least one major funding source was identified and a collaborative proposal is being developed by participants

Action Items

The following describe projects and activities emerging from the workshop. These may involve Tetiarioa Society and its partner organizations as well as participants in the workshop, their colleagues and other collaborators.

Managing Coconuts on a post-rat atoll

Observations from Palmyra and elsewhere have shown significant spread of coconut seedlings after rat eradications. Discussions during the conference and afterwards by email have debated whether to remove some or all of the coconut trees on Reiono, or to leave them for some period of time to study seedling recruitment. There were also discussions about best ways to remove coconut trees whether by cutting or poisoning.

Monitoring the Effects of Rat Removal

There was a lot of discussion about what to monitor, and what was learned from Palmyra. Planning for Tetiarioa rat removal needs to consider a broad array of physical and ecological factors for both the terrestrial and marine environments.

Tetiarioa Observatory: Sampling Protocols and Data Management

Protocols for long term study of Tetiarioa ecosystems were identified drawing particularly on experience on Palmyra (Lafferty et al.)

Climate-proofing Polynesian coral reefs through invasive rat removal

Many coral reefs and the ecosystem services they provide could be seriously degraded or even lost entirely within a few generations. An immediate scientific and conservation challenge is the facilitation of reef resilience in the face of climate change, overfishing, nutrient pollution, and many other anthropogenic stressors. Building on discussions at the workshop, we propose a major project to develop methods to efficiently remove invasive rats from South Pacific atolls. Specifically, we envisage a novel rat eradication program and scientific study to immediately advance conservation of coral reefs in French Polynesia. Our international consortium of scientific institutions and conservation organizations would first develop rat eradication strategies and associated research protocols that make use of new drone technology on the atoll of Tetiarioa. Then, subject to local approvals, we would apply the new technology (and a suite of scientific studies) to remove rats from an array of atolls in the Tuamotu Archipelago,

allowing recovery of endangered seabird populations while simultaneously enhancing the resilience of coral reefs.

Participants

Last name	First name	Institution
Bossin	Hervé	Institut Louis Malardé
Burkepile	Deron	UC Santa Barbara
Converse	Sarah	University of Washington
Davies	Neil	UC Berkeley
Doo	Steve	Cal State Univ. Northridge
Gardner	Beth	University of Washington
Griffiths	Richard	Island Conservation
Holmes	Nick	Island Conservation
Lafferty	Kevin	US Geological Survey & UCSB
Meyer	Chris	Smithsonian Institution
Meyer	Jean-Yves	French Polynesia - Research Department
Murphy	Frank	Tetiara Society
Russell	James	University of Auckland
Samaniego	Araceli	University of Auckland
Stoll	Benoit	University of French Polynesia
Teavai Murphy	Hinano	UC Gump / Atitia
Thurber	Becky	Oregon State University
Wegmann	Alex	The Nature Conservancy
Wolf	Coral	Island Conservation
Zubia	Mayalen	University of French Polynesia
Tweedt	Sarah	Yale University

Sponsors

