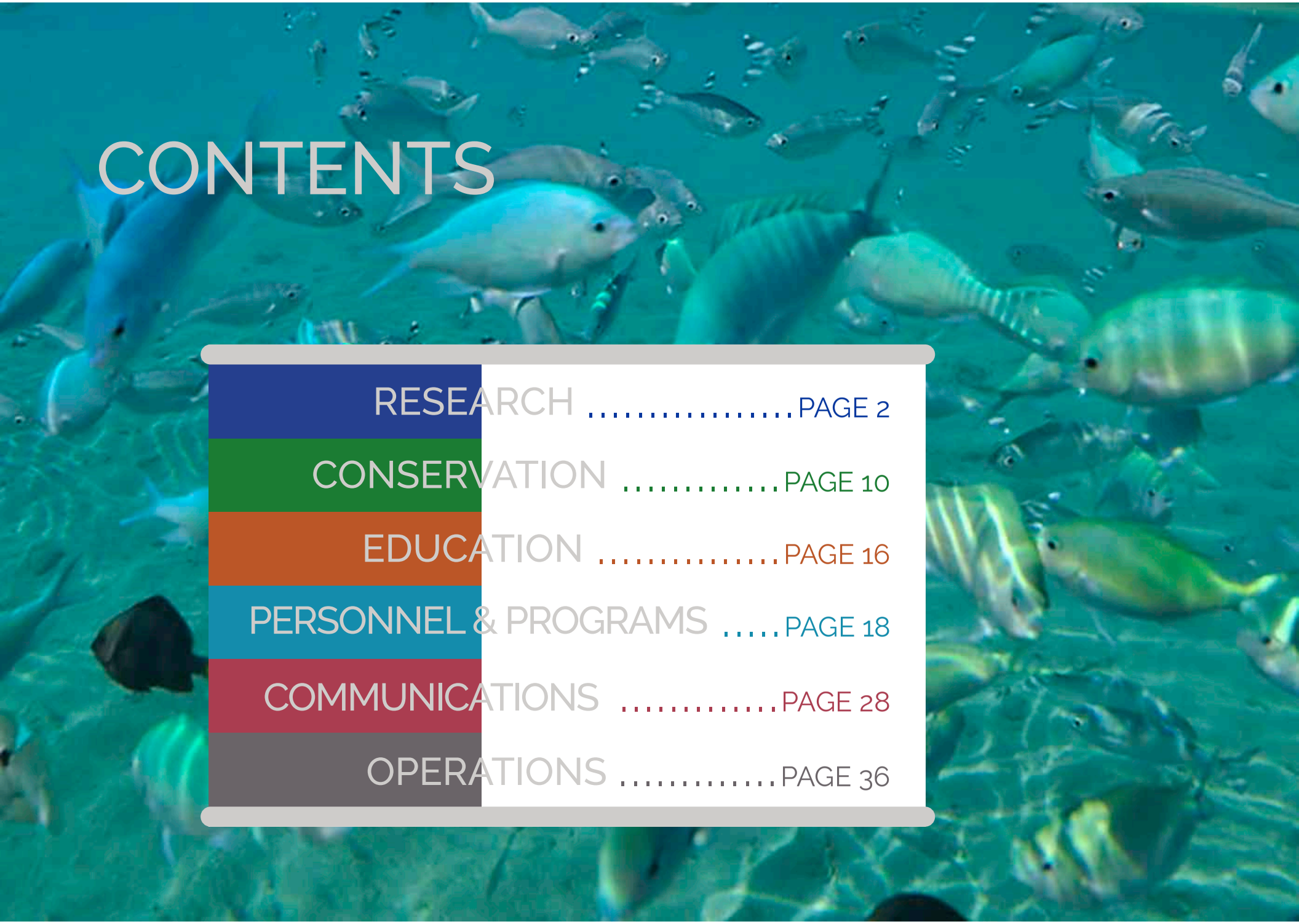
TETIAROA SOCIETY

TETIAROA SOCIETY FP
2019 ANNUAL REPORT



CONTENTS

RESEARCH 2019

An outstanding year for scientific research on Tetiaroa.

"The following are short summaries of each science program for 2019.

Once again Tetiaroa Society hosted and facilitated another outstanding array of research programs. Some of them were ongoing from previous years, some new, and some that will hopefully carry on for years to come.

AeLIMIN+

Study of the integrated control of the mosquito vector *Aedes polynesiensis* on motu Onetahi, Atoll of Tetiaroa

“The AeLIMIN+ project aims at suppressing an isolated *Ae. polynesiensis* population on motu Onetahi.

Project Dates: 29 Sep 2014 to June 2021

Principal Investigators: Hervé BOSSIN

Other Members: Michel Cheong Sang | Jérôme Marie | Hereiti Petit | Melanie POUSSET | Benoit Stoll | Margaux Jourdainne | Jean Yves Meyer | Xénia JOST | Constance METZGER | Hutia Barff | Denis PINSON | Lorenzo HOGA | Brian JOHNSON | Victor LISEMBART | Ambre Ly | Amélie BROCHERIEUX | Virginie LASKOWSKI

Affiliations: Institut Louis Malardé | University of French Polynesia | Tetiaroa Society | Archipel Production | Rutgers University

Progress:

Ae. polynesiensis population suppressed to near elimination on two motu (Onetahi, Honuea), preventative releases and mosquito monitoring (incl. non target *Ae. aegypti*) continues.

The AeLIMIN+ project aims at suppressing an isolated *Ae. polynesiensis* population on motu Onetahi using an integrated mosquito control approach combining the reduction of mosquito larval containers (The Brando hotel), the deployment of novel *Aedes* traps and weekly releases of *Wolbachia*-based incompatible male mosquitoes.

CULI-KO

Innovative control against the bloodsucking midge *Culicoides belkini* in the Pacific Island context

Progress:

Field mission with international team of experts conducted in April 2019.

- *Culicoides* (biting midges) and other arthropods surveyed on several motus of Tetiaroa, including Rimatu'u, Tiaraunu and Oroatera.
- Sorting and identification of sampled specimens underway. Already one (non-*Culicioides*) midge species (*Nilobezzia, Ceratopogonidae*) collected on Tetiaroa potentially new to science, as suggested by DNA analysis. Now in search of MSc student to begin pilot study of midge control using various approaches.

C. belkini © ILM – Y.SECHAN

Project Dates:30 Nov 2018 to 26 Nov 2021

Principal Investigator: Hervé BOSSIN

Other Members: Jérôme Marie | Glenn BELLIS | Lee COHNSTAEDT

Affiliations: Institut Louis Malardé | Charles Darwin University | USDA-ARS

Sponsors: Agence française de développement | DFC/DBO/EF/2018/0459 | $33,777.00

No-See-Ums are small hematophagous midges whose bites cause horrible itching. Small, almost insignificant, it is their number and their aggressiveness which gives them a considerable capacity of nuisance. They are feared by tourists and isalnd communities to the point of preventing the development of human activities in the most infested islands of the Pacific. Today, control of the bloodsucking midge *Culicoides belkini* relies mainly on chemical treatments using adulticidal spraying and larviciding in natural, swampy habitats where this midge breeds. The situation calls for the development of more effective control tools with the objective of a sustainable control of bloodsucking midges in wetlands. This research project will pool the combined expertise of ILM, a Polynesian research institute involved in Public Health, Tetiaroa Society model of sustainable development in the Pacific, and experts in their field representing two regional partners of scale (USA, and Australia). This project also seeks to mobilize existing expertise in Pacific Island countries within the range of *C. belkini* (e.g. Fiji, Samoa, Cook Islands). The control strategy once validated can be applied to the benefit of the populations living in the Pacific islands infested by *C. belkini.*

Into Uncharted Waters: understanding and predicting water movement and fluxes over coral reef atolls of the future

"This project aims to fill a critical need for understanding the hydrodynamics around Tetiaroa Atoll, an emerging convening point for coral reef science.

Project Dates: 01 Jul 2016 to 30 Jun 2018

Principal Investigator: James Hench

Other Members: Walter Torres | Melissa Duvall | Patrick Combe | Johanna Rosman | Pacifica Takata-Glushkoff | David Marshall | Nicholas Jeffress

Affiliations: Duke University | UNC | Bowdoin | University of North Carolina

Sponsor: Tetiaroa Society | $54,875.00

It is well recognized that water motion is important for the functioning of coral reefs. Circulation affects larval retention, export, and connectivity between reefs. Turbulent mixing and bed shear stresses affect the ability of larvae to settle on surfaces, as well as the ability of coral polyps and filter feeders to capture particles, and nutrient uptake rates. Water motion is also critical to understanding gas exchange, carbon fluxes and hence reef metabolism and calcification rates. Thus understanding of current and future reef states, including under ocean acidification and sea level rise, is predicated on knowledge of the hydrodynamic forcing and transport.

This project aims to fill a critical need for understanding the hydrodynamics around Tetiaroa Atoll, an emerging convening point for coral reef science. From a hydrodynamic standpoint Tetiaroa Atoll has received little attention to date, and so this proposal outlines a set of integrated field and modeling studies to begin filling this knowledge gap.

Funding: Sponsor: BNP Paribas

Progress:
Finished data collection. Working now on modeling hydrodynamics.

Marine Flora Diversity of Tetiaroa Atoll

Project Dates: 08 May 2017 to 12 May 2017

Principal Investigators: Mayalen Zubia | Olivier Thomas | Aschwin Engelen | Christophe Vieira

Affiliations: Université de la Polynésie française | National University of Ireland | CCMAR | Ghent University

Sponsors: University of French Polynesia $7,500.00 | Delegation de la Recherche $26,500.00

The objective of this first field mission is to launch a preliminary marine flora inventory of Tetiaroa. To date, some specimens have been collected but no studies have described the algal community of this atoll. To do so, we will implement a primary sampling in the lagoon of Tetiaroa in terms of the habitat typology. This preliminary inventory would help us achieve a former assessment of the macrophytes (macroalgae and seagrasses) and benthic cyanobacteria specific diversity dwelling on this island. The species identification will be performed through morphological and molecular analysis (for certain groups only).

Moreover, we will take advantage of this fieldtrip to work on the metabolome and microbiome of the Caulerpa genus. Our objective is to develop an identity card of the Caulerpa taxa using three complementary approaches:

1. molecular taxonomy and phylogeography to identify the clades (Caulerpa genus comprises a species complex),
2. chemotaxonomy with a metabolomic approach to determine the chemical signature of each clade, and
3. next-generation sequencing to assess the composition of microbial communities associated with the seaweed. It is therefore important to integrate microbiome components to studies on macroalgal proliferations in the Indo-Pacific reefs.

The capacity of species to proliferate depends on their adaptive capacity to cope with changing environmental conditions and currently it is indicated that their associated microbiomes could provide this adaptiveness. Until now, the proliferation capacity of macroalgae in French Polynesia has only been evaluated based on morphological, physiological and chemical characteristics of species. As associated microbiomes seem to explain proliferation success of some macroalgae, there is a need to integrate this aspect as well.

“The capacity of species to proliferate depends on their adaptive capacity to cope with changing environmental conditions and currently it is indicated that their associated microbiomes cold provide this adaptiveness.

Progress:
Sampling completed, report in development

Archaeological Research on Tetiaroa

"Tetiaroa occupies a very special place in Tahitian culture and history. TS cointinues the inventory of archaeological sites on the atoll...

Project Dates: 04 Nov 2019 to 22 Nov 2019
Principal Investigators: Guillaume Molle
Other Members: Benoit Stoll
Affiliations: Australian National University | University of French Polynesia

Completion of Phase 1 of the Archaeological project:

Survey and mapping of archaeological structures and Williams settlement

- complete the survey of the atoll
- finish the mapping of the large marae sites on Horoatera
- start the clearing and mapping of the large marae ari'i on Rimatu'u
- continue the work on the Williams plantation
- complete the GPS recording/mapping of all the sites

Progress:
Mapping completed, GPS work underway

SWAC Evaluation

Project Dates: 01 Feb 2019 to 01 Feb 2021
Principal Investigators: Franck LUCAS
Other Members: Pascal Ortega | Driss Stitou
Affiliations: University of French Polynesia | University of Perpignan

> "SWAC is particularly suited for all tropical areas where deep sea water is available near the coast, but could also be a promising solution for any location where air conditioning demand is high.

Progress:
Modeling complete, and working on instrumentation of Tetiaroa SWAC

Sea Water Air Conditioning (SWAC) technology is a building air conditioning process using cold deep sea water that seems to have extremely interesting energy performances. It can be a real solution, competing with conventional air conditioning technologies based on vapor compression cycles but also with other cooling processes based on solar energy. SWAC is particularly well suited for all tropical area where deep sea water is available near the coast like French Polynesia. But it could also be a promising solution for any location where air conditioning demand is high. Indeed, even when deep sea water is not available close to coast line, SWAC can be used as a low temperature thermal source for water cooled compression chiller.

There is no scientific study based on full scale experiments qualifying the energy performance of the SWAC solution and to compare it with other air conditioning technologies. The University of French Polynesia proposed in 2017 an evaluation of the SWAC performance, based on dynamic simulations. This study shows that SWAC can be 17 time more energy efficient than conventional air conditioning systems using vapor compression cycle. This study is a theoretical analysis and rely on simplifiying assumptions that must be validated.

Consequently, the scientific objectives of this project are to collect experimental data from the SWAC facility of the hotel "The Brando" in Tetiaroa, in order to:

1. Validate the numerical simulation models of a SWAC facility established by the UPF by experimental validation. Using this model, it will be possible to estimate the benefit of the SWAC for different locations. It will also allow to study energy performances of the SWAC as a function of the depth of sea water intake.
2. Analyze and evaluate the real performance of an operating installation over a long period (at least 1 year).
3. Compare the performance of SWAC with other building air conditioning technologies using validated numerical models and case study comparisons.
4. Identify possible optimizations regarding the design and the component sizing or the operation of the installation. One major issue is how deep
5. Study the generalization of SWAC in French Polynesia but also in all other location where air conditioning is needed and where sea water is available.
6. Promote SWAC energy performance and the French Polynesian expertise on this technology to scientific community.

Reef Stability Exploratory Pilot

Project Dates: 28 Jun 2019 to 01 Jul 2019
Principal Investigators: Craig Nelson
Affiliations: University of Hawaii

This project will conduct exploratory work to determine the tractability of conducting a whole ecosystem experiment and monitoring program to understand how the microbial ecology of reefs will shift under global stressors

Progress:
Field assessment completed.

Plant Recruitment following Rat Eradication

Project Dates: 08 Aug 2018 to 13 Aug 2018
Principal Investigators: Jean-Yves Meyer
Other Members: Paul Defillion
Affiliations: Research Department of French Polynesia | Université de la Polynésie française

Follow up on plant inventory on Reiono after the rat eradication

Progress:
Completed fieldwork.

IDEA Tetiaroa Island Digital Ecosystem Avatar

> “...our IDEA will empower people worldwide to engage in the health of their local communities, strengthening the resilience of their ecosystems and enhancing the well-being of all their citizens.

Progress:
Continued GIS work and analysis of LiDAR data.

Project Dates: 01 Jan 2014 to 01 Nov 2020

Principal Investigators: Neil Davies | Matthias Troyer | Sally Holbrook | Serge Planes | Russell Schmitt

Other Members: John Deck | Christopher Meyer | Hannah Stewart | Neo Martinez | Jennifer Dunne | Anthony Dell | Cedric Puleston | Gustav Paulay | Hongseok Ko | Tao Guo | Alessandro Capra | Armin Gruen | Alexander Kusenko | Lada Kirich | Hervé BOSSIN | Ary Hoffmann | Jeremie Gilles | Nathan Moses-Gonzales | Yves Dumont | Guy Hendrickx | Li Zhe | Benoit Stoll | Manaarii Longine | Joao Boavida | Chris Muglia | Laurina Phillip | Daniel Kammen

Affiliations: University of California, Berkeley | Smithsonian Institution | ETH Zurich | University of California, Santa Barbara | Fisheries and Oceans Canada | CRIOBE - Centre de Recherche Insulaire et Observatoire de l'Environnement | University of Arizona | Santa Fe Institute | National Great Rivers Research and Education Center | University of California, Davis | University of Florida | Università degli Studi di Modena e Reggio Emilia | University of California, Los Angeles | Institut Louis Malardé | University of Melbourne | International Atomic Energy Agency | M3 Consulting Group | CIRAD | AVIA-GIS | Tian Jin University | University of French Polynesia | Seasteading Institute

Our key goal is to predict how biodiversity, ecosystem services, and society on the islands will co-evolve over the next several decades, depending upon what actions are taken. This goal is critical to many, if not most places on Earth, but thanks to its relatively small size and extraordinarily well-described biota, Tetiaroa provides a wonderfully tractable model to show such a goal is attainable. Specifically, we will ask: What is the physical, biological, and social state of the island system today? How did it get to this point?

What is its future under alternative scenarios of environmental change and human activity?

We will address these questions by building a sustainability simulator: a place-based data science infrastructure and computational platform for scenario-based planning. It will will inform Tetiaroa's “Conservation and Sustainable Use Plan” (CASUP), helping to model the complex links and feedback loops between the environment, biodiversity, and human activities across a coupled marine-terrestrial landscape. The avatar technology will be broadly applicable to islands in general. For researchers, it will highlight data needs and help generate new hypotheses. For communities, it will illuminate the consequences of different management actions under alternate environmental scenarios. Ultimately, we seek to emulate at the ecosystem level P4 Medicine - the Predictive, Preventive, Personalized, and Participatory approach to human health that has revolutionized the biomedical field. In a similar way, our IDEA will empower people worldwide to engage in the health of their local communities, strengthening the resilience of their ecosystems and enhancing the well-being of all their citizens.

CONSERVATION

“This relevant achievement will inform future eradication programs, and produce important data for modeling ecological change on tropical islands.

Following the Conservation and Sustainable Use Plan, Tetiaroa Society hosted and supported scientific programs that help us to protect and conserve the natural and cultural heritage of Tetiaroa. This year Tetiaroa Society started the Tetiaroa Atoll Restoration Program, which draws on several other research and conservation programs to carry out a long term assessment of the restoration of the atoll to natural conditions.

TARP Tetiaroa Atoll Restoration Project

Project Dates: 1 January 2019 for multiple years

Principal Investigators: Neil Davies, James Russell, Frank Murphy

Other Members: Jean Yves Meyer | Thomas Ghestemme | Cecile Gaspar | Richard Griffiths | Hervé Bossin | Yadvinder Malhi | Maria Praetzellis | Deron Burkepile | Hillary Young | Rebecca Vega Thurber | Beth Gardner | Chris Meyer | Benoit Stoll

Affiliations: University of Auckland | University of California Berkeley | Island Conservation | University of French Polynesia | CRIOBE - Centre de Recherche Insulaire et Observatoire de l'Environnement | Institut Louis Malardé | Te Mana o te Moana | SOP Manu | University of Oxford | California Digital Library /Berkeley Institute for Data Science | University of California Santa Barbara | Oregon State University | University of Washington | Smithsonian Institution

The goal of the Tetiaroa Atoll Restoration Project (TARP) is to remove invasive species and restore native species and terrestrial and marine habitats to natural conditions. It aims to restore Tetiaroa's natural ecosystems from motu to reef, preserving the native biota, creating a refuge for endangered species, and allowing the coral reef to thrive and be resilient for the future. The initial focus is eradication of two species of rats and intense monitoring before and after the eradication in order to record the ecological response. Studies will cover plants, birds, terrestrial invertebrates, green sea turtles, fish, coral, algae, microbes, and water chemistry (soils, lagoon, lake, and groundwater). This plan will make the TARP the most intensively studied restoration on any tropical island, and the first to fully investigate the effects of rat removal on coral reefs. The restoration of seabird and green sea turtle nesting sites should result a significant rise in nesting success and population growth. A long-term goal of the TARP is to develop Tetiaroa as a sanctuary for rare and endangered atoll species from across French Polynesia.

"A long-term goal of the TARP is to develop Tetiaroa as a sanctuary for rare and endangered atoll species from across French Polynesia.

Progress:
fieldwork and reconnaissance completed.

Managing Invasive Rats at Tetiaroa

"This relevant achievement will inform future eradication programs, and produce important data for modeling ecological change on tropical islands.

Project Dates: 27 Nov 2017 to 28 Feb 2021

Principal Investigators: Araceli Samaniego | James Russell | Richard Griffiths | David Ringler

Other Members: Markus Gronwald | Thomas Bodey | Zachary Carter | Baudouin des Monstiers

Affiliations: University of Auckland | Island Conservation | Tetiaroa Society

Eradications of invasive rodents from tropical islands have a lower success rate compared to temperate islands. Understanding why is essential to improve our methods and hence increase the chance of eradication success. Tetiaroa is a great site to conduct research as there are two rodent invasive species present, several islands with different habitats, all three main groups of land crabs, low human disturbance, and the Ecostation.

The main questions are:

1) Do all rodents eat bait at the same rate regardless their age, reproductive condition and habitat?

2) Do reproductive females behave or eat differently than non-reproductive individuals?

3) Where do rats nest when the ground is dominated by land crabs?

4) Can we deter crabs from eating bait? Results will inform the eradication plan for the whole Tetiaroa Atoll, as well as rodent eradication and biosecurity strategies for larger tropical islands.

Progress:
Successful field season, planning for 2020/21 eradications.

Baseline Seabird Study on Tetiaroa

“To assess the success of our efforts and inform conservation plans, a baseline for the demography and health of Tetiaroa’s seabirds is timely.

Project Dates: 21 Oct 2018 to 31 Dec 2020

Principal Investigators: Beth Gardner | Sarah Converse | Julia Parrish

Other Members: Olivia Sanderfoot | Viviana Marcy | P. Dee Boersma | Amelia DuVall | Sarah Linch | Sierra Gillman | Trent Roussin

Affiliations: University of Washington | Eckerd College

Sponsors: Private donation to University of Washington | NA | $75,000.00

Seabirds are an ecological grouping of avian species that are highly threatened worldwide (Sydeman et al. 2012) due to a multitude of issues, including fisheries bycatch, rising sea levels, marine pollution, invasive species, and off-shore wind energy development. Plastic pollution is increasingly viewed as a risk to marine life, including seabirds (Ryan 1987). The goal of our project is to update the baseline information on the demography and health of seabirds on Tetiaroa. The Tetiaroa Society is actively engaged in rodent eradication as one means to improve seabird habitat. To assess the success of these efforts and inform conservation plans, a baseline for the demography and health of Tetiaroa’s seabirds is timely. We propose to build on and extend the work of Russell and Faulquier (2009) and Faulquier (2013) to establish comprehensive baseline information, including population estimates and breeding status of seabird species on each of Tetiaroa’s motu

Funding: Private donation to University of Washington.

Progress:
Successful field season with audio date collected and bird banding program begun

Kaveu Monitoring on Tetiaroa Atoll

Project Dates: 14 Sep 2018 to 31 May 2019
Principal Investigators: Te Mana O Te Moana Tetiaroa| Cécile Gaspar | Quentin Genet
Affiliations: Te Mana o Te Moana

A study in 2017 by the NGO Te mana o te moana was the first estimation of the population of coconut crab (Birgus latro), named kaveu in Tahitian, on Tetiaroa atoll.

During this second study, we will go every month 3 motu in order to document and better understand the reproductive cycle of kaveu in this Pacific area (not documented at the moment). That study is based on the kaveu density of kaveu on this motu and furthermore it is the one motu on which rat eradication will occur in the next year. This will enable us to monitor juvenile density.

For larger kaveu we may use another, more permanent marking process (cold marking) in order to better understand their movement patterns.

Monitor the beaches at night to try and observe larvae climbing back inshore and also the movement of adult crabs

Monitor the crab molting periods using non-invasive methods like motion activated cameras as well as reproduction phase -mating

"First phase data are from one of the motu on which rat eradication will occur this coming year, enabling us to gauge the effect of the program on juvenile density.

Progress:
Surveys continued though 2019

Green Sea Turtle Nesting on Tetiaroa Atoll

"The turtle program is a long-term monitoring project which shows pluriannual trends over a 10 year period, and its outcome will be used as a model for monitoring programs in other South Pacific countries.

Progress:
Monitoring of 2019-20 season underway.

Project Dates: 7 September 2018 to 31 May 2019;
September 2019 to May 2020

Principal Investigators: Cécile Gaspar | Margaux Touron | Quentin Genet

Other Members: Lucie Gabrie | Julien DEROO | Aude RAYNAL | Virginie POLY | Jonathan Monsinjon | Malik DRIVER | Didier BREMONT | Jaël Galichet | Ursula SIEBERT

Affiliations: Te Mana o Te Moana

The project was launched in 2004 by the NGO Te Mana o Te Moana with the support of the Marlon Brando family and has shown that Tetiaroa is one of the few protected green sea turtle nesting sites in the central South Pacific. Green sea turtle are classified under Endangered category on the IUCN list and under Category B of the French Polynesia Environmental code, however poaching for meat is one of the major local threats

A -Research on adult population. The research monitoring needs to take a new step including higher technology to follow the migration route by satellite tracking of post-nesting female and their genetic structure, but also a in-water monitoring of the male and female population around the coral reef slope. In addition Identification of each nester by photo identification in addition to flipper tagging is key to better understand their inter-annual nesting frequency.

B -Research on eggs and hatchling survival rate The project aims to use the high end new localization of nest program nesting safe that have been developed by well-known researchers but not tested on a long term survey yet. It will include key data of incubation temperature of the nests that are crucial in the sex ration determination of the hatchlings to be born in a global context of climate change (if incubation is higher that 28,5°C the nest produces 100% females)

Hatchling success and protection of babies is the second key component of this program in order to help increase the survival rate. This involves each night survey and excavation of each nest after hatchling is done. Deformed hatchlings, weak, dehydrated or injured babies will be transferred to the Moorea Sea turtle clinic which was created in 2004, and is managed by the Te Mana o Te Moana biologist and veterinarian.

The project intends to have team of biologist for 4 rounds every night on 3 of the main nesting motu (Tiauraunu, Horoatera and Onetahi) and this covers an beach line of 10 kilometer.

The turtle program is a long term monitoring in order to show pluriannual trends over a 10 year period and its outcome will be used for other South Pacific countries monitoring program.

EDUCATION

“...in all, 256 students and 58 teachers visited the island to learn about its natural and cultural history and sustainable development.

This was an interesting year for Tetiaroa Society's Education Program. The program hosted 13 field courses from Tahiti and Moorea, and one group of teachers. In all 256 students and 58 teachers/leaders visited the island to learn about its natural and cultural heritage and sustainable development. Most groups came for 4 full days which added up to 1300 visitor/days. This was more than in all of 2018 and showed the incredible interest that was generated in that inaugural year. During this time Tetiaroa Society also hosted a field course from Lakeside High School in Seattle that came to study Field Biology, French, and Tahitian Culture.

This year we also forged close ties to the Commune of Arue in Tahiti by participating in their “twin city” program with a community in New Caledonia. Our education team went with them and was able to promote cultural and conservation-based education program with schools in New Caledonia.

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Students study atoll natural history and Tahitian culture

"Tetiaroa Society hosted a field course for students from Lakeside School in Seattle. They studied Field Biology, French, and Tahitian Culture.

Tetiaroa Society hosted its first US high school group this year from Lakeside School in Seattle. The students spent two weeks on Moorea living with local families and then one week on Tetiaroa studying atoll natural history and Tahitian culture. The group also put in a day of work, removing grid material from Motu Reiono after the rat eradication project, and had a chance to do a Green Tour of The Brando Resort.

PERSONNEL & PROGRAMS

"We are only as good as our people, and we have a fabulous team!

Executive Director

Frank Murphy continued as Executive Director of TSFP. His duties include: overseeing the Guide Program, the Ranger Program, all administrative issues, human resources, accounting and communications, plus developing and managing CASUP programs. He also interfaces with guests of The Brando, does lectures, and occasionally guides tours. He works on the island and also out of a home office on Moorea. This year his work also included travelling to represent Tetiaroa Society for events in the US and New Zealand.

	Total	Av / month
Days worked	253	21
On island	122	11
Off island	131	10

Ranger Program

"TS Rangers are multi-taskers: they manage and maintain the Ecostation, host users, assist scientists in the lab and in the field, drive the boats, assist the Education Coordinator, maintain the boats, do trail work, and do administrative work... Whew!

The Ranger Program is the core of what Tetiaroa Society does. In agreement with SA Frangipani and Tahiti Beachcomber, Tetiaroa Society acts as the steward of Tetiaroa. As such, Tetiaroa Society is in charge of managing the atoll, and working with all partners, including the local community, to preserve Tetiaroa's natural and cultural heritage.

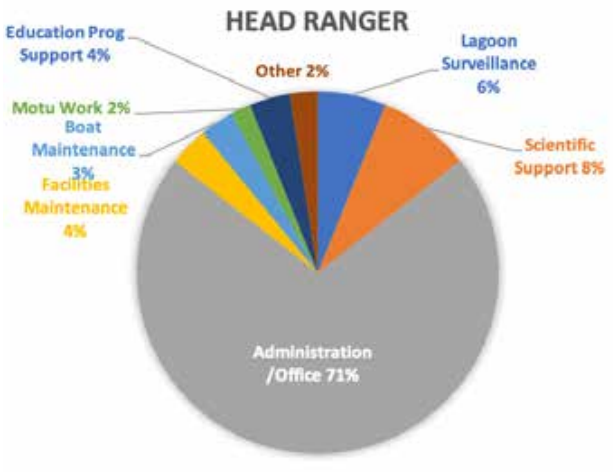
The primary job then for the Rangers is to maintain a security presence on the island at all times, and be the point of contact for fishermen or day tourists coming from Tahiti and Moorea. Along with this work they continued to manage and maintain the Ecostation, facilitate research, conservation and education activities, maintain the boats, do trail work, and do administrative work.

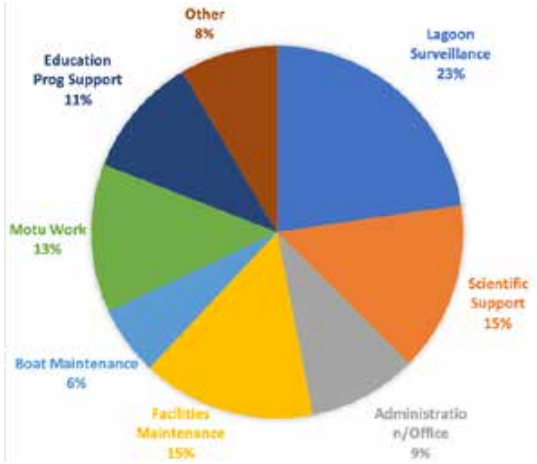
Ranger Program : The team and the work

"TS Rangers are multi-taskers: they manage and maintain the Ecostation, host users, assist scientists in the lab and in the field, drive the boats, assist the Education Coordinator, maintain the boats, do trail work, and do administrative work... Whew!

The Ranger team evolved in 2019 with a new position and a couple of new faces being added. Moana Le Rohellec moved on after working for four years on Tetiaroa. He was replaced as Head Ranger by Teva Beguet in May 2019. Thanks to support from Brando Enterprises, Tetiaroa Society was able to create a much needed and highly valued second Ranger position and hired Tapuarii Aa in July. With the two Rangers and the Head Ranger, Tetiaroa Society was able to have two Rangers on duty at all times to make sure that a security presence is there at all times, and still be able to cover the other tasks assigned to this team.

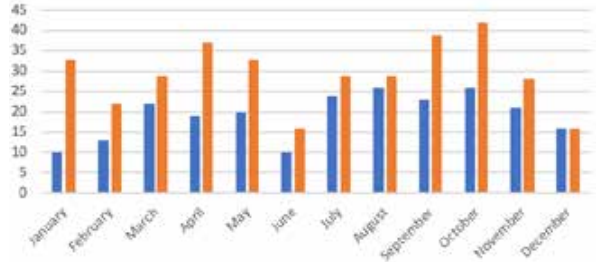
The following diagrams show percentage work time for Rangers and Head Ranger for all tasks.



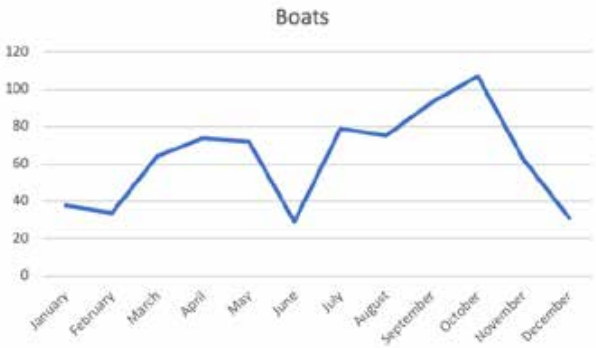


Ranger Program : Charter Boat Monitoring

Private Charter Boat Visiting Tetiaroa in 2019
Lagoon and motu surveillance was logged carefully in 2019, especially following the increase in private charter boat visits to the atoll.



The following two charts show the number of boats visiting Tetiaroa every month and the number of guests visiting the atoll from the private charters. The busiest months are those with good weather and within those months weekends generally have the most arrivals.



Ranger Program : Lagoon surveillance

The Rangers are also surveying the atoll to watch for fishermen coming into the lagoon and anyone who goes on land. There were 29 cases this year of fishermen observed by the Rangers inside the lagoon. Several of these were inside the no-take zone and were told that they could not fish there. Any boat that was seen to be fishing illegally was photographed and the photos were sent to the Gendarmes of Arue.

There were also instances of boats spending the night in the lagoon, which usually means they are trying to take coconut crabs or turtles. In these cases Rangers visited them before dusk and spent the night on beaches adjacent to the boats to make sure they knew we were watching.

Ranger Program : Budget & Beach Signs

Program Budget

The cost of the Ranger Program for 2019 was 12,861,803 CFP (about $120,000 USD), which include salaries, housing and food. These costs were covered by a combination of the donations by Frangipani, Brando Enterprises, charter boat donations, and the Conservation Fee from The Brando.

Thanks to support from Brando Enterprises Tetiaroa Society created new signs for the beaches.
The signs were of two types:

- Signs addressing general access to the motu, which are to be placed where ever there is easy access to a motu.
- Signs for Tahuna Rahi (Bird Island) that provide both information and rules for approach.

Following are examples of each in French and Tahitian language.

Guide Program

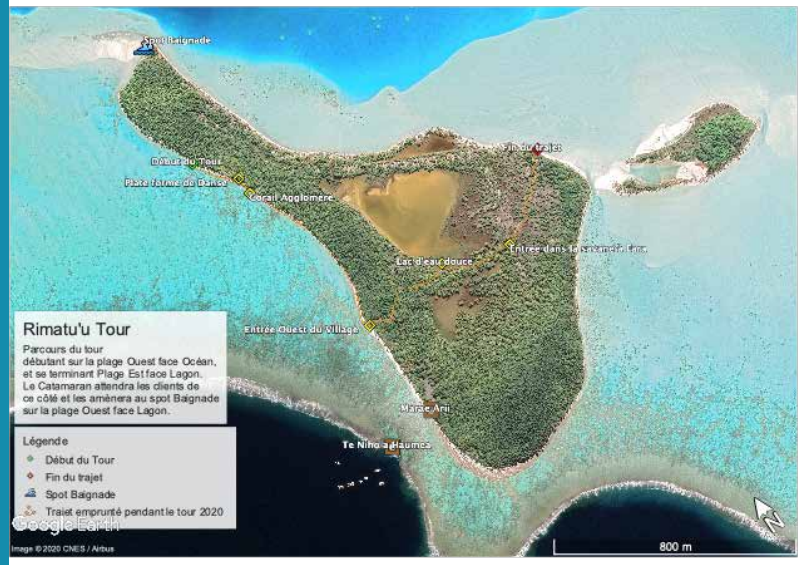
“The group worked wonderfully together and provided world-class tours for the Brando Resort.

The Guide Program had some turnover this year. In January we hired two new guides, Herehia Sanford and Tapuarii Aa to replace Hawaiki Mahiti and Teva Beguet (Teva came back as Head Ranger in March). Then in April, our Head Guide Aeata Richerd went on maternity leave, and Tihoni Maire took over as Head Guide. In July, our steadfast contract guide Thierry Sommers came back to replace Tapu who moved to a Ranger position. Thierry stayed on through whale season and then was replaced by a new hire, Mareva Barbeau, in November. Once again, the group worked wonderfully together, and provided world class tours for The Brando Resort.

Guide Program : Tour numbers

"The number of guests was relatively unchanged, but the guests took more tours than previous years.

The tour numbers for The Brando Resort went up again this year with small increases in tours, Guests, and hours. TS also created a new walking tour of Motu Rimatuu.



Guide Program : Activities

"The guides kept busy creating activities for the Lagoon School, and preparing presentations for the hotel guests.

The Tetiaroa Society Guides kept busy in the off time between tours enhancing and creating new presentations for resort guests. They also designed education games for the young hotel guests that come to Lagoon School.

Atoll Clean-up Day

"The guides and rangers joined The Brando staff in the atoll clean-up programs.

Tetiaroa Society regularly invites The Brando, TBSA, and Te Mana o te Moana staff to join in beach clean-up trips on the motu. These are always enjoyable events where comradery and conservation go hand in hand.

Results:
Many, many bags of trash were collected.

RAISING AWARENESS

Live & Digital Events

This year Tetiaroa Society's message began to go global.

With our partners - The Brando Resort, The Brando Trust, and the community of Tahiti and Moorea - Tetiaroa Society is developing a working model for sustainable tourism and management of island/ocean systems.

This year, recognition came in the form of awards and designations by world renown organizations. We also took part in international conferences concerning the oceans, and had the chance, with The Brando Resort, to share what is happening on Tetiaroa with Pacific Island leaders.

Eco-organisation of the year award

"This recognition by EarthX 2019 is greatly appreciated and inspires us to redouble our efforts - R.B.

In April, Tetiaroa Society and The Brando jointly were given the Eco-Organization of the Year award at the multi-day EarthX event in Dallas. Tetiaroa Society and The Brando was represented there by Cecile Gaspar, Rebecca Brando, and Frank Murphy. TS had the chance to take part in symposia and workshops, give presentations about our work, and network with an amazingly diverse array of activists, corporate representatives, philanthropists, scientists, and artists. On Earth Day the presentation of the award was made at the EarthX Global Gala.

United Nations World Ocean Day June 8

"We are the ocean, the ocean is us. - H.M.

Tetiaroa Society Cultural Director and Board Member, Hinano Murphy, was invited to present a Polynesian legend at the United Nations World Oceans Day symposium at the United Nations General Assembly room in New York on June 8th, 2019. The theme for the day was Gender and Oceans and Hinano presented the creation myth of Ru and Hina, brother and sister that created the oceans and islands. Hinano's presentation was the first of the day, and Tetiaroa Society Board Member Emeritus Sylvia Earle gave the plenary speech at the end of the day.

There were several other events surrounding this symposium that also provided valuable networking for Tetiaroa Society.

TUIA 250 October 6 & 7

"This conference was an amazing opportunity for Tetiaroa Society to be embedded in the Pacific-wide Polynesian cultural scene...

The TUIA 250 was a 2-month long commemoration of the 250 year anniversary of the arrival of Captain Cook and the Tahitian navigator Tupaia, and their interactions with the native Maori.

For the first major event in Gisborne, Hinano and Frank Murphy were invited to attend a two-day conference called Te Paepae o Tangaroa where Pacific cultural and environmental experts had honest conversations about the challenges facing the Pacific Ocean. As part of this Hinano gave a presentation on "Polynesian Traditional Knowledge and the Ocean." This conference and the events surrounding it was an amazing opportunity for Tetiaroa Society to be embedded in the Pacific-wide Polynesian cultural scene and many great connections were made for future collaborations.

Hope Spot Designation

"We need to do everything in our power to protect and restore places like Tetiaroa Atoll as if our lives depend on it... S.E.

In April 2019, Tetiaroa was chosen by the organization Mission Blue as a Hope Spot, one of selected areas across the globe that have been given this designation because of conservation initiatives. In this case, the Hope Spot committee recognized Tetiaroa Society's goal of protection of the island in partnership with The Brando Resort, The Brando Trust, the local community, and organizations like Te Mana o te Moana.

Dr. Sylvia Earle, Founder of Mission Blue commented, "We need to do everything in our power to protect and restore places like Tetiaroa Atoll as if our lives depend on it – because they do. The time is now to do what we can to continue to conserve this special place – hope for the world's atolls and reefs."

Pacific Island Parliament visits Tetiaroa

“...discussions focused on ocean and island resilience...

The Pacific Island Parliament Group held their bi-annual meeting in Tahiti on September 10-11, bringing together the Speakers of Parliament from 16 different countries. The theme for discussions was the “Blue Economy” focusing on ocean and island resilience and sustainable fisheries. The conference was also a time to share information on programs to reduce carbon emissions and create marine protected areas.
Parliamentary leaders from American Samoa, Cook Islands, Fiji, Easter Island, Hawaii, New Zealand, Niue, Palau Samoa, Tokelau, Vanuatu, and Wallis and Futuna, were joined by the French Polynesia President of the Assembly, Gaston Tong Song, the Mayor of Arue, Philippe Schyle, and the French Polynesia senator Maina Sage.

Ambassadors from TS in Noumea

“Tetiaroa Society partners, Institute Malardé and Te Mana o Te Moana, were on hand to talk about their work on Tetiaroa.

In October, the mayor of Arue invited Tetiaroa Society to participate with schools and municipal officials in a festival that celebrated the relationship between Arue and its “twin” city of Mont-Dore in New Caledonia.
Two representatives of TS, Hinano Murphy and Tihoni Maire, travelled with the Arue delegation to Mont-Dore and shared information about Tetiaroa Society’s programs with the participants which included schools and government representatives from Mont-Dore and also the town of Yogyakarta, Indonesia.

Monthly Newsletters "News from the Atoll"

"TS followers have a 38% 'open rate'; almost double the average for non-profits.

The TS newsletters are going strong. The reaction from our readers is very positive and encouraging. The newsletters continue to expand our communication reach.

TS followers combined with TB contacts make up over 12,000 subscribers. During 2019, we sent out over 150,000 newsletters.

The TS followers have a 38% 'open rate', almost double the average for non-profits, with the Brando contacts showing a 20% open rate.

Archives of all issues are available on the website.

TS Video Series

Tetiaroa Society continues to build a collection of videos on its YouTube Channel that introduce viewers to the natural and cultural heritage of the island. These videos are also now shown in the Air Tetiaroa lounge and at The Brando Resort.

Building subscribers on YouTube - TS currently has 177 subscribers

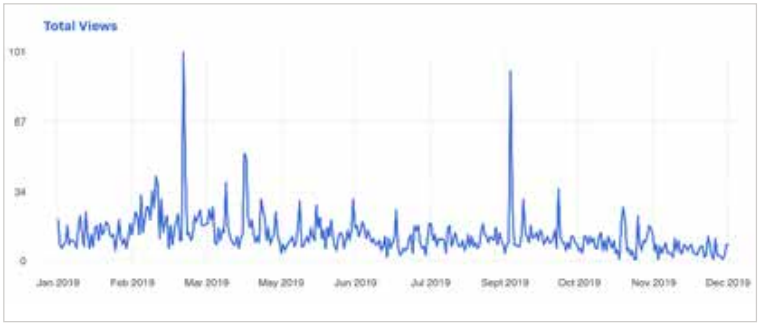
Communications via Website and Social Media

"In 2019, the site featured more frequent news articles and monthly, in-depth looks at Tetiaroa's amazing wildlife.

The TS website saw a lot of growth during 2019, with more frequent news articles and monthly in-depth looks at Tetiaroa Atoll's amazing wildlife. The monthly newsletters and news posted on social media all link back to the site, so site visits are up. The guides spent some time during the year to broaden and refine the 'Atoll guide' pages, and the Ecostation User guide was expanded.

Instagram currently has 1,461 followers.

TS gained 534 new Facebook followers in 2019, increasing from 3,724 to 4,258.



OPERATIONS

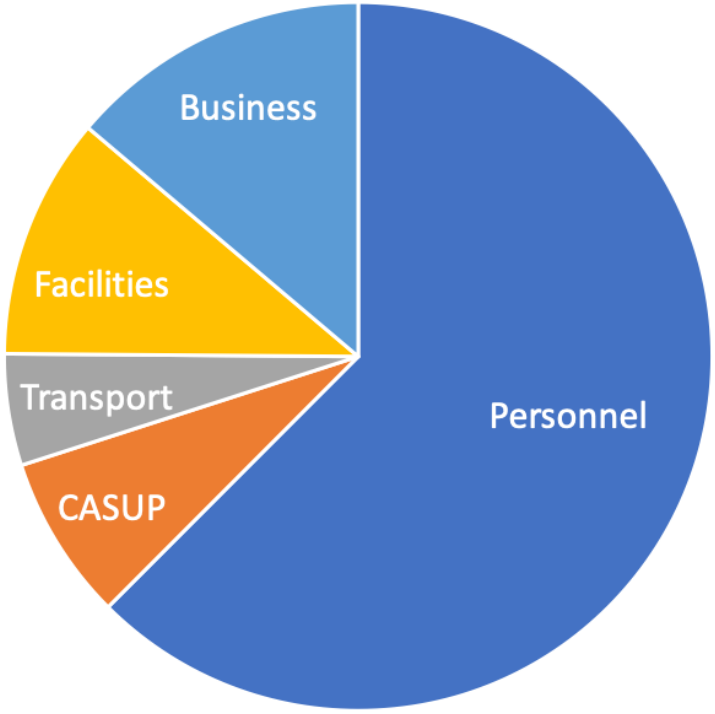
Ecostation Use

In 2019 the Ecostation had 83 users which is many fewer than in 2018 (146), but it still had comparable User/ Night numbers with 2214 in 2019 compared to 2538 in 2018.

Once again the largest use came from the Te Mana o te Moana team during the Green Sea Turtle nesting season months. Institute Louis Malarde had workers there during most week days throughout the year. Then on top of that the University of Washington had two large groups visit and all of the other research groups were scattered throughout the year.

Costs

"Our organization is growing and with it the costs of basic operations.



	CFP	USD
Personnel	42,278,903	$391,471
CASUP	5,100,910	$47,231
Business	9,351,128	$86,585
Facilities	7,478,364	$69,244
Transport	3,447,210	$31,919
TOTAL	67,656,515	$626,449

These are the major cost categories for Tetiaroa Society for 2019.

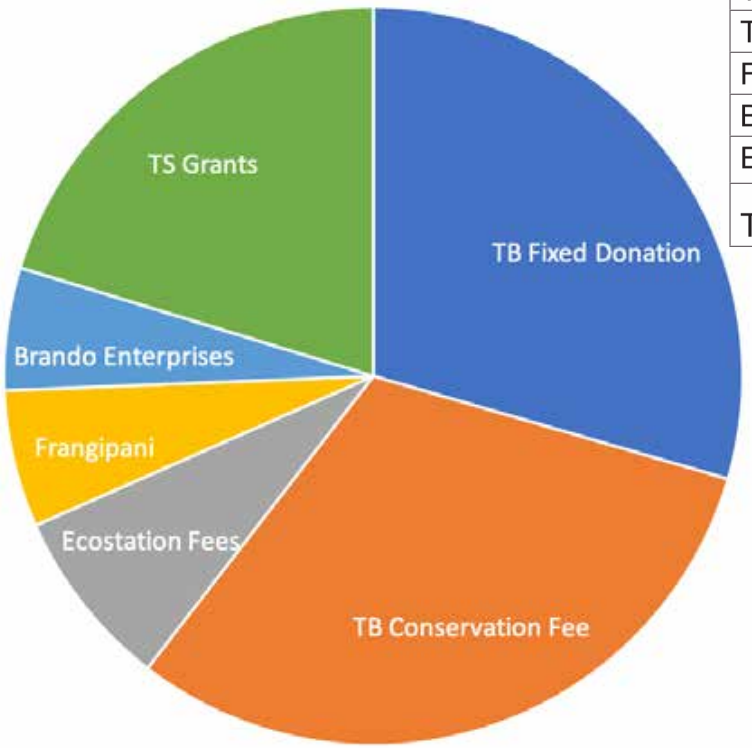
The majority of Tetiaroa Society annual costs go to personnel. This includes salaries, taxes and benefits, and housing. CASUP costs include all Conservation and the Education Program costs. Business costs include administration, accounting, and communications. Facilities costs include utilities, Ecostation and boat maintenance, and housekeeping. Transport is the cost of getting people on and off the island.

Income

"The programs on Tetiaroa were once again supported this year by many generous donations. Notable program and facility support came from:

- Richard H Bailey
- The O'Connell Family Foundation
- Courtney Ross
- Terry Causey

TSFP Income sources shifted a bit this year. The partnership with The Brando Resort accounted for donations that covered about 60% of the total income. This year we brought in Grants totaling 20% of total income and these covered Conservation and Education programs and overhead. As of the end of 2019 much of the grant funds are only partially spent and will be used in 2020. Frangipani continued support for the Ranger Program and Brando Enterprises provided support for Ranger Program for the first time this year. The Ecostation Fees were roughly the same as in 2018.



	CFP	USD
TB Fixed Donation	26,400,000	$244,444
TB Conservation Fee	27,719,603	$256,663
TS Grants	18,130,814	$167,878
Frangipani	5,375,961	$49,777
Brando Enterprises	4,802,578	$44,468
Ecostation Fees	7,070,844	$65,471
TOTAL	89,499,800	$828,702