

MONITORING AND EVALUATION PLAN

Title: Ua Pou islets (Motu Oa, Takahe and Mokohe) monitoring plan

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Monitoring and Evaluation Plan

I. INTRODUCTION

The tropical Marquesas islands are characterised by their isolation and high levels of endemism among native fauna and flora. This includes forty-two percent of the 320 native vascular plants and a diverse terrestrial snail community, with at least 78 species represented. Of the 12 native land birds 11 occur only within the archipelago, several restricted to a single island. Nineteen species of seabird breed there including the most eastern population of the Endangered Phoenix Petrel.

The archipelago has been inhabited for millennia first colonised by Polynesians 1,000 to 2,000 years ago and from the late 18th Century, Europeans. Associated landuse practices (notably fire) and the introduction of invasive alien species have resulted in extensive native habitat loss and species extinctions. Studies show that one island alone (Ua Huka) once supported seven more seabird species than are present today and 13 land birds that are now gone, including 10 endemic rails, pigeons and parrots (Steadman 1995). In recent times, the Red-moustached Fruit-dove, Ua Pou and Eiao Monarchs have all gone extinct and two further bird species are Critically Endangered.

Monitoring of seabirds and other species before, during and after the project will inform the impact of removing rats from these islets including how endangered species respond and community interest.

Site & Background

Ua Pou is the third largest (106 Km²) of the Marquesas Islands, located 50 km to the south of the main island and administrative centre Nuku Hiva. The island is of volcanic origin characterised by several basalt pillars, the tallest Mt Oave is 1,230m asl and the highest elevation in the archipelago. The island covers an area of 105.6 square kilometres. During the 2017 census, the local population was 2 213 people. The largest village is Hakahau, of Hakahau Bay, on the northeast coast. The village nearest to Motu Oa and Takahe is Hakata'o



Figure 1: Ua Pou and offshore islets proposed for management by the restoration project



Motu Oa 33.35 ha



Motu Takahe 6.77 ha



Motu Mokohe 10.63 ha

Table 1: Avifauna-species presence for Motu Mokohe, Takaae, and Oa.

Common name	Species (20)	IUCN Red list ¹	Mokohe	Takaae	Oa	Source
Blue noddy Paraka	<i>Anous cerulea</i>	LC	✓	✓	✓	Dérand et al. 2017
Brown noddy Noio	<i>A. stolidus</i>	LC	✓	✓	✓	Dérand et al. 2017
Sooty tern Taraka	<i>Onychoprion fuscatus</i>	LC	✓	✓	✓	Dérand et al. 2017
Spectacled tern	<i>O. lunatas</i>	LC			✓	
Masked booby Kena	<i>Sula dactylatra</i>	LC	✓		✓	Dérand et al. 2017
Brown booby Kakio'a	<i>S. leucogaster</i>	LC	✓	✓	✓	
Red-footed booby Hauhee	<i>S. sula</i>	LC			✓	Butaud 2009
Greater frigatebird Mokohe	<i>Fregata minor</i>	LC	✓		✓	Butaud 2009
Lesser frigatebird Mokohe	<i>F. ariel</i>	LC			✓	Dérand et al. 2017
Wandering sandpiper	<i>Tringa incana</i>	LC	✓			
Pacific golden plover Kivi	<i>Pluvialis fulva</i>	LC	✓			Butaud 2009
Bulwer's petrel Teiko	<i>Bulweria bulwerii</i>	LC	✓		✓	Holyoak & Thibault 1984
Polynesian storm petrel Pitai	<i>Nesofregatta fuliginosa</i>	EN	Pre-1995		Pre-1995	Holyoak & Thibault 1984
Phoenix Petrel Koputu	<i>Pterodroma alba</i>	EN	Pre-1995		Pre-1995	Holyoak & Thibault 1984
Red-tailed tropicbird Tavake	<i>Phaeton rubricauda</i>	LC		✓	✓	Dérand et al. 2017
Tropical Shearwater Ka'ako	<i>Puffinus bailloni</i>	LC	✓	✓	✓	Dérand et al. 2017
Christmas Shearwater Ka'ako	<i>Puffinus nativitatis</i>	LC			✓	Holyoak & Thibault 1984
Black noddy Noio	<i>Anous minutus</i>	LC		✓		Dérand et al. 2017
Grey-backed tern Tara	<i>Sterna lunata</i>	LC	✓		✓	Dérand et al. 2017
Wandering Tattler Tuki, kivi, kivi kivi	<i>Heteroscelus incanus</i>	LC	✓			Butaud 2009
Number Species per islet			14	7	16	

¹ LC Least Concern, EN Endangered

II. INDICATORS

Outcome	Indicator	Data Collection Method	Baseline Situation	Timing	Responsibility
<i>The outcome that the indicator is measuring</i>	<i>What to measure to evaluate progress towards achieving the outcome</i>	<i>How the indicator is measured – details in the next section</i>	<i>The indicator measurement before the eradication operation</i>	<i>How often will the indicator be measured</i>	<i>For data collection, analysis and evaluation.</i>
The native biodiversity and ecosystems of the Ua Pou islets Motu Oa, Motu Takaae and Motu Mokohe recover from the effects of introduced Pacific rats and are safeguarded against future invasive species					
Objective 1. Pacific rats are successfully eradicated from Motu Oa, Takaae and Mokohe and with no human health and significant negative environmental impacts					
1. Sufficient bait is available to lethally expose 100% of the rat population on each islet	All bait transects have bait for at least 3 nights after application	Bait uptake transects	N/A	After the first bait application on Motu Oa, Mokohe and access permitting Takaae	Operation Manager, SOPManu, BL, Ua Pou communities
	100% bait coverage and the target application rate is met	Bait output monitored (spreader, bags, and application rate) Bait coverage maps	N/A	Bait output continuously monitored over each application. Bait maps analysed on completion of each treatment block and islet	Operation Manager, BL, UAV consultant
2. No significant non-target species mortality	Birds	Examine dead birds for evidence of rodenticide and complete toxicology tests where necessary	No rodenticides applied prior to the baiting operation	7-10 days after the first bait application	Operation Manager, SOPManu, Ua Pou communities
3. Pacific rats eradicated from the 3 islets	No Pacific rats detected	Rat trapping, chew sticks and motion cameras as appropriate	Pacific rats present on all 3 islets	12 and 24 months after completion of the baiting operation	Ua Pou communities, SOPManu, BL
	Reference samples identify any rats detected of different geographic origin to original population	Original population genetic samples collected and secured for each islet. In the event Pacific rat are detected (post baiting) 25 rat samples are collected for each infested islet	25 rat (genetic) samples collected for each islet	One off, pre-baiting and should Pacific rat be detected within 2yrs of post bait application	BL, SOPManu

Outcome	Indicator	Data Collection Method	Baseline Situation	Timing	Responsibility
4. The application of Brodifacoum rodenticide poses no significant risk to marine life	Brodifacoum presence in coastal water samples	Collection of coastal water samples for each islet and laboratory analysis for Brodifacoum	No rodenticide in coastal waters	Sample 1 - prior to bait application. Sample 2 – on completion of bait application. Sample 3 - 6 months after bait application	Operation Manager, SOPManu, BL, Ua Pou Communities
5. Potential human exposure to primary and secondary brodifacoum sources prevented	Bait consumption, Land crabs, coastal crustaceans and fish	Harvesting prohibited supported by signage and awareness information. Potential exposure reports	All indicator species are currently harvested	Prohibition for six months from bait application	Communities and leaders
Objective 2. Populations of native birds and other biodiversity increase and ecosystems improve over time					
1. Bird species are protected, and their populations increase.	Sooty Terns and Bulwer's Petrel increase	Assess Sooty tern colony size and number of birds (aerial imagery and colony counts). Assess change in Bulwers Petrel numbers and nests/locations (numbers identified via observers and remote detection devices)	Sooty Tern colonies on all islets to be mapped prior to Sep 2022. Sooty tern population counts (plots) completed on Motu Oa prior to Sep 2022 On Motu Oa Dusk/dawn Bulwers Petrel counts conducted in 2021 and to be repeated in 2022 alongside investigation of potential nesting locations Motu Oa. 2021 acoustic recorders deployed on all islets	2023 and 2025 and 5yearly thereafter, all during peak breeding - Sooty Tern colony plots and aerial images - Bulwers counts and searches Acoustic recorders operate - Sep 2021-23. - Sep 2025-26 5yrs thereafter	SOPManu, BL, Ua Pou Communities
	Changes in abundance of other established seabird species and waders	Motu Oa and Motu Mokohe - All significant seabird colonies mapped - Census all surface and tree nesting species - Coastline transects - Conduct burrow density and occupancy counts for Tropical Shearwater	Seabird distribution and density data collected in 2021 (updated in 2022) Coastline transects monitored in 2021 (updated 2022) Tropical shearwater transects established 2022	2023 and 2025 repeat seabird distribution and density maps, coastline and Tropical SW transects and a 5-10yr cycle thereafter	SOPManu, BL, Ua Pou Communities

Outcome	Indicator	Data Collection Method	Baseline Situation	Timing	Responsibility
	New seabird species establish/detected (potentially Polynesian Storm Petrel and Phoenix Petrel) for all islets and land birds and waders on Motu Oa	Motu Oa dawn/dusk observations/counts (seabirds) Acoustic recorder sampling for all islets Species checklist for Motu Oa	2021-2022 acoustic recorder baseline all islets 2021 dawn/dusk observations (repeated 2022) Bird surveys conducted 2017, 2021 and 2022	2023 and 2025 for counts and acoustic recorders operate September 2021 to September 2023. Redeployed 2025-26. All monitoring 5-10yr cycle thereafter	SOPManu, BL, Ua Pou Communities
2. Traditional seabird (egg) harvest is sustainable	Sooty tern egg collection	Number of eggs collected for Motu Oa	Local knowledge of collection and periods	2022 and sustained annually over each nesting period	Ua Pou Communities, SOPManu, BL
3. Native plant species/communities recover	Threatened species Native species successional phases	Vegetation plots on Motu Oa Permanent photopoints on all islets	Botanical surveys for all islets identifying threatened species 10x10m plots established on Motu Oa in 2020	All monitoring 2023, 2025 and 5-10 yearly thereafter	SOPManu, BL, Ua Pou Communities
4. Native invertebrate populations recover.	Invertebrate species assemblage including native and non-native, threatened species and Species size classification particularly Carabidae	Conduct general invertebrate surveys on all islets Pitfall trapping (Motu Oa) Other sampling methodologies as prioritised from general survey	General invertebrate survey and pitfall collection 2021 and 2022	All monitoring 2023, 2025 and 5-10 yearly thereafter	SOPManu, BL, Ua Pou Communities
5. Native reptile populations recover	Species presence and abundance	Sticky trap transects Incidental observations	Record of species for each islet, but no formal survey	Baseline 2022, repeat assessments 2023, 2025 and 5-10 yearly thereafter	SOPManu, BL, Ua Pou Communities
6. Crab species/populations recover	Species presence and abundance	Daytime and nighttime transects sampling all major habitat types on Motu Oa and Motu Mokohe		Two visits of the site yearly	
	Crab harvest rates	Number and size/weight of crabs collected by species and month	Establish baseline in 2022	Every month for 2022 and 2023. If difficult to sustain (annually) repeat in 2025 and 5-10yrs thereafter	SOPManu, BL Ua Pou Communities
Objective 3. Strengthen biosecurity for the islands to ensure they remain rat free and reduce the risk of new invasive species introduction					

Outcome	Indicator	Data Collection Method	Baseline Situation	Timing	Responsibility
Potential IAS incursions to all islets minimised/avoided and establishment prevented	Detection of rodents and high-risk threats	Rat detection methods (and for other priority threats) deployed on all islets	Existing local capacity strengthened in 2022	Annually	Ua Pou Communities, SOP Manu
	Implementation of biosecurity measures	- Record of people landing on islets - Survey of biosecurity awareness - Compliance checks	Local capacity established in 2022	- Monthly/annual record of landings/permissions - Biosecurity awareness survey 2022, 2023 and 2025 - Monthly compliance checks	Ua Pou Communities, SOP Manu
	The genetic origin of rats on an islet(s)	Genetic samples collected and secured for each islet and potential source locations (as required)	25 rat (genetic) samples collected for each islet	On detection of rats on an islet	BL, SOPManu, Ua Pou communities
Objective 4. Increased capacity for invasive vertebrate eradication and support for island restoration in French Polynesia					
Knowledge of the impacts of invasive species on biodiversity are understood and the interventions supported.	Local people trained in biodiversity monitoring and biosecurity methods	Record of people trained/participating in monitoring and biosecurity	Local involvement in monitoring	Monitoring and biosecurity training 2022	SOPManu, BL
	Local Association/Group sustaining monitoring and biosecurity activities	Receipt of monitoring and biosecurity outputs	Ua Pou environmental association have indicated support	Ongoing	SOPManu, Ua Pou Association/Group
	Ua Pou leaders and national stakeholders are engaged	Meeting records with Ua Pou Council, DIREN Trip reports provided to Ua Pou Council and DIREN Project outputs developed in consultation with stakeholders	SOPManu have strong relationship with national project partners and history of communication/info sharing	As per 2022 and 2023 project activities/workplan	SOPManu, BL

Outcome	Indicator	Data Collection Method	Baseline Situation	Timing	Responsibility
	Invasive species impacts, interventions and biodiversity outcomes communicated	Implementation of communications plan	Communication plan developed	As per communications plan schedule	BL, SOPManu, Project partners

III. DATA COLLECTION DETAILS

Eradication Success (Operational monitoring)

Bait Availability

Bait uptake

Randomised transects established on at least Motu Oa and Motu Mokohe (Motu Takahe access permitting). Individually marked baits identified within each 20m long x1m wide transect and monitored daily, recording removed/remaining baits for at least three consecutive days/nights

Bait coverage

Bait application monitored through:

- the number of buckets applied in accordance with the target application rate
- continual real time video surveillance of bait flow/availability through the UAV bait spreader
- flight paths recorded (GIS) and analysed (with spatial mapping software) at the end of each treatment block and on completion of the island.

All actual and potential gaps in bait spread remedied with additional bait application

Non-target Species

Each islet searched for dead birds and other wildlife 7-10 days after the first bait application. Animals found autopsied for evidence of brodifacoum and where detected, sent for toxicology examination to indicate cause of mortality

Confirmation of rat eradication

Snap trapping, chew blocks, and motion cameras deployed on each islet 1 year after completion of the baiting. Trapping and chew blocks for a minimum of 3 nights and motion cameras up to one month.

Rat genetic reference collection

Minimum of 25 unique genetic samples (1cm section of tail) collected for each islet and stored in 80% ethanol. Accompanying sex, age and morphometric details recorded for each sample. DNA signature identified for each sample and stored by EcoGene NZ. Should rats be identified for any islet after baiting (and prior to declaration of eradication success) 20 unique samples (or as many as can be sourced) will be caught and analysed by EcoGene to identify if their (genetic) origin is the same as the original population or a different source.

Water sampling

Coastal water samples collected from the immediate near-shore area surrounding each islet and sent for brodifacoum toxicology assays by EcoGene NZ. Sampling will occur immediately prior to

the first bait application, on completion of the second (final) bait application and 6 months after bait application.

Preventing human exposure to rodenticide (brodifacoum)

Harvesting of all crabs, near-shore crustaceans and fish surrounding each islet will be prohibited for 6 months after completion of the baiting. Communities will be consulted with in agreeing this measure (through the baiting operation planning phase) and communications and awareness disseminated in support of the prohibition immediately prior to the baiting commencement. Awareness will include warning signs for each village and erected at landing/access points on each of the three islets. An advisory about the operation and prohibition, will also be broadcast on local radio.

All medics for the island will be given information about the operation and confirmation of familiarity with anticoagulant (rodenticide) symptoms, that Vitamin K stocks are available and able to be administered. In the unlikely event poisoning does occur this will be reported through appropriate channels including to SOPManu and will be shared as part of the learnings from the operation

Bird and other Biodiversity (Outcome monitoring)

Birds

Sooty terns

High resolution aerial photography/video will identify the location, size and density of all Sooty tern colonies for each islet.

Density (population size) will be ground-truthed with permanent 12x12m plots across a representative selection of colonies on Motu Oa. The plot corners will be marked with a permanent pole (GPS points recorded). All nests in the plot are counted from a distance of <10 m from the plot margin.

Supplies: Drone (with high-res camera) binoculars, datasheet/notebook, GPS, tape measure and poles for marking permanent plots.

Effort: 2 people, 2 days on Motu Oa for aerial imagery and counts made during peak breeding season typically May/June annually. One day for 1-2 people for aerial imagery on Motu Takaae and Motu Mokohe

All other surface and tree nesting colony species

High resolution aerial photography/video will identify the location, size and density of all surface and tree nesting colony species (frigatebird spp, booby spp and Noddy spp) on each islet

Population size will be validated on the ground through nest counts (breeding pairs) of representative colonies.

Breeding pairs are represented by (active) 'nests' which may contain an adult(s), eggs, chick(s), or non-fledged juvenile in each instance only one of these life stages represents a breeding record i.e. if there are chicks and adults present in the same nest, this is still only a single observation.

For each species maintain a running tally of 'breeding pairs' or 'individuals' do not mix the two in the same count and clearly identify if the records are for breeding pairs or individuals. The breeding stages are clustered as:

- Adult 'incubating' and may or may not have an egg
- Downy chick (Stage 1 – S1)
- Large chick with some adult feathers (S2)
- Juvenile, mostly adult feathers, but typically some down still present (i.e. head/neck) and not yet independent of parents (S3).

Supplies: binoculars, datasheet/notebook, GPS

Effort: Done in association with Sooty Tern counts (no additional resources required)

Burrow and Cavity nesting Seabirds

Tropical Shearwater

Motu Oa and Motu Takaae have significant Tropical Shearwater colonies.

Counts will assess population changes by:

- Delineating the margins of all major colonies on Motu Oa (using a GPS)
- Randomly located transects bisecting a representative number of the colonies (and providing a statistically significant level of sampling)
- Each transect will be assessed over a 2m width noting burrow entrances, and checking each for occupancy (with a burrow scope) and recording the status (adult, egg, chick and

Supplies: binoculars, datasheet/notebook, GPS, Endoscope (to check inside the burrows), pin-flags or flagging tape to mark burrows.

Effort: 2 people 2 days.

Dusk/Dawn Seabird surveys

From permanently marked vantage points on the seaward perimeter of each islet, all seabirds flying onto the islet will be recorded. Observations prior to nightfall or from dawn should commence 30 minutes prior to darkness, or from dawn. In both instances do not count birds flying from the islet back out to sea. Maintain a tally of individuals for each species and note the observer, location (GPS point), start and finish time, weather conditions.

These counts should pay particular attention to rare/undetected species including Polynesian Storm Petrel and Phoenix Petrel

Supplies: binoculars, data-sheet/notebook, GPS

Effort: 2 people, 2 nights, and mornings

Automated Acoustic recorders

Remote recorders will target rare/undetected species specifically Polynesian Storm Petrel and Phoenix Petrel, but will also record others such Bulwers Petrel and Tropical Shearwater. For rare species this will enable or at least increase the potential for detection and relative change over time similarly, for more common species (such as Bulwers and Tropical Shearwater) the frequency and intensity of calls will provide a measure of population change.

Recorders will be deployed on all islets, 3 on Motu Oa, 2 Motu Takahe and 2 Motu Mokohe. The recorders will be sighted to optimise detection of Polynesian Storm Petrel, and Phoenix Petrel also sampling Bulwer's Petrel and Tropical Shearwater flight paths and breeding areas.

Recorders will operate every night continuously recording for 2 hours from dusk then sampling for 5 minutes every hour up until two hours before dawn when they will again record continuously turning off at daybreak. A call baseline will be established from late 2021 until the rodent baiting operation in Sep 2022 and continue for 12 months after the baiting to September 2023. At which time the data will be analysed.

Supplies: 7 Song-Meters, each with an external battery box and 16 D size batteries, 1 256 GB memory card, GPS, camera, flagging tape, zip ties, string.

B. Other avifauna

There are no previous records of terrestrial birds for the islets, but given their proximity to Ua Pou some species may establish. Spotless crane is most suited to the habitat, and coastal waders such as Bristle-thighed curlew (EN), Wandering tattler and Pacific golden plover may become more common. Lack of forest habitat reduces the likelihood of other species such as Marquesan swiftlet, White-capped Fruit-dove and the Marquesan Reed-Warbler, but it's not impossible all are present on Ua Pou.

Counts for all bird species will be maintained while on each islet (for other monitoring) maintaining a tally of individuals for every species encountered. If nesting or breeding behaviour is observed, record this also. See Table 1 for all bird species recorded for each islet.

Supplies: binoculars, data-sheet/notebook, list of species previously present (Annex 2), GPS

C. Vegetation

Note presence and locations of all plant species that are present on the islets according to plant list provided by J.F. Butaud 2009 (Annex 3).

Photo-point: Photographs provide a simple method to see changes in vegetation, whether remnant vegetation or revegetation sites. To ensure that the location of photos is the same, use a marker point in the landscape which will not change or be hidden - use a particular tree, rock.

Methods to be used for vegetation monitoring:

- Photo-point: repeat images from the same origin, and size marked with permanent physical reference, GPS coordinate and bearing
- Permanent plots of 100 m² (5 per motu). Recording: species abundance-dominance (covering classes: absent 0, one very little +, between 1 and 5%, 5 to 25%, 25 to 50%, 50 to 75%, more than 75%) within 3 strata 0-1, 1 to 5, > 5); counting the number of seedlings or young plants of woody species (0 to 10 cm high, 20 to 50 cm, more than 1 m); diameter at 'breast height' for all stems >1cm (DBH)
- complete species list (to detect new invasive species but also native species that were absent or very rare and not detected)

Supplies: Tape decameter, compass, field botanical identification book, camera and pin-flags for quadrats, GPS, compass & notebook. During Two-three visits every year

D. Land-Crab species

To assess crab species and abundance conduct 10, 25m long, 2m wide transects on Motu Oa and 5 on Motu Mokohe. Transects are randomly located and proportional to the major habitat types. See Annex 4 for the information to record for each transect and the crab species known for Marquesas.

Supplies: data-sheet or notebook, crab identification guide, GPS, headlamp, spotlight, compass

Geckos and Skinks

Gecko and Skink species will be sampled with sticky traps set on transects in representative habitats. Traps will be activated for two hours in both daytime and nighttime conditions, daylight traps checked every 15 minutes. Trapped animals will be identified (photographed as necessary) and released back into the area they were caught at the end of the 2hr trapping period.

See Annex 5 for skinks and geckos known for Ua Pou.

Invertebrates

No current species list is available for arthropods species yet for Ua Pou specifically, and not per islet. There is a list of data per species for each archipelago in French Polynesia (see Ramage 2017 Checklist of arthropods of French Polynesia – excel sheet).

Very little is known of the invertebrate fauna for the islets with no formal surveys having occurred. A general survey will provide a baseline for all major terrestrial invertebrate groups and will guide future sampling methods and priority areas.

Typically large bodied invertebrates such Carabids are sensitive to rat predation and are expected to respond following the removal of rats. Pitfall trapping is an effective means of sampling these invertebrates and lines of pitfall traps will be established through major habitat types. The traps will run for one month (a year) and specimens trapped identified (to at least taxonomic Family) and counted.

Supplies: 100 pitfall traps, spade, water, dish-soap, test-tubes filled with ethanol. GPS & notebook

General Survey Methods

Incidental Observations

A record of all species observed while on the islet

IV. REFERENCES

Butaud 2009. Evaluation écologique des motu des îles Marquises. Diren report, 65 p.

Dérand G.D. 2017. January 2017 mission to the marquesas archipelago. Report on the field surveys and consultations for the eradication of introduced mammals from seven islets and islands. SOP Manu report, 24 p.

Raine, H.; Reiss K.Y. & Hallman Behnke, J. 2017. Kahuama'a seabird preserve management plan. Internal report State of Hawai'i, Department of Land and Natural Resources, Division of Forestry and Wildlife.

Ramage, T. 2017. Checklist of arthropods of French Polynesia. Zoosystema 39(2) 213-255 (excel sheet).

Annex 1: Bird Data Records

No. of individual birds (i) or breeding pairs (p). A field data sheet for bird surveys includes:

- Island name
- Date of survey. All records must be unique to a specific day and field sheet.
- Name of the observer(s) completing the survey (i.e. the person(s) making and recording the observations) and specific to the motu surveyed
- Weather conditions over the course of survey (wind strength, cloud cover, rainfall) if these change significantly over the survey period note the part of the survey this applies to
- Time survey started and finished for each transect and motu (preferably in 24hr time)
- Start and finish locations and survey route are recorded for each transect.

Each perimeter survey can be recorded as a single continuous log however, if other activities occur over the course of a perimeter survey it should be stopped (with finish time and location noted) and restarted on completion of these activities. New start and end points, times etc. must be noted.

Survey start, finish and route locations are all recorded with a GPS, these waypoints noted on the field sheet and the name of the track log

- Bird species detected and a running tally of each.
- For seabirds, for each species, maintain a running tally of 'breeding pairs' or if a species is not breeding or only very few count individuals. Breeding pairs are represented as 'nests' which may contain an adult(s), eggs, chick(s), or non-fledged juvenile in each instance one of these life stages represents a single record (i.e. if there are chicks and adults present in the same nest this is still only a single observation).
- Do not mix counts of individuals and breeding pairs in the same count and note which of these has been recorded for each species. While it's generally not necessary to count individuals and breeding pairs (for the same species) this can be done and is useful if only small numbers of birds are breeding but the majority are not, but in this instance clearly identify those counted as breeding pairs and those counted as individuals. Note the overall stage of development for each species i.e. proportion nest building/courting; incubating (on egg or assumed to be); have chicks (all stages of development) and; juveniles (largely independent – may still be hanging about the nest but are not breeding)
- For shorebirds maintain a running tally of individuals for each species for a specific transect (i.e. inner or outer lagoon perimeters) and day. Pay particular attention to Bristle-thighed Curlew
- Flowering and Fruiting
 1. None. Flowers or Fruit are not present anywhere
 2. Rare. Flowers or Fruit occur on few plants (<5%) across the entire atoll with very low amounts of flowering or fruiting on each
 3. Low. There is occasional flowering or fruiting present across the islet, but it is not common i.e. >5% and up to 25% of plants are fruiting or flowering. None or very few individuals are fruiting or flowering heavily

4. Medium. Flowering or fruiting is common across the islet >25% and up to 75% including some individual plants with high levels of flower or fruit
5. High. Flowering or fruiting is abundant with the majority of plants flowering or fruiting across the atoll <75%. Heavy flowering or fruit sets is common among individuals

Use this table in field notebook to keep running totals with each column representing a separate motu. Alter the space in tables in anticipation of numbers.

[illegible]

The flowering and fruiting status of plant species of interest refer methodology for species and categories

Annex 2: Birds confirmed present/absent on Motu Oa, Takahe as of 2017 and Mokohe as of 2009 (Butaud 2009).

Common name	Local name	Scientific name	Oa	Takahe	Mokohe
Phoenix petrel	Koputu	<i>Pterodroma alba</i>	×	×	×
Bulwer's Petrel	Teiko	<i>Pterodroma ultima</i>	×	×	×
Tropical Shearwater	Ka'ako	<i>Puffinus bailloni</i>	✓	✓	×
Christmas Island Shearwater	Ka'ako	<i>Puffinus nativitatis</i>	×	×	×
Polynesian Storm Petrel	Pitai	<i>Nesofregatta fuliginosa</i>	×	×	×
Red-tailed tropicbird	Tavake	<i>Phaethon rubricauda</i>	✓	✓	×
Red-footed Booby	Hauhee	<i>Sula sula</i>	✓	×	×
Masked Booby	Kena	<i>Sula dactylatra</i>	✓	×	✓
Brown Booby	Kakio'a	<i>Sula leucogaster</i>	✓	✓	✓
Great Frigatebird	Mokohe	<i>Fregata minor</i>	×	×	✓
Lesser Frigatebird	Mokohe	<i>Fregata ariel</i>	✓	×	×
Sooty Tern	Taraka	<i>Sterna fuscata</i>	✓	✓	✓
Grey Back Tern	Tara	<i>Sterna lunata</i>	×	×	×
Blue-grey Noddy	Paraka	<i>Procelsterna caerulea</i>	✓	✓	✓
Brown Noddy	Noio	<i>Anous stolidus</i>	✓	×	×
Black Noddy	Noio	<i>Anous minutus</i>	×	×	×
White tern	Inake	<i>Gygis alba</i>	×	×	×
Pacific Golden Plover	Kivikivi	<i>Pluvialis fulva</i>	×	×	✓
Wandering Tattler	Kivi	<i>Heteroscelus incanus</i>	×	×	✓
Bristle-thighed Curlew	Keuhe	<i>Numenius tahitiensis</i>	×	×	×

Annex 3: Plant list per islet gathered in 2009 by J.F. Butaud

Taxons	Oa	Takahe	Mokohe
<i>Canavalia rosea</i>	1		
<i>Euphorbia sachetiana</i>	1	1	1
<i>Chloris barbata</i>			1
<i>Hibiscus tiliaceus</i>		1	
<i>Ipomoea pes-caprae subsp. brasiliensis</i>	1		
<i>Ipomoea violacea</i>	1	1	1
<i>Dinebra xerophila</i>	1	1	1
<i>Leucaena leucocephala</i>			1

<i>Microsorium grossum</i>	1	1	1
<i>Morinda citrifolia</i>	1	1	
<i>Pisonia grandis</i>	1	1	1
<i>Portulaca lutea</i>	1	1	1
<i>Portulaca oleracea</i>	1		1
<i>Scaevola taccada</i>	1		
<i>Senna occidentalis</i>		1	
<i>Thespesia populnea</i>	1		1
<i>Tribulus cistoides</i>	1		1
<i>Waltheria tomentosa</i>	1		1
Total species	14	9	12

Annex 4: Main terrestrial crab species list in Marquesas

Coenobita perlatus
Cardisoma carnifex
Discoplax rotunda
Geograpsus crinipes
Geograpsus grayi
Geograpsus stormi
Metasesarma obesum

Another 35 species can be collected in the inter-tidal zone, such as *Grapsus tenuicrustatus*, main species that is fished by locals (i.e. Toetoe).

Annex 5: Current list of reptiles present in Marquesas and absence/presence of those species on Ua Pou (Duron & Meyer 2016).

Complete list of reptiles present in the Marquesas	Ua Pou presence/absence
GEKKONIDAE	
<i>Gehyra insulensis</i>	✓
<i>Gehyra oceanica</i>	✓
<i>Hemidactylus frenatus</i>	x
<i>Hemidactylus garnotii</i>	✓
<i>Hemiphyllodactylus typus</i>	x
<i>Lepidodactylus lugubris</i>	✓
SCINCIDAE	

<i>Cryptoblepharus poecilopleurus</i>	x
<i>Emoia gr. cyanura indét.</i>	✓
<i>Emoia impar</i>	✓
<i>Emoia pheonura</i>	✓
<i>Lipinia noctua</i>	✓