LEADING THE RECOVERY OF TWO OF SAMOA'S MOST THREATENED BIRD SPECIES

the tooth-billed pigeon (Manumea) and the mao (Ma'oma'o) through ecological research to identify current threats

BIODIVERSITY CONSERVATION LESSONS LEARNED TECHNICAL SERIES

25

CONSERVATION INTERNATIONAL
Pacific Islands

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The Critical Ecosystem Partnership Fund is a joint initiative of l'Agence Française de Développement, Conservation International, the Global Environment Facility, the Government of Japan, the MacArthur Foundation and the World Bank. A fundamental goal is to ensure civil society is engaged in biodiversity conservation.

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CONSERVATION INTERNATIONAL
Pacific Islands

CRITICAL ECOSYSTEM PARTNERSHIP FUND

The **Critical Ecosystem Partnership Fund** is a joint initiative of l'Agence Française de Développement, Conservation International, the European Union, the Global Environment Facility, the Government of Japan, the MacArthur Foundation and the World Bank. A fundamental goal is to ensure civil society is engaged in biodiversity conservation.

ABOUT THE BIODIVERSITY CONSERVATION LESSONS LEARNED TECHNICAL SERIES

This document is part of a technical report series on conservation projects funded by the Critical Ecosystem Partnership Fund (CEPF) and the Conservation International Pacific Islands Program (CI-Pacific). The main purpose of this series is to disseminate project findings and successes to a broader audience of conservation professionals in the Pacific, along with interested members of the public and students. The reports are being prepared on an ad-hoc basis as projects are completed and written up.

In most cases the reports are composed of two parts, the first part is a detailed technical report on the project which gives details on the methodology used, the results and any recommendations. The second part is a brief project completion report written for the donor and focused on conservation impacts and lessons learned.

The CEPF fund in the Polynesia-Micronesia region was launched in September 2008 and will be active until 2013. It is being managed as a partnership between CI Pacific and CEPF. The purpose of the fund is to engage and build the capacity of non-governmental organizations to achieve terrestrial biodiversity conservation. The total grant envelope is approximately US$6 million, and focuses on three main elements: the prevention, control and eradication of invasive species in key biodiversity areas (KBAs); strengthening the conservation status and management of a prioritized set of 60 KBAs and building the awareness and participation of local leaders and community members in the implementation of threatened species recovery plans.

Since the launch of the fund, a number of calls for proposals have been completed for 14 eligible Pacific Island Countries and Territories (Samoa, Tonga, Kiribati, Fiji, Niue, Cook Islands, Palau, FSM, Marshall Islands, Tokelau Islands, French Polynesia, Wallis and Futuna, Eastern Island, Pitcairn and Tokelau). By late 2012 more than 90 projects in 13 countries and territories were being funded.

The Polynesia-Micronesia Biodiversity Hotspot is one of the most threatened of Earth's 34 biodiversity hotspots, with only 21 percent of the region's original vegetation remaining in pristine condition. The Hotspot faces a large number of severe threats including invasive species, alteration or destruction of native habitat and over exploitation of natural resources. The limited land area exacerbates these threats and to date there have been more recorded bird extinctions in this Hotspot than any other. In the future climate change is likely to become a major threat especially for low lying islands and atolls which could disappear completely.

For more information on the funding criteria and how to apply for a CEPF grant please visit:

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Acknowledgements

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We also thank Magiagi village who allowed us to work in the forest under their communal ownership and the Secretariat of the Pacific Regional Environment Programme in Samoa who provided additional technical support and facilities.

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The work on the Ma'oma'o was supported by additional grants from the Rufford Small Grants Foundation, the Mohamed bin Zayed Species Conservation Fund and the National Geographic Conservation Fund.

Les Moran setting up mist net in Magiagi study area. Photo: David Butler.

Lessons Learned

Project Design Process

Aspects of the project design that contributed to its success/shortcomings.

The project set out to undertake detailed research on two threatened bird species, for which recovery plans had been developed by the Government and international partners in 2006, and submitted an initial budget accordingly. CEPF approved a contribution of US$176,653 about half the requested sum of $353,013 giving a total project budget including support from partners of $341.473 compared to $601,893 originally proposed.

The obvious response to a budget of around half that originally sought would have been to reduce the scope to just work on one of the species. However it was decided to continue to try to work with both. Resources were initially directed towards the Ma'oma'o as a suitable study area had already been identified and a student was recruited to undertake a PhD through Massey University, NZ to carry out the field study. There had been a hope that a student could acquire a scholarship allowing the budget to recruit a second to work on a PhD or MSc on the Manumea, and that the same area might hold significant populations of both species. Neither of these eventuated and the budget provided was also seriously eroded by currency fluctuations, so work on the Manumea was quite limited. The progress made has largely depended on the principal of the grantee organisation putting in much of his own time.

The lesson here is that principal donors and grantees need to have a robust discussion when the funding offered falls well short of that requested. There's an obvious tendency for grantees and their partners (particularly the Government agency in this case) to be committed to the conservation work proposed and to aim to do 'more with less'. This needs to be countered by hard questioning by the principal donor to end up with a realistic programme. One of the end results of an un-realistic programme is that everyone has to spend time unproductively re-formulating work plans and modifying targets.

Having discussed this lesson, if one of the species had been dropped it would probably have been the Manumea given the difficulties finding a study population. This report will show that useful progress has been made on the Manumea and that we now know that it is the more endangered of the two. There has also been no tangible progress on other objectives within the recovery plan on this species. So it has proved important that it was not dropped. Though the project did not achieve what it set out to do for Manumea if it had not proceeded almost nothing at all would have happened for this bird.

Project Implementation

Aspects of the project execution that contributed to its success/shortcomings.

Recruiting a research student to undertake the key role

The research on the Ma'oma'o was based on providing a 3-year scholarship to a student towards a PhD (c.US$71,000 or US$23,750 a year). This is considered to have been a very cost-effective approach to support someone with sufficient experience (from undergraduate and MSc work) in the field for long enough to collect the necessary data on a rare bird. However such a student needs considerable support, particularly when working in a developing country, and this has been provided within this project by the involvement of six experienced scientists making short visits (particularly at the start), Government field staff and local villagers assisting on an almost daily basis, and periodic international volunteers.

Another advantage of this approach is that it should ensure that the project's findings reach multiple audiences, through the donor's usual reporting and the student's work towards a thesis, scientific papers and presentations to conferences. In this case the student also secured additional funds (National Geographic) so that the results will reach a popular audience.

Having an individual working in the field over a long period (2.5 years) helped to build trust with the local village community and the Government. It also facilitated the passing of skills to staff of the Ministry of Natural Resources & Environment (MNRE).

Finally, one person working largely full-time on the project provided the flexibility needed to adjust the programme as new information was obtained. This was particularly important for the Ma'oma'o as at the outset we did not know when its breeding season was and this proved to be spread over a long period.

Working with village communities

This is a challenging issue throughout the Pacific and particularly in Samoa where much of the land is in communal village ownership. The project benefited from the fact that it was not the first time that the different villages involved had been involved in discussions about bird conservation. A national project to raise awareness of the Manumea had been conducted in 1995 funded by the RARE Center for Tropical Conservation and all the villages had been approached either during surveys for the two species in 2006 or in a programme to identify Important Bird Areas in 2008/09. This meant that the project did not need to start with *fono* or meetings with Village Councils which involve relatively significant traditional fees and sometimes generate expectations that funds will flow to the village. Instead we could work through *pulenuu* (village mayors whose role is to liaise with Government), and in the case of the Ma'oma'o, individual landowners. Workshops were held at intervals with the main village associated with the Ma'oma'o work, but probably more important to maintaining productive relationships was the near-daily contact with the project team. The team periodically employed villagers to assist in the field, though this was not without its challenges. It also earned considerable goodwill by doing small things like always stopping to give lifts to villagers heading to and from their plantations.

Ministry staff played crucial roles guiding the project team on how to approach villagers, leading such approaches and communicating with villagers encountered in the field in Samoan. In one such encounter a family were persuaded not to clear any further land for plantations in a particular area when the staff person told them how important their forest was for the Ma'oma'o.

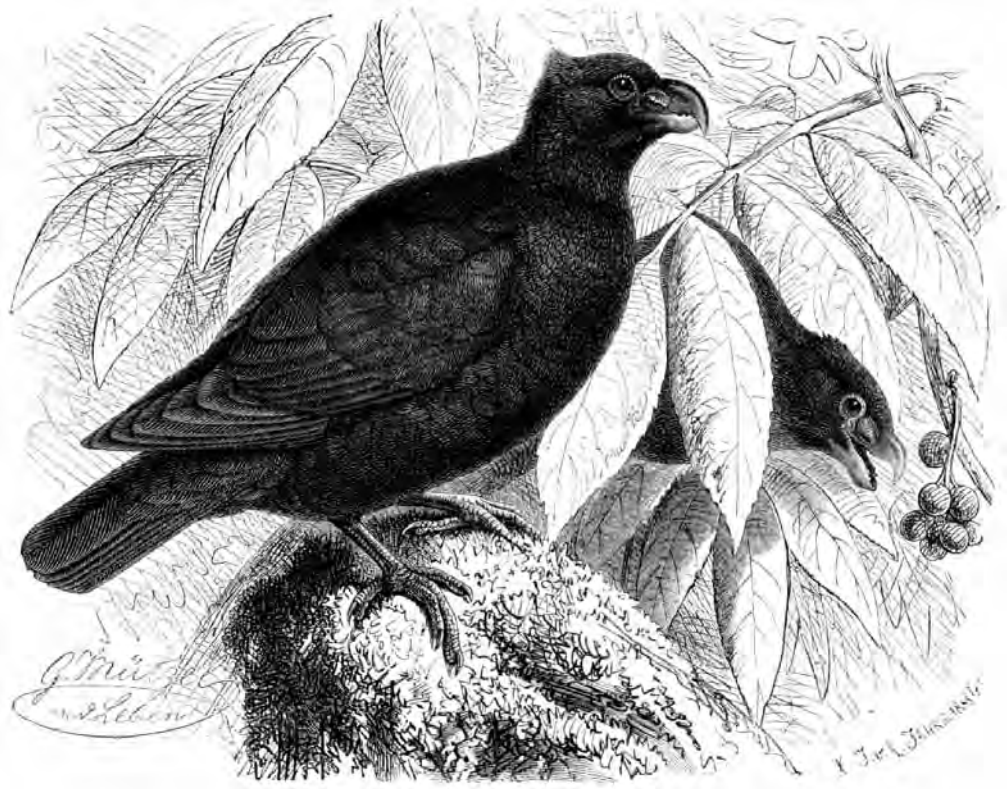
Working with Government

A project such as this when most of the funding is directed through an NGO and Government is in a supporting rather than leading role, is also challenging. The Government committed to providing US$150,000 of in-kind support and certainly lived up to its commitments largely through making considerable staff time available. One skilled field staff person contributed significantly to the field research through his commitment, observational and tree climbing skills. The head of the Parks & Reserves section provided key day to day support, as did the Assistant CEO (Biodiversity and Conservation). Relationships with staff at these levels were generally very positive and productive, but we did not do such a good job of keeping the CEO of MNRE informed. I think there were three lessons here:

- It would have been beneficial if the grantee and Government had signed an MOU at the outset setting out how the relationship between the two would work
- An NGO grantee cannot assume that other Ministry staff will do a thorough enough job of keeping their CEO informed and needs to take some responsibility for this itself.
- It also cannot be assumed that if there is a change in CEO the new appointee will be adequately briefed on the detail of all projects. The grantee needs to make an approach to enquire if the new CEO would like a briefing on the work.

There were specific issues around money as the CEPF approach meant that funds could not be transferred directly to Government to carry out any aspects of the project. Thus the usual system whereby suppliers were provided with order forms from Government to guarantee payment did not operate. In its absence, suppliers rarely provided materials or service and invoiced for later payment. Instead the project needed to pay cash up front which made the work of managing the project much more difficult. Greater flexibility whereby some funds could be transferred to Government to undertake specific tasks, e.g. run a village workshop, would have been beneficial.

Young Manumea. Photo: Ulf Beichle.



Tooth-billed Pigeon from Brehms Thierleben. :Verlag des Bibliographischen Instituts, 1882.
Source: http://www.zeno.org/Naturwissenschaften/l/bt05665a, WIkimedia Commons.

MANUMEA

TOOTH-BILLED PIGEON

Samoan 50 sene coin featuring the Manumea.

Forest in Samoa.

Introduction

The Manumea or tooth-billed pigeon (*Didunculus strigirostris*) is arguably Samoa's most important bird. It has been recognised as the National Bird, appears on coins and postage stamps, and was adopted as the mascot for the South Pacific Games held in Samoa in 2007. It is endemic to Samoa, never recorded in nearby American Samoa, though a closely-related extinct species, *Didunculus placopedetes*, has been identified from bones in caves in Eua, Tonga (Steadman 2006).

The bird was a traditional and highly esteemed source of food, especially for the high chiefs and fine mats were often made with Manumea feathers sown into them. Importantly, the Manumea plays a vital ecological role in the Samoan rainforests by distributing the seeds of our native Samoan forest trees. It is a large fruit pigeon (38cm) with relatively short wings and is not considered a very strong flyer and was observed to spend some time on the ground. It was apparently never a very numerous bird and in the 1890s there was already reference to it being hard to find.

The reader is referred to the Recovery Plan signed off by the Minister of Natural Resources & Environment (MNRE 2006) for detailed information on the knowledge of the species at that date.

The current project started work in October 2009, aimed initially at tackling Objective 5 within the Manumea recovery plan: '*Increase the understanding of the breeding and feeding ecology of the Manumea to aid species recovery*' and a similar objective in the Ma'oma'o one. However insufficient resources and difficulties in finding a potential study population led to its aims being significantly reduced. It undertook some surveys, but its main achievement has been to foster discussion about the future management of the species and bring together a large group of people internationally who are keen to become involved.

Manumea photographed in captivity in 1970s. Photo: Betty Gillespie.

Conservation status

The Manumea is currently listed as **Endangered** with the following criteria:

A2bcd = Reduction in population size (**A**) - based on an observed or estimated population size reduction of 50% or greater over the past 10 years or 3 generations (whichever is the longer) (**2**) based on an index of abundance (**b**), decline in area or quality of habitat (c) and actual or potential levels of exploitation (d), i.e. hunting.

B1ab (ii, iii,v) = Change in geographic range (**B**) – extent of occurrence less than 5000 km2 (**1**) and habitat severely fragmented (a) and continuing decline in (b) area of occupancy (**ii**), area or quality of habitat (**iii**) and number of mature individuals (v)

C1 +2a(i) = Population size estimated to number fewer than 250 mature individuals (**C**) and an estimated continuing decline of at least 25% within 3 years or one generation (whichever is longer) (**1**), plus a continuing decline in numbers of mature individuals.

However during a project workshop hosted by the Government in November 2012 it was agreed that its status needed to be reviewed with the expectation that '**Critically Endangered**' was now appropriate.

Manumea photographed in captivity. Photographer not known.

Findings

Surveys

In November 2009 a team of David Butler and two staff from the New Zealand Department of Conservation, Ralph Powlesland and Les Moran, visited Samoa primarily to trial high-net capture techniques for the Ma'oma'o. They visited two of the eight key areas identified in the recovery plan, Uafato and Matafa'a (one day each), along with Division of Environment and Conservation staff and were guided in the forest by local villagers. No sightings or recent records of Manumea were obtained though Matafa'a people indicated that Manumea were still present.

That same month Butler led a Forestry Division team on a five-day survey of another key area, O Le Pupu Pue National Park, funded by the Japanese International Cooperation Agency. Again no Manumea were detected.

In May 2012 a bird survey was carried out of a fourth key area, the uplands of Savaii, within another CEPF-funded project managed by SPREP. Two four-person teams visited a variety of sites over a 2-week period and obtained only a single uncorroborated sighting of a Manumea by one individual. No calls that could definitely be assigned to this species were heard. One of the teams also spent a day in a fifth area, Aopo Lowlands with no result. Information was also forthcoming that the species can no longer be regularly observed at a sixth site, Tafua Peninsula.

The Savaii uplands were considered a possible stronghold for the Manumea following a 1996 survey in which birds were heard during almost every five-minute count in transects at several sites. It was concluded that this was no longer the case, though whether there had been a significant decline over 6 years or whether there were problems of misidentification in the earlier survey was uncertain. Automatic sound recorders were used at intervals during the Savaii survey and analysing their records may yield further information on the Manumea in the next few months.

Fagaloa Bay with Uafato key site in background. Photo David Butler.

Forest of the Matafa'a key area. Photo: David Butler.

Crater in central part of Savaii uplands. Photo Rebecca Stirnemann.

On the positive side, Stirnemann has seen Manumea on 10 occasions during her two and a half years of field work on Ma'oma'o – each observation of a single adult within or near the water catchments above Apia.

While all these surveys represent snapshots, not a sustained effort at different times of year, they indicate that Manumea are now very rare and apparently in small numbers and scattered in patches of intact forest.

Further surveys are now planned, following up on the recent sightings and going back to Matafa'a and other key areas on Upolu. The priority is clearly to find birds but at the same time consideration needs to be given to how easy it would be to research and manage them. The Matafa'a key area (see below) is an example of a workable study area if sufficient birds persist there as it has reasonable road access and walking tracks through it. By contrast the Uafato key area would be difficult as it takes 1+ hours of walking to access it.

Map of Matafa'a Falelatai key site (source: Manumea Recovery Plan).

Management discussions and international support

Butler prepared two discussion papers on the Manumea in December 2010 and August 2012. The second was circulated to a distribution list of over 30 people who had expressed an interest in contributing to the conservation of the Manumea through the provision of advice, resources or field support. This included representatives of the following overseas organisations: Birdlife Pacific, Captive Breeding Specialist Group of IUCN, Conservation International, Durrell Wildlife Conservation Trust, German Zoological Society for the Conservation of Species & Populations, Healesville Sanctuary, Island Conservation, Louisville Zoo, Massey University, Newquay Zoo, Pacific Bird Conservation, Secretariat for the Pacific Regional Environment Programme, and University of Kent.

A workshop was held in Samoa in November 2012 as one of the concluding activities of the project, bringing together several of these people and staff of MNRE to discuss the future management of the Manumea. It developed plans for future surveys and recognised that a combined programme of field and captive management was necessary to tackle the recovery of the species. Planning and seeking resources for such a programme is the next major step.

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Young Manumea. Photo: Ulf Beichle.

Adult Ma'oma'o colour banded and fitted with transmitter. Photo: Rebecca Stirnemann.

MA'OMA'O

MAO

Ma'oma'o © George Bennett.
*Source MNRE "*Recovery plan for the Ma'oma'o or mao *(Gymnomyza samoensis)*, Samoa's large forest honeyeater*", 2006.*

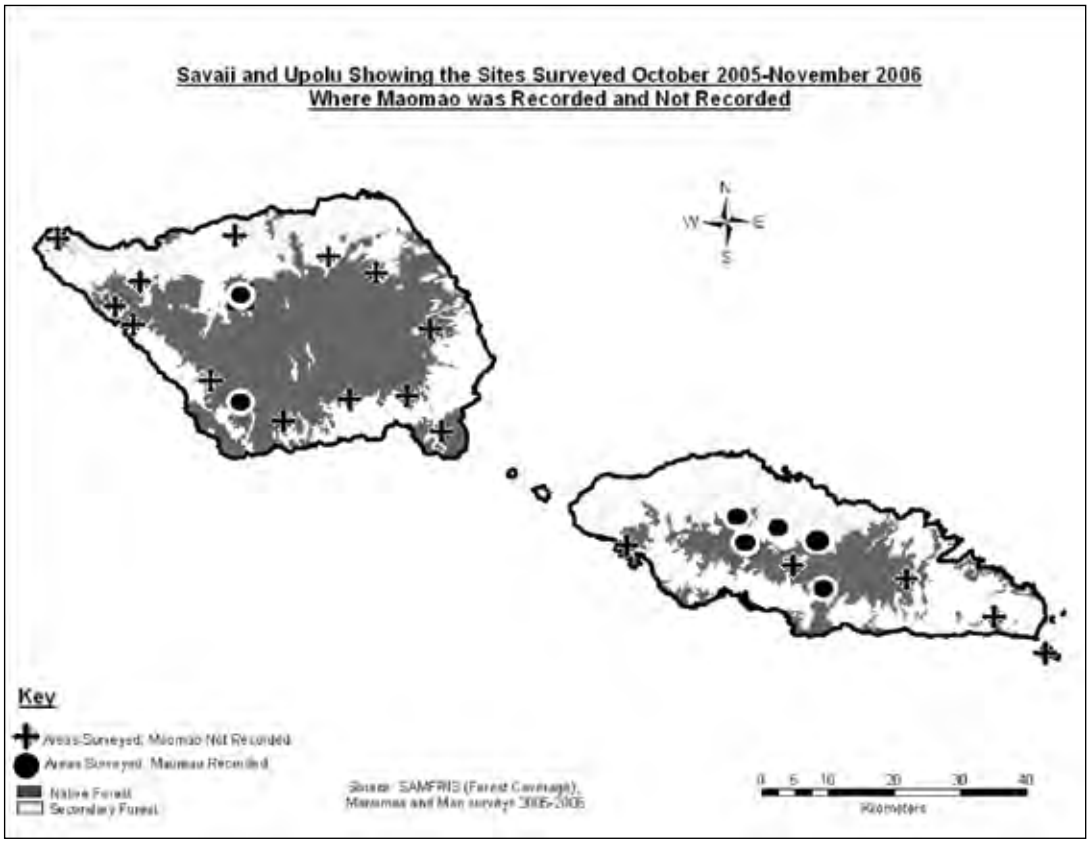
Matiu Fogavai of Magiagi Village with the first Ma'oma'o caught. Photo: D. Butler.

Introduction

The conservation status of the Ma'oma'o

The Ma'oma'o (*Gymnomyza samoensis*) was once distributed through the forests of both American Samoa and Samoa. The Ma'oma'o is now presumed to be extinct in American Samoa and surveys from 2005-2006 suggest population numbers have been declining in Samoa (Fig 1). The Ma'oma'o is currently classified as 'endangered' (IUCN Redlist). The population is considered to be in ongoing decline and in need of urgent attention.
In 2006 the Government of Samoa developed a recovery plan for the Ma'oma'o. The recovery plan (2006) identifies a goal of securing the Ma'oma'o, maintaining its existing populations on Upolu and Savaii, and re-establishing populations at former sites.

Figure 1. Map of Ma'oma'o observations showing the spatial decline of this species (Recovery plan 2006).



Effective conservation action of threatened species requires a sound ecological knowledge (Fahrig & Merriam 1994). There are no current breeding records available on the Ma'oma'o (Watling 2001). The only mention of breeding behaviour describes 2–3 eggs and a nest high up in the fork of a tree (Ashmole 1963). However Watling (2001) suggests the breeding biology of the Ma'oma'o is likely to be similar to the Giant forest honeyeater (*Gymnomyza viridis*) of Fiji of which a single nest has been described. This nest was described as approximately 18–20 meters from the ground in the outer foliage of a large tree. The nest consistent of a fairly substantial basket formed of epiphyte roots. Only a single dependent juvenile Giant forest honeyeater has ever been observed and an extended period of dependence post-fledging is likely. A single offspring would suggest slow recruitment levels in this species.

The introduction of alien taxa has played a key role in avifauna extinction and declines, especially on isolated islands Samoa is unlikely to be an exception. Currently Samoa has three introduced rat species, ship rat (*R. rattus*), Norway Rat (*R. norvegicus*) and Pacific rat (*R. exulans*). There is no detailed information on their abundance and distribution currently available. However, all three species have been shown to be a threat to nesting birds on New Zealand islands. Feral cats can also have a strong impact on ecologically naive island species by removing chicks after they fledge or adult birds whilst near the ground.

Ma'oma'o habitat has been significantly reduced over the last few decades. The amount of forested land area in Samoa has declined by 18% from 1987 to 1999. In addition to loss of forest, the quality of the forest that remains has become more degraded. An analysis in 1999 identified 32% of the total forest cover as 'open' forest (less than 40% tree cover) and less than 0.05% as 'closed' forest, largely as a result of Cyclones Ofa and Val. An additional 24% of the forest cover is classified as secondary re-growth forest. As a result the montane forest in Samoa is now extremely open and patchy and thus has less food resources for birds and is increasingly vulnerable to invasive weeds. Loss of forest is likely to affect Ma'oma'o by 1) reducing breeding feeding habitat, 2) reducing the amount of good quality habitat through an increase in fragmentation and 3) opening the forest to an increase both the abundance and diversity of invasive species.

In this study, we provide detailed data on the basic breeding biology and ecology of the Ma'oma'o, including timing of breeding, nest site selection, egg characteristics, clutch size, length of incubation and nestling period, reproductive output and breeding dispersal. Specific research questions raised in this study include:

- Is there a particular breeding season and for how long does it continue?
- How many eggs are laid in an average clutch?
- What is the duration of the incubation and nestling periods?
- What is the role of the female and the male during the incubation and nestling stages?
- What happens after the fledglings leave the nest and what is the length of the dependence period?
- What threats are there to this species?
- What are the species habitat requirements?
- What are the species dietary requirements and do they vary over time?
- What is the reproductive success of the species?

Study site

Samoa consists mainly of two large islands, Savaii and Upolu, which lie in the South Pacific between latitude 11˚and 15˚ S. and longitude 168˚ and 173˚W. Both islands are over 1,000km^{2}and are mountainous with a maximum elevation of 1,900m.The main wet season is in December to March but there is a high rainfall at high elevation all year (approx. 600–800 mm of rainfall annually). The disturbance ecology of Samoa includes cyclones which occur relatively frequently (four storms over 50 year period, Elmqvist et al. 1994). Tropical rainforest once covered the majority of the main islands of Samoa.

The Ma'oma'o population was intensively monitored at two study sites. The first site is located 3 km from Magiagi village in the Vaisigano water catchment (Upolu Island, S13˚54.5, W171˚44.3). It encompasses steep ridges and steep slopes (average slope 18˚) up to 300 m a.s.l., as well as a large flat area at the base of the valley and reaches dissected by many creeks. The high flat elevation area has been planted with banana and taro crops but large trees still remainthat are utilised byMa'oma'o. The habitat also has a high density of introduced Tamaligi (*Falcataria moluccana*) containing native mistletoe (*Loranthus samoensis)*as well as other introduced trees such as the African tulip (*Spathodea campanulata*).

The second study site was located near Lake Lanotoo at S13˚90.817,W171˚80.645 at approximately an elevation of 700m.This site encompasses steep ridges and steep slopes which still retain dense forest and a large flat valley where some clearing of the understory for agriculture has occurred but where large native trees still remain.

Methods

High and low canopy mist-netting techniques were used to capture birds using playback of theircalls as a lure over June 2010–January 2013. In the territories of known pairs 'cold' searching techniques are used to locate nests. Following detection some Ma'oma'o nests were protected from rat predation by fitting a 30 cm high metal ring around the trunk of the nest tree. Active nests were monitored regularly every 1–4 days using visual checks, and by observing parental behaviour from a distance. When possible, a nest camera was placed above active nests for continuous monitoring. However, in some cases camera failure meant constant footage was not available.

Observations of breeding behaviour were made on all nests. In order to record breeding behaviour and nestling dietary requirements, we observed the nest sites visually during incubation and during the nestling stage as well as filming at the nest.

All newly fledged chicks (easily determined by colouring and behaviour) found at either of the study sites were observed for up to 1 hour one to two times per week (with at least 3 days between observation periods) until the fledgling was no longer present on the natal territory. The amount of time the parent bird spent feeding the fledging was averaged over the length of time they were observed and any observation period that was less than 10 min was not included for analysis .Adults with chicks were located by eliciting a response from the parents to a playback call or listening for the begging calls of a chick.

After fledging or nest failure we described the nest site and measured height from the ground, nest diameter, DBH of nest tree, nesting material and nesting cover.

We collected standard morphometric data from each captured individual. Body mass was taken using a Pesola spring scale (accuracy 0.01 g) and morphological measurements of bill, tarsus and wing length were also taken. Captured birds were banded with coloured split rings and metal bands (NZ banding scheme). Radio tags were fitted with a back-pack body loops and a break point breast strap.

Left: Telemetry.
Right: Gettting dropped off by the NZ Air Force for the survey in the uplands of Savaii.

Findings

Ma'oma'o were monitored from mid-June 2010 – November 2012 at regular intervals (minimum of twice fortnightly) during all months except January and February.

Identification of Ma'oma'o sex and age

The following characteristics were identified:

- Male Ma'oma'o- larger than female, blue eyes
- Female Ma'oma'o- Smaller than male, brown eyes
- Male and Female calls vary and can be used to differentiate sex
- Juvenile- shorter beak, brown eyes intially changing colour until approximately 2+ months post-fledging, makes loud continual begging calls

Timing of breeding

Ma'oma'o pairs have a prolonged reproductive season though there appears to be a peak in breeding in June-October.

Nests

We found 15 Ma'oma'o nests. All nests were similar in structure and material compositionand were constructed of young branches from various trees (Fig. 1) and contained little lining. All nests were oval in shape, 14 ± 1.8 cm across the longest side, and 8 ± 1.5 cm wide at the widest point. At no time did any of the intensively monitored pairs (12 in 2011 and 17 in 2012) produce more than one chick in a year.

Figure 2. The Albizia/mistletoe nest and egg of the Ma'oma'o from Upolu, Samoa. November 2010. Photo Fialelei Enoka.

Ma'oma'o pairs are territorial and territory defence was observed. The nest site appeared to be the focus of the territory during the breeding season.

The egg

The eggs were oval in shape. The background colour is buffish white to pink with pinkish brown markings on one end of the egg (Fig. 2). The markings formed irregular shaped spots. Observations to date suggest each clutch is composed of only a single egg or chick (Fig. 2, Fig 3).

Figure 3. The Albisia/mistletoe nest containing the single chick of the Ma'oma'o from Upolu, Samoa. November 2010.

Observations from nests that fledged young suggest the egg takes +19 days until hatching, and chicks fledge approximately 21–22 days later. So the period in the nest is approximately 40+ days from hatching to fledging. A juvenile is dependent on the adult for an additional 2–2.5 months post-fledging during which it remains in the adult birds' territory.

Only the female was observed incubating the egg. Feeding of chicks both in the nest and post fledging also appears to be almost exclusively performed by the female. However, on three occasions the male was observed feeding the female a grub which she in turn feed to the chick. Both the male and the female were observed performing nest defence, driving other birds away from the nest. The food items that could be identified being fed to the nestling included long dark coloured grubs obtained from under the bark of branches of trees such as *Albisia* and breadfruit (*Artocarpus altilis*). Most of the food items fed to the chick ranged from 1-3cm in length. In addition, a green insect, possibly a caterpillar, was also observed being fed to the chick. Geckos and lizards also seem to form an important part of the chick diet at our study sites.

The nestling's faecal sacs were removed by the female Ma'oma'o and discarded directly below the nest. The female was never observed flying away with the faecal sacs.

Ma'oma'o chick in nest.

Nestling development and fledging

The newly hatched nestling was blind, naked and had pink-purplish skin, a yellow-coloured culmen, pale-yellow gape flange, and the inside of the mouth was bright yellow without any tongue spots (Fig 4).

Figure 4. Newly hatched Ma'oma'o chick.

The first feather tracts erupted when the nestling was 9-10 days old and the culmen darkened to a horn colour (Fig. 5).

Figure 5. A 9-10 day old chick with feathers beginning to erupt.

Just before fledging the chick filled the entire nest. It was active, standing on the side of the nest and stretching its wings. The plumage of the nestling was olive, similar to that of the adult female but with a darker head than the adults' (Fig. 6).

Figure 6. A 19 day old chick two days prior to fledging.

At this stage the eyes of the chick were milky brown. Pin feathers on the face and down on the head are obvious and are present for a few days post-fledging. The beak was bright yellow with a dark grey culmen, which gradually became darker with age. Unlike the adult birds, the beak of a fledgling is not curved.

Fledging proceeded over several days, the young gradually moving out on supporting branches during the day and returning to the nest at night. The female would perch in the branches above the nest to sleep at night after the chick was approximately 12 days old. The nestling fledged at a mass that was 50% of the adult female's mass, a tarsus that was 90% that of the adult female's length and a wing length that was 80% of the adult female's.

The chick flew poorly for the first 2-9 days after fledging and spent some time on the ground. Once away from the nest, the chick was highly vocal in soliciting food. Feeding rates at this stage were as high as 23 times per hour. After 3-4 weeks the fledgling was observed trying to forage independently but the majority of the food at this stage was still accepted from the female.

A 2 month old juvenile was captured and weighed and measured. The iris of the juvenile was almost completely blue with a small ring of brown around the pupil (Figure 7). At this age a gape is still visible and the beak is almost completely black in colour.

Figure 7. Juvenile Ma'oma'o approximately two months post-fledging showing the iris and beak colour at this age.

Nest predation

The predation event of one Ma'oma'o nest was recorded by nest camera during the night at 00.41am on the 29/11/2010 (Fig. 8). This took approximately seven seconds in total and occurred whilst the female Ma'oma'o sat on the nest incubating an egg. A rat identified as the black rat (*Rattus rattus)* jumped onto the incubating female's back from the branch above, driving her off the nest. She flew down and out of the nest. At later sightings she did not appear to be injured though she did lose a number of feathers in the attack. The rat removed the egg whole from the nest and carried it off in its mouth. The rat left no evidence of egg fragments or destruction of the nest. Following the predation event there was no sign of either adult, but parental birds could only be detected if in view of the camera so they might have been close to the nest. In the 15 days following the event the adult birds remained in the territory.

Figure 8. Ma'oma'o nest predation by *Rattus rattus.*

Rat protected tree with a Mao nest.

Life history traits of the Ma'oma'o

The Mao has a slow life history and an extended breeding season increasing its vulnerability to predation.

- 1 egg is produced per clutch
- Long period of dependency: 2-2.5 months post fledging. Full breeding period takes 3.5-4 months per chick.
- The female does all incubating and chick feeding, male is present and defends chick and nest from other birds
- Ma'oma'o re-nest if they fail during the breeding season
- Ma'oma'o do not appear to re-nest if they are successful in producing a chick
- The species is territorial with high site fidelity
- Breeding season May-Feb. Peak in June-Oct coinciding with bud burst (July) and increased insect abundance and in Sept-Nov an increase in flower production.

Ecological requirements

HABITAT

- The Ma'oma'o only occurs in areas with a canopy layer of trees. It does not occur in logged areas with no large tree canopy cover. But Ma'oma'o are present in modified habitat such as areas with plantations where large trees still remain.
- Most of the time this species is in the high canopy layer but it also spends considerable time foraging on the trucks of trees and also feeds on nectar on the ground (ginger) and in low bushes (ie. *Heliconia*). The female also spends some time foraging under dead leaves on the ground to feed the fledgling.
- Ma'oma'o appear to select territories with high tree species diversity and with appropriate nectar sources and an appropriately large singing tree for the male.
- Trees near a commonly used territory singing tree are selected for nesting. No particular tree species is used for nest building but all nests are higher than 5 meters from the ground.

DIET

- Adult- In the early dry season Ma'oma'o primarily forage for invertebrates (and potentially reptiles like geckos and skinks) by probing dead material and searching through mossy areas in trees.
- From June/July following leaf budburst more invertebrates are gained by gleaning. Nectar is likely to be an important energy source during the breeding season. Nectar from native and non-native species are used: *Heliconia*, coral tree, ginger flowers, some orchid flowers, mistletoe, African tulip, etc. A Ma'oma'o pair will defend nectar sources from other species, in particular other honeyeaters.

REPRODUCTIVE SUCCESS

- Average annual reproductive success of Ma'oma'o was 0.33 (n=29) chicks surviving through to the post-fledging period per adult female per year. However in areas near plantations annual reproductive success is lower at 0.125 (n=8) chicks per adult female – note the lowersample size.
- Maximum reproductive success if pairs do not re-nest is 1 chick per female per year. If a female does re-nest maximum reproductive success is still no more than 2 chicks per female per year.

Nest survival- Survival appeared to be lower in populations breeding near plantations (which also appeared to have higher rat numbers) but sample sizes of Ma'oma'o breeding pairs in plantations were too small to verify this statistically. Therefore we used artificial nests as a proxy to determine which factors influenced nest predation. Results showed that nests within 50 meters of a plantation were significantly more likely to be predated than nests in forested areas and nests near plantations were 40% more likely to be predated. Local scale effects such as nest height or local site vegetation did not significantly affect predation rates.

SURVIVAL

Identification of factors that limit population growth is essential for taking conservation action but this requires an understanding of the life history stages at which species are limited.

Nest predators- We captured footage of one nest predation by the black rat (*Rattus rattus) and observed a rat running out towards a branch at towards a nest at two other periods.*. The female was on the nest at the time and did not attempt to protect the nest. Other potential predators are the barn owl, wattled honey eaters (however the adults can potentially drive these species away from the nests) and Pacific boas (in low numbers) but these are considered likely to have little effect on reproductive success of the Ma'o ma'o.

Juvenile survival- During the first 2 weeks after fledging most chicks were poor fliers and spent some time on the ground and on low vegetation. During this period they are likely to be at risk from cats.

Adult survival- 2 adult females disappeared during the breeding season. Females are potentially predated on the nest. The Ma'oma'o population is potentially biased towards males.

There was no evidence that invasive myna birds have any major impact on Ma'oma'o survival.

FUTURE MONITORING OF THE SPECIES

Experience from this study suggests the presence of adult birds does not indicate that birds are successfully producing chicks.Therefore it is critical to monitor reproductive success to understand what factors are affecting the reproductive success of the population.However even with intensive fieldwork insufficient nests will be found to provide a meaningful long-term measure of breeding success. The alternative approach to measuring breeding success is to monitor territories for fledglings, which can be detected by their conspicuous call and which due to their prolonged parental requirements will remain in the territory for extended periods of time. Systematic visits to territories every month may be an effective method in detecting successful breeding attempts (i.e. the presence of fledglings), although unsuccessful nesting attempts would go undetected.

Conclusions as to why the species is declining

With an decrease in native forest cover there has been an expansion of plantations. This pattern is likely to continue and has had two important consequences 1) loss of habitat for Ma'oma'o and 2) changes in non-native rat abundance. Increased rat abundance increases nest predation rates. Bird species with slow island life history strategies (one chick, long dependence period, low maximum reproduction) are more sensitive to increased nest predation than other species. The additional probable nest predation of adult females on nest is also likely to be contributing to the decline of the species. Upolu forest has become increasingly fragmented over time. However Savaii retains a large area of upland forest that could be a potential refuge/source for the species if rats are in lower numbers or absent. It is now critical to determine if the uplands of Savaii are a refuge from rats and thus providing an important source of young Ma' ma'oo.

THE FUTURE

A workshop was held in Samoa in November 2012 as one of the concluding activities of the project, bringing together several experts and staff of MNRE to discuss the future management of the Ma'oma'o. Plans were developed for future surveys and research and reintroduction to American Samoa should be investigated. Planning and seeking resources for such a programme is the next major step.

References

Ashmole, M.J. 1963. *Guide to the Birds of Samoa*. Pacific Scientific Information Center, B. P. Bishop Museum, Honolulu, Hawaii.

Fahrig, L., and G. Merriam. 1994. Conservation of fragmented populations. *Conservation Biology*. 8: 50-59.

Watling, R. 2001. *A Guide to the Birds of Fiji & Western Polynesia.* Environmental Consultants, Fiji.

Measuring the wing of a Ma'oma'o.

loooking at moult in a Ma'oma'o chick.

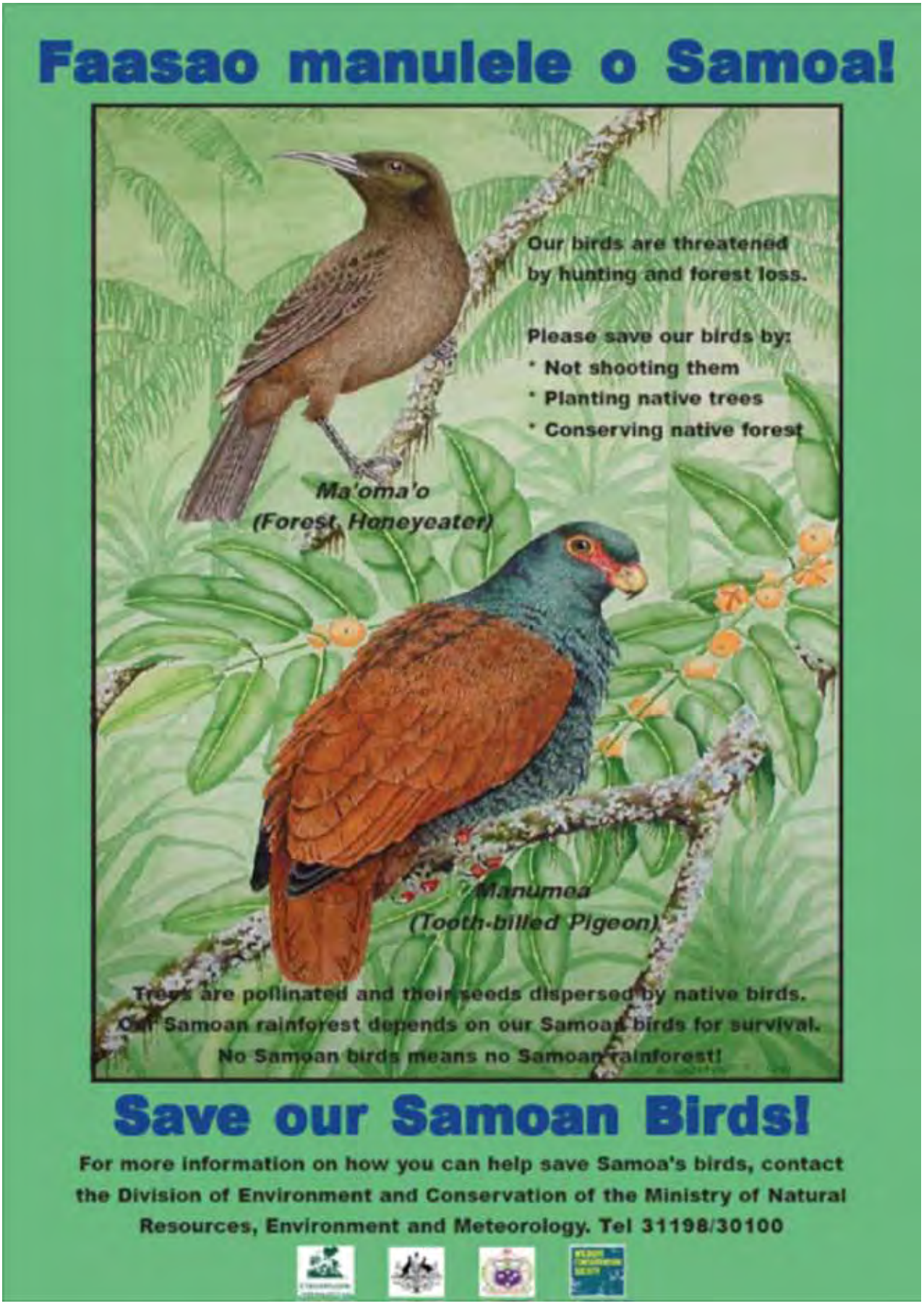
Measuring the wing of a Ma'oma'o.

Fealele Enoka with a Mao: one in the hand is worth many in the bush.

Field research, Samoa.

Ma'oma'o chick in nest fitted with remote camera.
Photo: Rebecca Stirnemann.

Rebecca Stirnemann (r) & Fialelei Enoka (l) extracting bird from mist-net.



An example of historic advocacy. Local poster encouraging the community to protect local bird species.

CEPF Large Grant Final Project Completion Report

Leading the recovery of two of Samoa's most threatened bird species, the tooth-billed pigeon (*Manumea*) and the mao (*Ma'oma'o*) through ecological research to identify current threats

Organization Legal Name

David Butler Associates Ltd

Project Title

Leading the Recovery of Two of Samoa's Most Threatened Bird Species, the Tooth-Billed Pigeon (*Manumea*) and the Mao (*Ma'oma'o*), through Ecological Research to Identify Current Threats

Date of Report

February 2013

Report Author and Contact Information

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CEPF Region

Polynesia-Micronesia Hotspot

Strategic Direction

3. Safeguard and restore threatened species

Grant Amount

$176,653

Project Dates

1 October 2009 – 31 December 2012

Implementation Partners for this Project

Please explain the level of involvement for each partner

David Butler Associates Ltd – Project Management and provision of expert support.

Ministry of Natural Resources & Environment, Government of Samoa – Significant in kind-support in the form of staff time to assist with community liaison, coordination of fieldwork, participation in fieldwork, provision of office and logistical support, and liaison within Government.

New Zealand Department of Conservation – In-kind support providing the time of several staff to provide expert assistance in the field in Samoa and technical assistance including the development of remote nest cameras.

Massey University, New Zealand – In kind-support providing the time of two lecturers to supervise work of Rebecca Stirnemann to undertake PhD research on Ma'oma'o including assistance in the field in Samoa and participation in species recovery meetings. Administrative support for Stirnemann who was the key contributor on the Ma'oma'o aspect of the project.

Magiagi Village, Samoa – Village approved the use of their land for field research, provide occasional field assistants and participated in workshops and meetings to discuss the conservation of Ma'oma'o.

Secretariat for the Pacific Regional Environment Programme (SPREP), Samoa – provision of library support to PhD student.

A large number of other international agencies contributed by providing time for their staff to participate in discussions about the conservation of the Manumea in particular and in some cases they supported travel to meetings in Samoa.

Conservation Impacts

Please explain/describe how your project has contributed to the implementation of the CEPF ecosystem profile

1.0 Summary and link to CEPF Investment Strategy

The Manumea or tooth-billed pigeon (*Didunculus strigirostris*) and Ma'oma'o or mao (*Gymnomyza sameonsis*) were listed as two priority species for CEPF investment in this hotspot and link to the opportunity identified to ' improve the conservation of threatened terrestrial species, especially those that are most endangered, require species-focused action and are taxonomically distinctive'. Both are listed as endangered by IUCN, both are endemic to Samoa and the Manumea is the only surviving member of its genus.

While the Manumea had been the subject of some research in the 1980's, the Ma'oma'o had not been studied before this project. The project concentrated on the latter, in part due to the limited resources available and in part to the difficulties of finding a study population for the former. We now have a much clearer understanding of the ecology of the Ma'oma'o and the threats to its survival and are confident that it is not in imminent danger of extinction. There are options for some species-focused actions for Ma'oma'o including translocations, but its long-term recovery will depend on the management of large areas of suitable habitat.

The Manumea on the other hand is now considered closer to extinction than previously thought and it is recommended that its status is changed to 'critical'. This study carried out limited surveys and CEPF also funded a full biodiversity survey of upland Savaii, previously considered a potential stronghold of the species, and together they paint a bleak picture of very few birds encountered. Focused action on this species is a very high priority for future work.

CEPF identified its 'niche' as catalyzing action by civil society to counteract threats to biodiversity. The project has successfully engaged the community of Magiagi in the Ma'oma'o study and they continue discussions with the Government on the management of their key site which is also a water catchment. The student who undertook the research on the Ma'oma'o, Rebecca Stirnemann has also played a role in the formation of a new NGO in Samoa provisionally named the Samoa Conservation Society.

2.0 Background

The Manumea and Ma'oma'o are the first two of Samoa's endangered birds to have recovery plans published following a programme of surveys and community consultations in 2005/06, supported by the World Conservation Society and the Government of Australia through its Regional Natural Heritage Programme. Both species were 'upgraded' from 'vulnerable' in 1994 to 'endangered' in 2000 (IUCN Redlist) and were considered in ongoing decline and in need of urgent attention. While loss of forest habitat was a key threat in the past, what was impacting on remaining populations was less clear, so both required 'species-focused' action. Hunting might be a factor for the Manumea and predation and shortages of food could be issues for both. This project was designed to identify the current threats to the two species by detailed ecological research using an 'adaptive' approach and to engage the community in this research and subsequent management of their populations.

3.0 Project Approach

The project is focused on Recovery Plan Objectives 5 for Manumea and 3 for Ma'oma'o which are both entitled 'Increase the understanding of the breeding and feeding ecology of (the species) to aid species recovery.' This is seen as a necessary first step before management regimes can be designed for each species within community-based or national park management plans. The conservation of both species would involve their management in areas under the traditional ownership of local communities. So the project was been designed in a way to involve them from the outset.

The initial research was planned to involve the application of the most recent field techniques including capture in highrigged mistnets, radio-tracking and remote photography at nests. The most cost-effective approach was identified as utilizing one to two students to undertake PhD's supported by local assistants and technical advisers. The two students might each work on a different species, or on a different aspect (e.g. feeding and ranging, or breeding) of both species. It was also proposed to create at least one MSc, working through University of the South Pacific or National University of Samoa, to undertake a specific project in year 2 or 3 which would be defined after the first year's field study. In the event, the funds allocated together with significant exchange rate fluctuations only allowed one PhD student to be recruited.

Studies were to be concentrated on a small number of study areas based on the 'key areas' for the conservation identified for each species in their recovery plans. There were 8 areas listed for the Manumea, five on Upolu which were logistically simpler and thus the priority for assessment. The

first area listed is O Le Pupu Pue National Park where a bird survey was planned to be undertaken shortly within a Japanese International Cooperation Agency (JICA) project so this will assist this assessment. Six areas were listed for the Ma'oma'o, 5 on Upolu. One of these areas the Vaisigano River catchment was seen as a very likely study site for 4-6 territories were identified there in 2008 by a team including Dr Butler and individual birds readily observed.

Local people from Samoan agencies and village communities whose land is chosen as study areas were to assist with the research in the field and thus develop their own skills. Provision will be made for them to obtain additional training as appropriate.

Raising public awareness about the species and steps required to conserve them would be the subject of specific activities, aimed first at community leaders responsible for the management of customary land of the study areas and other key sites for the species, then at the wider public.

4.0 Results – Manumea

Please refer to the section on Manumea: page 11 of this publication.

5.0 Results – Ma'oma'o

Please refer to the section on Ma'oma'o: page 19 of this publication.

6.0 Cyclone Evan

Severe Tropical Cyclone Evan struck Samoa on 12 December 2012 causing widespread damage and flash flooding, particularly on Upolu, leaving 12 people dead and destroying almost 700 homes and power and water supplies. With winds up to 201km/h this was the most devastating cyclone to hit Samoa since Cyclone Val in 1991.

A team led by MNRE conducted a brief assessment of its impacts on forest and terrestrial biodiversity on the 18th visiting 59 sites (see map below). It noted that vegetation on the coastal plains and other mid-elevation areas had been highly impacted compared to many high elevation forest areas that were still intact and unaffected. (Rapid Disaster Team. Unpubl. Report for Disaster Advisory Council, 20 December 2012. 9pp.).

Some key observations were as follows:

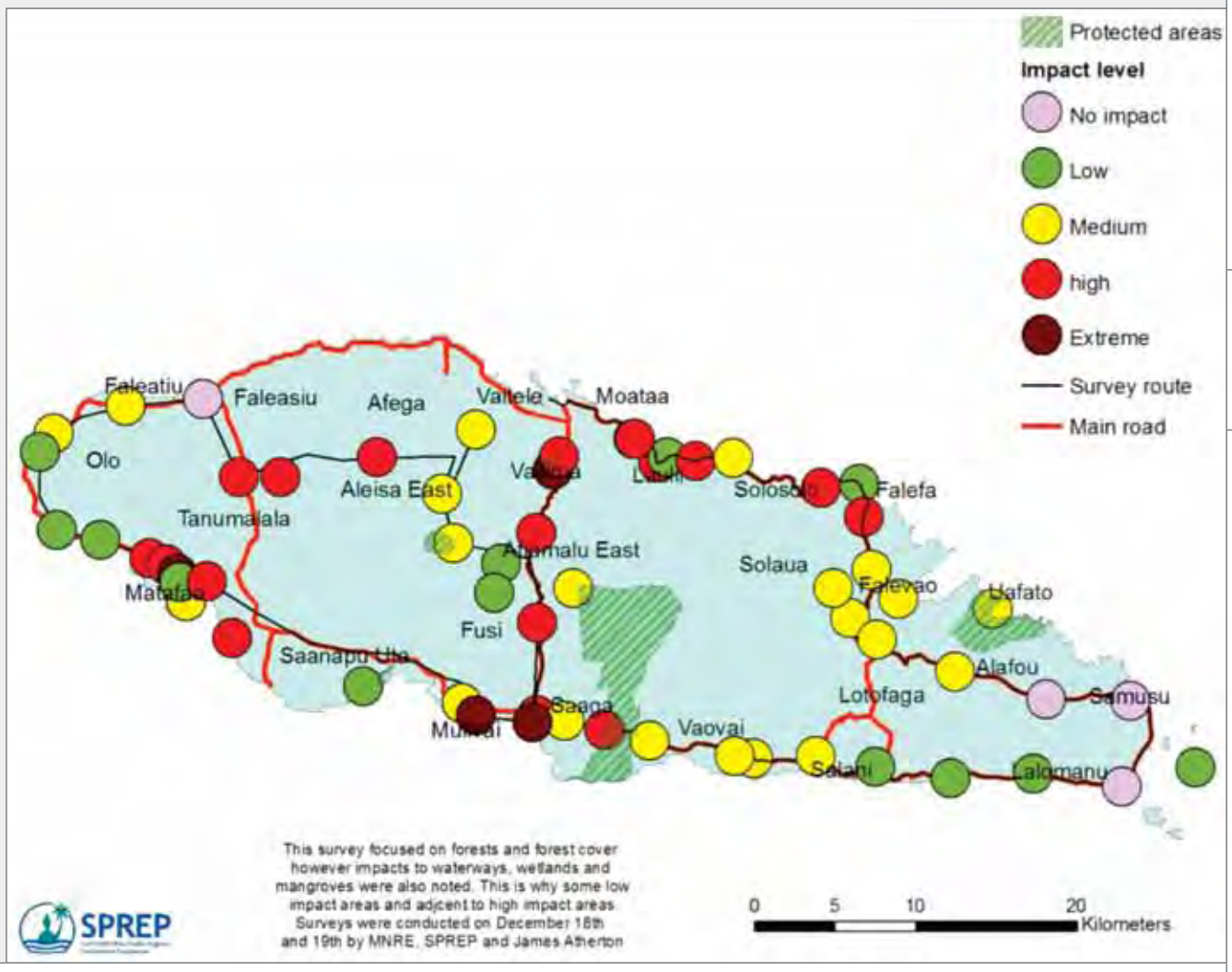
- The severest forest damage observed was on the southern coast of Upolu from the Matafaa area (Lefaga district) to Falealili District. Mt Vaea in north central Upolu was also severely impacted perhaps because of its exposed aspect.
- The strongest cyclonic winds on Upolu appeared to be from the south and south west with greatest impacts on south and south west facing slopes.
- Greater damage appeared to be in the lowland than the upland areas of Upolu.
- Forest damage appeared greatest in secondary forest areas dominated by introduced species such as *Albizia spp.* (Tamaligi) and *Spathodea* (Faapasi or African tulip).
- Patches of native forest remain in mangrove areas, sheltered valleys and within craters – these are important refugia for native biodiversity and every effort should be made to protect these sites.

- Native wildlife (flying foxes, pacific pigeons and doves etc) are easily seen because of the defoliated forest and therefore potentially hunted more easily.
- Approximately 80–90% of all Reserves and National Parks in Upolu have been highly devastated.

The report's immediate recommendations focused on the conservation of remaining wildlife habitats and highlighting the ban on hunting native birds in the aftermath of the cyclone. The Manumea and Ma'oma'o were identified as two species of particular risk. Detailed follow-up is needed to assess the impacts on the two species in detail. Indications are that secondary forests were more seriously affected which is likely to have led to losses of Ma'oma'o. Some areas of primary forest, the habitat of the Manumea, lost significant numbers of trees and most were completely defoliated making surviving birds very vulnerable to hunting. Reviewing the map it looks like 3 out of the 5 key areas identified for Manumea and Ma'oma'o in their recovery plans had high levels of damage including the Matafa'a one shown earlier in the Manumea section of this report.

Stirnemann visited in January 2013 to check on her Ma'oma'o study populations. She recorded that most trees in the cyclone area had all their leaves/fruit/flowers completely removed and that many birds changed their foraging patterns. Rat numbers appeared to be increasing since the cyclone and a major increase in nest predation rates would be expected with consequential impacts on population numbers. The Magiagi Important Bird Area, one of the study sites, was very heavily impacted by severe flooding.

Map of Cyclone Evan's Impact (Source: report of Rapid Disaster Team):



PLANNED LONG-TERM IMPACTS - 3+ YEARS (AS STATED IN THE APPROVED PROPOSAL):

Programmes are in place at sufficient sites to improve the status of the Manumea and the Ma'oma'o so that they are under no immediate threat of extinction. Several key habitats for each species are protected from logging, and communities and Government agencies are actively involved in their management. Projects have been started to address all the objectives specified in the two recovery plans. Lessons learned from research on these species have been applied to the management of others both in Samoa and elsewhere in the region.

ACTUAL PROGRESS TOWARDS LONG-TERM IMPACTS AT COMPLETION:

A workshop held in November 2012 as one of the project's final activities reviewed the recovery plans for the two species and noted limited activity outside of this project and none of the recovery plan objectives had been addressed in detail. This reflects the reality of limited resources within Government and the lack of a strong bird-orientated NGO in Samoa. The Government and Magiagi village are now more aware of the values of the upper Vaisigano River catchment and discussing its management.

PLANNED SHORT-TERM IMPACTS - 1 TO 3 YEARS (AS STATED IN THE APPROVED PROPOSAL):

Detailed information has been gained on the breeding and mortality of the Manumea and Ma'oma'o. This has led to the identification of the key threats to the two species and efforts have begun to address these. One or more local communities are actively engaged in the conservation of these species through the management of their lands. Government staff have taken their field conservation skills and experience to a new level.

ACTUAL PROGRESS TOWARDS SHORT-TERM IMPACTS AT COMPLETION:

Detailed information has been obtained on one species, the Ma'oma'o, and there is discussion of translocations of birds to new sites. Other species-specific management to address threats does not seem to be needed urgently and the shorter focus should be on conserving and enhancing forest habitats for a range of species including the Manumea and Ma'oma'o. Work on the Manumea found no significant population that could be the subject of work to identify threats so further survey work has become an urgent priority. Magiagi village landowners have agreed not to cut areas of forest within a key site for Ma'oma'o. Ministry of Natural Resources and Environment staff have been closely involved in fieldwork on the ground and gained experience of a wide variety of bird research techniques including high netting, banding, radio telemetry, nest finding and the use of cameras to monitor breeding.

Please provide the following information where relevant

- *Hectares Protected*: N/A
- *Species Conserved*: One (Ma'oma'o)
- *Corridors Created*: N/A

Describe the success or challenges of the project toward achieving its short-term and long-term impact objectives.

Short-term objectives have been largely achieved for one species, the Ma'oma'o. Exposing Government staff and community members to detailed research on this species has raised awareness and increased field expertise that should contribute to long-term objectives. The project has also developed significant international support for the conservation of Manumea that should help ensure that concerted action is taken to prevent its extinction.

Were there any unexpected impacts (positive or negative)?

No.

Please summarize the overall results/impact of your project against the expected results detailed in the approved proposal:

Project Components

COMPONENT 1 PLANNED:

A field research programme is developed for the Manumea (tooth-billed pigeon) to provide sufficient understanding of its breeding and feeding ecology to trial approaches to manage its recovery.

COMPONENT 1 ACTUAL AT COMPLETION:

No research programme has yet been developed. Initial surveys located no areas where there were sufficient Manumea to facilitate study so research concentrated on the Ma'oma'o. There only proved to be sufficient resources for detailed work on the one species though information was also gained on Manumea during the course of this.

COMPONENT 2 PLANNED:

A field research programme is developed for the Ma'oma'o (mao) to provide sufficient understanding of its breeding and feeding ecology to trial approaches to manage its recovery.

COMPONENT 2 ACTUAL AT COMPLETION:

An extensive research programme was developed based on a student Rebecca Stirnemann enrolled for a PhD at Massey University, New Zealand supported by a range of experts, Ministry staff and community assistants. This has generated detailed information on nesting, revealing the significance of rats as a predator, and on feeding and diet so that we now have a good idea of its requirements. We are thus potentially able to manage a site to increase Ma'oma'o numbers by controlling predators and planting food trees if there is a deficiency in this respect.

COMPONENT 3 PLANNED:

One or more local communities are supportive of and engaged in the research programmes and developing the means to assist in the conservation of the two species.

COMPONENT 3 ACTUAL AT COMPLETION:

The Magiagi community who own the land for a key site for Ma'oma'o in the Vaisigano catchment have been involved in the project through village workshops, meetings and the involvement of villagers in the field. They are supportive of efforts to conserve the site and cease any further clearance of it for agriculture.

COMPONENT 4 PLANNED:

The programmes have increased interest in the two species and led to further activities taking place to address recovery plan objectives.

COMPONENT 4 ACTUAL AT COMPLETION:

The Ma'oma'o research programme has increased national interest in this species through various awareness activities lead by Stirnemann. The project, together with the outcomes of a recent CEPF-funded survey of upland Savaii, has raised awareness of the plight of the Manumea and there are now around 10 overseas organisations who have expressed some commitment to its conservation.

Were any components unrealized? If so, how has this affected the overall impact of the project?

Component 1 was largely unrealized as designed. As a result we are not in a position to recommend how to manage the Manumea in detail. However the project has demonstrated how rare it is, which in turn has led to a strong consensus at a meeting in November 2012 on the immediate actions needed including surveys and management in the wild and captivity.

Please describe and submit (electronically if possible) any tools, products, or methodologies that resulted from this project or contributed to the results.

The key methodologies used in the field research were largely based on procedures developed in New Zealand and elsewhere: High-rig mist netting, radio tracking, use of remote video cameras at nests, using artificial nests to measure predation rates and wax tags to monitor rats. Automatic sound recorders developed by the New Zealand Department of Conservation were used in the latter stages of the project.

Lessons Learned

Describe any lessons learned during the design and implementation of the project, as well as any related to organizational development and capacity building. Consider lessons that would inform projects designed or implemented by your organization or others, as well as lessons that might be considered by the global conservation community.

Project Design Process: (aspects of the project design that contributed to its success/ shortcomings)

The project set out to undertake detailed research on two threatened bird species, for which recovery plans had been developed by the Government and international partners in 2006, and submitted an initial budget accordingly. CEPF approved a contribution of US$176,653 about half the requested sum of $353,013 giving a total project budget including support from partners of $341.473 compared to $601,893 originally proposed.

The obvious response to a budget of around half that originally sought would have been to reduce the scope to just work on one of the species. However it was decided to continue to try to work

with both. Resources were initially directed towards the Ma'oma'o as a suitable study area had already been identified and a student was recruited to undertake a PhD through Massey University, NZ to carry out the field study. There had been a hope that a student could acquire a scholarship allowing the budget to recruit a second to work on a PhD or MSc on the Manumea, and that the same area might hold significant populations of both species. Neither of these eventuated and the budget provided was also seriously eroded by currency fluctuations, so work on the Manumea was quite limited. The progress made has largely depended on the principal of the grantee organisation putting in much of his own time.

The lesson here is that principal donors and grantees need to have a robust discussion when the funding offered falls well short of that requested. There's an obvious tendency for grantees and their partners (particularly the Government agency in this case) to be committed to the conservation work proposed and to aim to do 'more with less'. This needs to be countered by hard questioning by the principal donor to end up with a realistic programme. One of the end results of an un-realistic programme is that everyone has to spend time unproductively re- formulating work plans and modifying targets.

Having discussed this lesson, if one of the species had been dropped it would probably have been the Manumea given the difficulties finding a study population. This report will show that useful progress has been made on the Manumea and that we now know that it is the more endangered of the two. There has also been no tangible progress on other objectives within the recovery plan on this species. So it has proved important that it was not dropped. Though the project did not achieve what it set out to do for Manumea if it had not proceeded almost nothing at all would have happened for this bird.

Project Implementation: (aspects of the project execution that contributed to its success/ shortcomings)

RECRUITING A RESEARCH STUDENT TO UNDERTAKE THE KEY ROLE

The research on the Ma'oma'o was based on providing a 3-year scholarship to a student towards a PhD (c.US$71,000 or US$23,750 a year). This is considered to have been a very cost-effective approach to support someone with sufficient experience (from undergraduate and MSc work) in the field for long enough to collect the necessary data on a rare bird. However such a student needs considerable support, particularly when working in a developing country, and this has been provided within this project by the involvement of six experienced scientists making short visits (particularly at the start), Government field staff and local villagers assisting on an almost daily basis, and periodic international volunteers.

Another advantage of this approach is that it should ensure that the project's findings reach multiple audiences, through the donor's usual reporting and the student's work towards a thesis, scientific papers and presentations to conferences. In this case the student also secured additional funds (National Geographic) so that the results will reach a popular audience.

Having an individual working in the field over a long period (2.5 years) helped to build trust with the local village community and the Government. It also facilitated the passing of skills to staff of the Ministry of Natural Resources & Environment (MNRE).

Finally, one person working largely full-time on the project provided the flexibility needed to adjust the programme as new information was obtained. This was particularly important for the Ma'oma'o as at the outset we did not know when its breeding season was and this proved to be spread over a long period.

WORKING WITH VILLAGE COMMUNITIES

This is a challenging issue throughout the Pacific and particularly in Samoa where much of the land is in communal village ownership. The project benefited from the fact that it was not the first time that the different villages involved had been involved in discussions about bird conservation. A national project to raise awareness of the Manumea had been conducted in 1995 funded by the RARE Center for Tropical Conservation and all the villages had been approached either during surveys for the two species in 2006 or in a programme to identify Important Bird Areas in 2008/09. This meant that the project did not need to start with *fono* or meetings with Village Councils which involve relatively significant traditional fees and sometimes generate expectations that funds will flow to the village. Instead we could work through *pulenuu* (village mayors whose role is to liaise with Government), and in the case of the Ma'oma'o, individual landowners. Workshops were held at intervals with the main village associated with the Ma'oma'o work, but probably more important to maintaining productive relationships was the near-daily contact with the project team. The team periodically employed villagers to assist in the field, though this was not without its challenges. It also earned considerable goodwill by doing small things like always stopping to give lifts to villagers heading to and from their plantations.

Ministry staff played crucial roles guiding the project team on how to approach villagers, leading such approaches and communicating with villagers encountered in the field in Samoan. In one such encounter a family were persuaded not to clear any further land for plantations in a particular area when the staff person told them how important their forest was for the Ma'oma'o.

WORKING WITH GOVERNMENT

A project such as this when most of the funding is directed through an NGO and Government is in a supporting rather than leading role, is also challenging. The Government committed to providing US$150,000 of in-kind support and certainly lived up to its commitments largely through making considerable staff time available. One skilled field staff person contributed significantly to the field research through his commitment, observational and tree climbing skills. The head of the Parks & Reserves section provided key day to day support, as did the Assistant CEO (Biodiversity and Conservation). Relationships with staff at these levels were generally very positive and productive, but we did not do such a good job of keeping the CEO of MNRE informed. I think there were three lessons here:

- It would have been beneficial if the grantee and Government had signed an MOU at the outset setting out how the relationship between the two would work
- An NGO grantee cannot assume that other Ministry staff will do a thorough enough job of keeping their CEO informed and needs to take some responsibility for this itself.
- It also cannot be assumed that if there is a change in CEO the new appointee will be adequately briefed on the detail of all projects. The grantee needs to make an approach to enquire if the new CEO would like a briefing on the work.

There were specific issues around money as the CEPF approach meant that funds could not be transferred directly to Government to carry out any aspects of the project. Thus the usual system whereby suppliers are provided with order forms from Government which guarantee they will be paid does not operate. In its absence, suppliers will rarely provide materials or service and invoice for later payment. Instead the project needs to pay cash up front which makes the work of managing the project much more difficult. Greater flexibility whereby some funds could be transferred to Government to undertake specific tasks, e.g. run a village workshop, would be beneficial.

Sustainability/Replicability

Summarize the success or challenge in achieving planned sustainability or replicability of project components or results. Also summarize any unplanned sustainability or replicability achieved.

The key to sustaining project achievements and to tackling the urgent need for work on the Manumea lies with the Ministry of Natural Resources & Environment. At the November 2012 meeting the Ministry re-affirmed its commitment to the recovery of the two species and stated that it would do its best to act on its recommendations. However it has limited financial resources and few experienced staff so that it will require outside support in terms of major funding and expertise.

The Ministry's ability to carry out field activities and to develop funding proposals has been severely constrained by Cyclone Evan which struck Samoa, particularly Upolu Island, on 13 December 2012. Effort has been concentrated on cyclone relief and damage assessment and at the time of writing (February 2013) its work programme has not yet returned to normal.

Additional Funding

Provide details of any additional donors who supported this project and any funding secured for the project as a result of the CEPF grant or success of the project.

Donor	Type of funding*	Amount	Notes
Ministry of Natural Resources & Environment, Government of Samoa	Project Co-financing	US$150,000	Covered involvement of managerial and field staff, office and logistical support.
New Zealand Department of Conservation	Project Co-financing	US$14,820	Covered involvement of two staff in the field and assistance with supply and organisation of equipment.
National Geographic Fund	Grantee & Partner leveraging	US$17,061	Grant awarded to Stirnemann to support work on Ma'oma'o
Rufford Small Grants Foundation	Granting & Partner leveraging	GBP3,500	Grant awarded to Stirnemann to support work on Ma'oma'o
Mohamed bin Zayed Species Conservation Fund	Granting & Partner leveraging	US$5,000	Grant awarded to Stirnemann to support work on Ma'oma'o

**Additional funding should be reported using the following categories:*

A Project co-financing (Other donors contribute to the direct costs of this CEPF project)

B Grantee and Partner leveraging (Other donors contribute to your organization or a partner organization as a direct result of successes with this CEPF project.)

C Regional/Portfolio leveraging (Other donors make large investments in a region because of CEPF investment or successes related to this project.)

Performance Tracking Report Addendum

CEPF GLOBAL TARGETS

Provide a numerical amount and brief description of the results achieved by your grant. Please respond to only those questions that are relevant to your project.

PROJECT RESULTS	If relevant, provide your numerical response for results achieved during the annual period.	Provide your numerical response for project from inception of CEPF support to date.	Describe the principal results achieved during the project term. (Attach annexes if necessary)
1. *Did your project strengthen management of a protected area guided by a sustainable management plan? Please indicate number of hectares improved.*			
2. *How many hectares of new and/or expanded protected areas did your project help establish through a legal declaration or community agreement?*			
3. *Did your project strengthen biodiversity conservation and/or natural resources management inside a key biodiversity area identified in the CEPF ecosystem profile? If so, please indicate how many hectares.*			
4. *Did your project effectively introduce or strengthen biodiversity conservation in management practices outside protected areas? If so, please indicate how many hectares.*	50 ha	50 ha	A village community owning land which is a key area for the Ma'oma'o has expressed a commitment to its conservation and is in discussion with Government.
5. *If your project promotes the sustainable use of natural resources, how many local communities accrued tangible socioeconomic benefits?*			

Information Sharing and CEPF Policy

CEPF is committed to transparent operations and to helping civil society groups share experiences, lessons learned, and results. Final project completion reports are made available on our website, www.cepf.net, *and publicized in our newsletter and other communications.*

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