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Abstract: Conservation is essentially a social activity – it is about, by and for people. Managing invasive species on islands to reduce their “community effects” (that is, effects on communities of people as well as on communities of plants and animals) makes good sense. Consequently, many demonstration projects supported as part of the Pacific Invasives Initiative involve social and economic objectives as well as biological ones. In New Caledonia, for example, dialogue between conservation agencies and local tribes about a proposed pest mammal control project on Mont Panié has been taking place for nearly 10 years. As well as being involved in pest control activities to achieve biodiversity conservation outcomes, there is particularly strong local support for a proposed project to reduce feral pig (*Sus scrofa*) impacts in tribal gardens. It is anticipated that reduced pig impacts will lead to important improvements in peoples’ livelihoods. A proposal to eradicate invasive cane toads (*Bufo marinus*) from Viwa Island in Fiji to protect an endangered ground frog was modified following consultation with local residents to first include the eradication of feral cats (*Felis catus*), feral dogs (*Canis familiaris*), and rats (*Rattus* spp.). These preliminary eradications were undertaken by the residents, with training and support from eradication specialists. Viwa islanders now have the knowledge and skills to ensure their island remains free of these pests. Also, Fiji Vatu-I-Ra Island is an important seabird breeding site. Local residents gave their support for rats to be eradicated from the island. Several people were trained and participated in the eradication operation. In addition to removing predation pressure on nesting seabirds and creating opportunities for an eco-tourism business, another early outcome has been increased measures by the owners to protect the island from further human-induced impacts. These and other demonstration projects are discussed to illustrate attempts at achieving biological, social and economic objectives through managing invasive species on islands.

Key Words: community approach, conservation, invasive species, island conservation.

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INTRODUCTION

Conservation is essentially a social activity – it is about, by and for people. Managing invasive species on islands to reduce their “community effects” (that is, effects on communities of people as well as on communities of plants and animals) makes good sense. Consequently many demonstration projects supported as part of the Pacific Invasives Initiative (PII) involve social and economic objectives as well as biological ones. We discuss three PII-supported demonstration projects where socio-economic objectives have been progressed alongside biodiversity conservation ones.

PEST MAMMAL CONTROL, MONT PANIÉ, NEW CALEDONIA

With a unique and diverse biota, New Caledonia is ranked as one of the world’s “Biodiversity Hotspots”. Many native plants and animals are endemic, and threatened, by human-induced changes including nickel mining, fires, and invasive species. Relationships between New Zealand and New Caledonian agencies have developed in recent years focused on biological similarities between the two Gondwana remnants, and on common approaches to addressing threats to biodiversity in both countries. In the late 1980s, the Maruia Trust coordinated a rapid biodiversity survey at five sites in New Caledonia. In consultation with the Government of Province Nord, it was subsequently decided to develop a conservation management

project at one of these sites, the Mont Panié Special Botanical Reserve in the north-east of Grand Terre. Mont Panié is the highest mountain in New Caledonia. Its flanks are covered with the largest tract of rainforest remaining in the country. With the added support of Conservation International, the 'Mont Panié co-management conservation project' was initiated in 2003.

While there is no nickel mining in the northeast, a combination of fires and a range of invasive plants and animals are leading to significant biological degradation in the Mont Panié area. Important progress has already been made in raising awareness among local people of the impact of fires on biodiversity values, and on peoples' livelihoods. The number of fires being deliberately lit is declining in some areas. Community awareness of invasive species issues has also been raised. Dialogue between conservation agencies and local tribes about proposed pest mammal control on Mont Panié has been taking place for nearly 10 years. In 2003, a visit was arranged to New Zealand (NZ) for a group of local people from Mont Panié so that they could see pest mammal control projects first-hand, and to talk to local stakeholders. In line with an aim to involve and train local people, the Association Dayu Biik was established which includes representatives of Kanak tribes and clans living on the flanks of Mont Panié. The main purpose of the Association is to provide a conduit for communication between the tribes and the conservation project and to ensure local perspectives are properly reflected in decision-making.

Because controlling invasive species typically involves intensive and on-going actions, an important aim of the co-management project is to develop local capacity to achieve pest control targets and to sustain desired outcomes. Initially, six pest mammals have been targeted within the Mont Panié reserve: two species of rat (*Rattus* spp.), cats (*Felis catus*), dogs (*Canis familiaris*), deer (*Cervus* spp.), and pigs (*Sus scrofa*). In addition to causing biodiversity declines, some of these mammals also have economic impacts. The NZ Department of Conservation (DOC) was initially engaged by the project partners to assess the feasibility of these mammals being controlled and of outcomes being sustained by local people. Following its establishment in 2004, the PII facilitated and coordinated specialist inputs to this project. A 3-year 'Proof of Concept' project focused on two activities: controlling rats and feral cats by intensive trapping within a 100 ha trial area

at Thoven, and reducing feral pig impacts on gardens on the flanks of Mont Panié. The rat and cat trapping trial was initiated to determine the feasibility of trained local trappers reducing these pests to low densities. Trapping also allowed for rodent species to be identified and their densities to be assessed. Experienced pest control staff from the DOC provided advice and support in the field, trained local trappers and assisted in data analysis and evaluation.

As a result of the commitment and skills of the local trappers rat control targets were met, leading to some confidence that rat and cat control is achievable on Mont Panié-proper. A larger-scale experimental control project focusing initially on rats and cats is currently being designed to be undertaken within the reserve. If successful, it can be anticipated that this experiment will lead to extensions to the control regime on Mont Panié as well as the initiation of further intensive small mammal control projects elsewhere in New Caledonia. While there are important differences between New Caledonia and NZ the successful control of invasive mammalian predators in Mont Panié forests will result in important biodiversity conservation outcomes, as has occurred in NZ. Community capacity to trap rats may also lead to their reduced impacts on corn and some other garden crops.

In addition to pest control activities to achieve biodiversity conservation outcomes, there is strong support for the development of local capacity to more effectively reduce feral pig impacts in tribal gardens. Many local people are dependent on garden produce for their food and income. Depredations by feral pigs in gardens have led to significant impacts. The traditional practice of growing water taro in terraces has been abandoned. Pigs are now seriously threatening yam cultivation. Yams are a staple in the diet of local people and a pillar of the Kanak culture. Other crops are also being affected. Attempts to reduce pig impacts have included trapping and fencing-off gardens, and burning vegetation surrounding gardens in the hope that pigs will not venture into these open areas. None of these initiatives have been particularly successful. At the start of the 'Proof of Concept' project the President of Province Nord, M. P. Neaoutyine, encouraged the project team to find a solution to the pig problem, suggesting that reducing pig impacts in gardens would lead to important social and economic benefits.

Following a visit by experienced pig hunters from NZ, it was resolved that use of experienced

local hunters and trained dogs was likely to be a key tool, perhaps alongside others, in reducing pig impacts in gardens in the Mont Panié area. Three trained and experienced pig-hunting dogs were brought to Mont Panié and, with their NZ handlers, quickly demonstrated that this technique, indeed, has potential to reduce the pigs-in-gardens problem. The three-dog team (reduced to 2 dogs midway through the 2-month visit when one was killed by feral dogs while holding on to a pig) caught just over 1 pig per hunting day. This capture rate is much higher than what local hunters had been able to achieve using local dogs. A growing number of local men accompanied the NZ hunters on hunting trips to learn first-hand how dogs can be used to effectively catch pigs. By the end of the NZ pig hunters' visit there was strong interest from some local hunters to acquire, train, and hunt with dogs using the techniques demonstrated. Interest was also expressed, and some calls received, for such hunter-dog teams to respond to requests to remove pigs from specific gardens.

This investigation showed that experienced local hunters using trained dogs could potentially address the problem of pig impacts in tribal gardens. While there are still significant challenges to overcome, including identifying and addressing the mechanism which leads to widespread blindness in dogs in the area and the risk of feral dogs disrupting hunting activities, there is very strong local support to develop this approach further. It is anticipated that addressing social and economic objectives by controlling feral pigs around tribal gardens will also lead to further support for biodiversity conservation activities further up the mountain within the reserve. A range of other benefits for people, dogs and native wildlife can also be expected.

With positive results from both the rat and cat trapping at Thoven and from the pig hunting using trained dogs around gardens, discussions are now focused on designing projects to advance biodiversity conservation objectives using intensive experimental predator control at selected sites within the Mont Panié reserve, and establishing a garden protection service to be provided by local hunters with trained dogs using proven techniques. Further meetings have been held with stakeholder groups to report on progress, and with government agencies and other organizations with interests and capacity to support the next phase in this capacity-building programme.

CAT, DOG AND RAT ERADICATION, VIWA ISLAND, FIJI

A proposal by researchers from the University of the South Pacific (USP) to eradicate invasive cane toads (*Bufo marinus*) from Viwa Island in Tailevu, Fiji, to protect the endangered Fijian ground frog (*Platymantis vitiana*) was modified following consultations with local residents to first include the eradication of cats, dogs and rats. The proposal to eradicate cane toads and invasive mammals (rats, feral cats, and feral dogs) was in line with objectives in the Fiji Biodiversity Strategy and Action Plan (1999) to protect and conserve Fiji's biodiversity. Managing the threats posed by invasive organisms is considered a high priority because of the significant effects these pest species have on Fiji's fragile insular ecosystems. Both rats and cane toads are listed as problem species in the strategy.

Eradicating invasive species is a challenging task, especially on inhabited islands. With no record of cane toads having been successfully eradicated anywhere in the world, there was even more reason to advance carefully towards such an outcome on Viwa. It was clear from the outset that in addition to developing new management approaches and techniques, securing the support and engagement of Viwa residents in eradication, and subsequent biosecurity activities, would be critical. Consultation with stakeholders over several years resulted in concerns raised by villagers being addressed in the planning process and implemented as part of the eradication programme. These included water supply, health issues, rubbish disposal, and crop losses to rats.

The essence of the Viwa project is that local residents would undertake cat, dog and rat eradication and on-going biosecurity activities themselves. The development of local capacity to manage invasive mammals would also be a useful step towards the proposed cane toad eradication. Development of this local support and capacity required the community to be involved in all decisions and to be engaged in the full range of management activities. The Pacific Invasives Initiative coordinated a series of meetings and a feasibility study and established a project management team. A project coordinator and two project managers reported to a local stakeholders committee. A Technical Advisory Group (TAG) provided specialist advice from time to time.

The project coordinator is a USP conservation biologist. He was responsible for ensuring that

there was an atmosphere of understanding and trust between all those involved and that everything was in place for a successful outcome. One of the project managers was responsible for facilitating communication between landowners and the heads of the Mataqali (clans), and for managing project staff and their activities on the island. The other project manager was responsible for project logistics, finance, equipment and data collection and analysis. The stakeholder committee included the village chief, the six heads of the Mataqali and a number of women and youths. The TAG consisted of specialists from the PII and the DOC, a local consultant, and government administrators from the Native Lands Trust Board, Fijian Affairs Board and Ministry of Environment.

It is clear that there are important benefits in local residents undertaking an eradication operation. These people have a greater stake in the project, especially where there are anticipated social and economic, as well as biodiversity conservation, outcomes. As a result local residents may be more motivated to achieve project objectives than workers from elsewhere. Another important consideration is that having a skilled, permanent workforce on the island allows effective biosecurity measures to be consistently applied, and for rapid responses to be taken should targeted pests re-invade. An interesting additional benefit from the Viwa rodent eradication project was the promotion by Viwa residents of another rodent eradication operation on a nearby island. There are significant additional challenges in eradicating rats from inhabited islands compared to remote, uninhabited ones. For example, applying toxic baits in and around peoples' homes and managing the risks of rats arriving with freight and luggage present potential problems. Observations from the Viwa project suggest, however, that there may also be important advantages in having resident people present.

Preliminary results from these eradications indicate that feral dogs were successfully removed by local residents without the need for any formal eradication project. Feral cats were informally removed, although we understand one pet cat remains on the island. Once a grid network of cut and marked 'bait lines' had been established over the entire 60 ha island, baits containing the anti-coagulant brodifacoum were repeatedly presented in 1,260 bait stations on this grid until all sign of rat presence declined to zero. Such an effort by a large number of local residents is a major achievement. Observations have already been made of increased

numbers of lizards and birds, and people are reporting improved garden yields. It has even been suggested that there are more fish in fishing areas around the island. This is presumably due to people being involved in the rat eradication rather than going fishing! The village development committee is pursuing the construction of a lodge to provide accommodation for eco- and religious tourism. This potential source of income provides some of the impetus for the continuing biosecurity work on the island, but a recent PII survey showed that not having to deal with rats in houses contaminating food, biting children, and eating clothes was recognized as a major outcome of the eradication.

Sign of at least one rat was found during surveillance checks after the eradication was complete. It was not clear whether this indicated the eradication had failed, or that a rat quickly invaded from elsewhere. Contingency measures were immediately put in place, including putting out more bait in the area where the rat sign was found. There has been no further sign of this or other rats.

Some important lessons have been learned from this project about working with, and empowering, local people. These lessons will be important as further demonstration projects are initiated. Local people have skills and knowledge which will be useful to them as they continue to enhance their own environment. Many of these people are now also strong advocates for invasive species management. Print and television media carried stories of the eradication and religious tourists from many countries around the world have seen what can be done when invasive species management projects address both biodiversity and livelihood issues.

RESTORING VATU I RA ISLAND, FIJI

Vatu I Ra is a small (2.3 ha) island located about 15 km off the north-eastern coast of the main island of Viti Levu. The island is uninhabited but is visited by fishermen who are known to harvest seabirds and eggs. The island has also been used for periodic tourist visits, from which the land-owning community has not derived benefits. Vatu I Ra has been identified by BirdLife International Pacific (BIP) as an Important Bird Area as it supports a large breeding colony of black noddies (*Anous minutus*). Following its declaration as an important bird area, the owners began to work towards establishing an ecotourism business focused on bird

watching on the island. A nearby hotel is assisting in this community venture.

A relationship was initiated in 2003 when the owners of Vat I Ra approached BIP for assistance in managing the island. Two initial surveys and a community awareness meeting were undertaken which led to a proposal by BIP for the rats to be eradicated from the island. There was clear evidence that the rats were preying heavily on seabirds and their eggs and chicks. This proposal was supported by the community. Funding for the rat eradication was provided by the Australian Government's Regional Natural Heritage Program through the Critical Ecosystems Partnership Fund. PII support included assistance to BIP staff in designing the operation and facilitating specialist inputs from an experienced DOC practitioner to refine techniques and to train field staff. Several local people were trained and participated in the eradication operation. The eradication operation involving two hand-spread applications of toxic bait was successful in removing all the rats from the island. In addition to undertaking the eradication itself, local people were also trained in follow-up rat monitoring, quarantine and contingency measures, and have participated in subsequent bird surveys. These people have also learned much about seabirds and other animals and plants on the island.

A lot of effort has been applied to promote Vatu I Ra as an important bird island globally and nationally. Within the community BIP held meetings to raise awareness and generate support. A sign board was erected on the island to discourage fisherman from harvesting seabirds and their eggs. It has been very encouraging to see that local landowners have visited the nearby school to talk about Vatu I Ra, its biodiversity, and the need to protect it. They have also given presentations in district and provincial meetings to inform the whole province about the importance of keeping the island rat-free.

One important community impact has been that it has brought together the members of Mataaqali (clans) from several villages (especially Nasau and Navuniivi villages) as well as people from urban areas. According to the clan leader, this to him is

the greatest thing that could ever happen in his lifetime; his people have realized what is happening in the community and have all come together with their families to Vavia (site of eco-lodge) to assist in seeing that the project is successful. As a side benefit of the project, after realizing the number of youth they have in the clan, they have set up a Development Youth Group.

Two government ministries (Tourism and Youth) have recognised the initiative of the landowners and have assisted them financially, as well as in providing materials. The Ministry of Youth donated farming equipment and musical instruments to encourage the youth to farm their land and to record local songs as a source of alternative income.

The development of new insights and skills, the engagement of new networks and the establishment of initiatives following the rat eradication are all seen as steps towards the community managing the island in a sustainable manner.

Following the success of the Vatu I Ra eradication project BIP has received a number of requests for biodiversity surveys and rat eradication from other provinces in Fiji. Funds have recently been secured from the David and Lucile Packard Foundation to identify Fiji's important seabird areas and to study the feasibility of undertaking further eradications.

As these and other projects evolve, it is becoming increasingly clear that identifying social and economic objectives, as well as biodiversity conservation ones, from the project design stage is important. Exciting opportunities to more effectively manage invasive species to reduce their impacts on native biodiversity, and on peoples' livelihoods, can be anticipated if integrated objectives are tackled in partnership.

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