Final Project Report

March 2005 - March 2008

Fiji Coral Gardens - Living Reefs

Submitted to:

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I. BACKGROUND

With over 10,000 km^2 of coral reefs, Fiji is ranked fifth on the planet for coral reefs, after Indonesia, the Philippines, Australia, and Papua New Guinea. Although the French Pacific is technically ahead of Fiji, the figures include several island groups from New Caledonia to the Tuamotus.

Coral reefs are foundational to Fiji's national economy, being primary providers of fisheries and tourism resources, as well as providing an important protective function for coastal communities during tsunamis and storms. Unfortunately, these diverse sources of protein and economic sustenance have suffered widespread decline due to over-exploitation and damage in recent years, inadvertently inflicted by the growing populations and the tourism resorts that depend upon them. Over-harvesting of reef resources, destructive fishing, coral harvesting, poor terrestrial management and poor coastal zone management all contribute to the decline of reefs and associated resources. Resource decline at the community level in Fiji is causing negative social impacts; including poor nutrition, economic decline, conflict, and urban drift; while at the resort level the guest experience is suffering from reef decline as well. Serious beach erosion is a secondary problem related to coral reef decline, compounded by sea level rise, as healthy coral reefs produce up to 3 tons of sand per mile of reef per day, helping build beaches.

The Government of Fiji has for many years recognized the traditional right of tenure by indigenous Fijian communities over their customary marine resource areas. As coastal fisheries resources have declined in Fiji, conflicts over fishing rights have become commonplace between indigenous communities and the fishing and tourism industries. On the positive side, with a new realization that managed reef systems can result in a significant increase in overall catch, the Fiji Fisheries Department has set a goal of encouraging each of Fiji's 411 customary marine management units (qoliqoli) to have sustainable community-based management plans established in the next several years. Unfortunately, very few fishing communities have taken an active part in coral reef management to date, as top-down government-driven approaches have dominated in the past, and as government fisheries officers and resources are too few to stimulate a countrywide transformation to community management. Recurring political coups also disturb the nation, with the latest one occurring in December 2006 during the USAID project, and these events sap the energy of government staff and tax limited funding, making community-based coral reef management the only workable solution in the Fiji context.

The coup of December 5, 2006 was directly related to marine resources and the associated political conflict related to the introduction of a new law by the Prime Minister, with the Military Commander specifically stating that if the bill was not dropped, the military would intervene in the national interest to maintain stability. This "Qoliqoli Bill", would have handed over full legal ownership of all near-shore marine areas to native Fijian communities, and would have in turn required all tourism operators to negotiate with the new owners for rights and fees, leases and the like for usage of the waters and reefs by tourists.

The aim of ***Coral Gardens-Living Reefs*** is to support the conservation and sustainable management of marine and coastal resources by communities, resorts and marine industries in the areas most utilized and impacted by the tourism and coral-reef based industries of Fiji, resulting in increased fish catches, enhanced tourism, and enhanced reef-based industries. The programme nurtures effective win-win partnerships between resource owning communities, government, tourism operators and marine industries in project sites. Capacity is built in the areas of natural resource governance, environmental management, marine park management, environmental restoration, enhancement of reef-based tourism activities, "coral

gardening" as a value-added profession for resorts, and sustainable reef-based livelihoods. For areas where coral harvesting is or has been a problem, sustainable coral farming is offered as an alternative and non-destructive commercial activity, used as a reward and incentive for coral reef conservation and best-practice resource management. Sustainable financing mechanisms for the establishment of permanent community-resort marine parks are also being explored and developed, with potential to have a major impact of national policy, which is presently under review. The overall outcome is that communities, resorts, and the government are becoming more aware of their environment and are becoming empowered to better carry out sustainable resource management and conservation initiatives.

The benefits of the project to communities are increased fish catches and restored coral reef health. Associated longer-term benefits are poverty alleviation and increased food security in the surrounding community, with greater community and resort benefits from tourism and marine industries, resulting in lower conflict levels between resource owning communities and industry due to more equitable sharing of benefits derived from sustainable reef-based livelihoods.

Project sites:

Although the original project plans called for five sites, two additional sites were added in 2007, based on the securing of co-financing for Serua and Cuvu Districts. Both sites proved to be ideal for the work, due to the major tourism and aquarium industry activities of the Coral Coast and Beqa Lagoon.

1. Nacula District, Yasawa Islands, Ba Province
2. Yaqeta Vanua (Sub District), Yasawa Islands, Ba Province
3. Yasawa District, Yasawa Islands, Ba Province
4. Malolo District, Mamanuca Islands, Nadroga Province
5. Moturiki District, Lomaiviti Islands, Lomaiviti Province
6. Serua district, Coral Coast and Beqa Lagoon, Serua Province
7. Cuvu District, Coral Coast, Nadroga Province

Of the sites, the Moturiki and Serua sites are both areas affected by wild coral harvesting. These sites also have less access to employment through the tourism industry, and therefore in addition to resource management and coral reef conservation, we focused on sustainable coral farming as a potential economic venture and alternative to the wild coral trades. However, the community aspects of the project always have taken first priority in the work at each site initially, as they form a foundation of management on which the tourism and coral trade aspects of the project can be built. While marine conservation and community participation and awareness aspects of the project were carried out at all sites, the tourism aspects of the project were a major focus at the Nacula, Yaqeta, Malolo, and Moturiki sites during the project, while the coral farming aspects were confined to Serua and Moturiki.

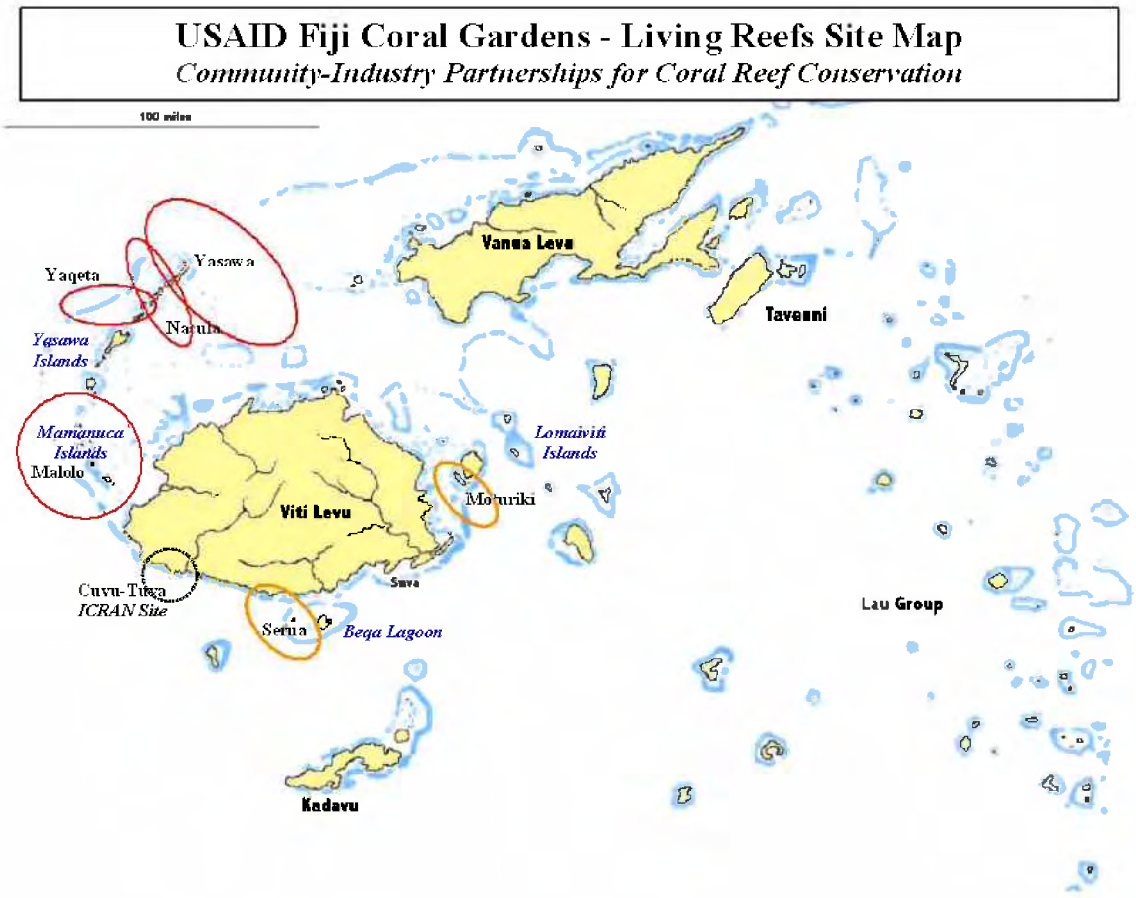


Figure 1. Fiji USAID sites. Coral reefs are light blue, red and black circles denote primary tourism sites, while orange circles indicate sites with coral harvesting and smaller-scale tourism.

II. PRINCIPAL IMPLEMENTING PARTNERS

Counterpart's principal local partner, Partners in Community Development-Fiji, gained considerable capacity during the project, taking on new Natural Resources Management staff and increasing community and environmental work. The staff has become central to PCDF's Natural Resources Management program. In addition to the five core PCDF staff, five local university graduates were also taken on and trained during the course of the project. Private sector partners were: Turtle Island resort, Coral View Resort, Oarsman's Bay Resort, Navutu Star Resort, Nanuya Island Resort, Musket Cove resort, Shangri-La's Fijian Resort, Leleuvia Island Resort, Cagalai Island Resort, the Welesley Resort, Crusoe's Resort, Yanuca Island Resort, Nacula Divers, Ovalau Divers, Malolo Cat, and South Seas Cruises. Three coral trading companies were also involved as potential partners, but these attempts, despite initial interactions and meetings, did not result in any tangible outcome during the project, and we decided to distance ourselves, rather than risk being used to "green wash" this destructive industry. Primary government partners include the Ministries of Tourism and Environment, the Ministry of Fisheries, Ministry of Education, and the Department of Fijian Affairs. In addition to PCDF, our primary local NGO partner, other NGO

partners involved at one or more project sites include: Pacific Blue foundation, Fiji Locally Managed Marine Area Network, the Mamanuca Environment Society, Live and Learn Foundation, Resort Support, OISCA International, Foundation of the Peoples of the South Pacific International, University of the South Pacific Institute of Marine Studies, and Fiji Institute of Technology.

III. OVERALL IMPACT SUMMARY

The USAID funded Coral Gardens- Living Reefs Fiji project ran from March 2005 to March 2008. In spite of numerous challenges, including a military coup on the Fijian Government, a considerable amount of work was successfully carried out. In fact, the amount of work was significantly more than originally forecasted. Seven sites were developed in diverse coral reef environments, including both fringing and barrier reef systems, resulting in 265,100 hectares of coral reef coming under sustainable management, with 38 no-take Marine Protected areas being established by the project, with the recovery of fish stocks and key indicator species being substantiated by monitoring data. Environmental governance structures have been strengthened with the training and establishment of a fish warden system in all project sites, including 154 village fish wardens trained and issued badges by the government Fisheries Department. These wardens have proven to be key elements in the functioning of the plans, and are actively involved in giant clam restocking, coral restoration, and enforcement of the no-take areas. The coral reef management poster curriculum, produced for use in community awareness workshops and by fish wardens as they interact with the communities, has had significant spill-over to government fisheries officers and to other NGOs working in Fiji.

To transform the coral trade into a sustainable industry, second-generation farmed corals were successfully marketed to tourists in Fiji in collaboration with the Fiji Government, and seven coral farms have now been established or upgraded in two district sites, with some 3,000 second generation corals being cultivated presently for a second phase of trials to take place later this year, funded by other donors.

Partnerships with the tourism industry and resorts for coral reef conservation were developed by the project, with 11 resorts sponsoring coral gardening and marine park activities, and with a major grant being given by private industry to carry forward the coral and marine park work around Shangri-La's Fijian Resort. A confirmation of the highly significant impact of the project, BBC TV came to the USAID sites to film the work, and a 10-minute program on the project "The Coral Gardener" aired on March 18, 2008, disseminating some of the project's results globally. Additional footage from the project, focusing primarily on the community and environmental aspects of the work is being included as part of a five-part BBC series on the Pacific Islands being produced for airing sometime in 2009. A website to disseminate project results was also launched www.coralsforconservation.com.

A major goal of the project was to nurture partnerships between resource owning communities, government, tourism operators and marine industries at project sites, facilitating stakeholder meetings at the national, provincial, district and village levels to address the importance of marine ecosystems. The process used as the primary management planning and problem solving methodology of the project was highly participatory and involved root-cause analysis of resource decline and environmental degradation by the resource owning communities, with formulation and implementation of community-based resource management plans for each district. These plans have included the setting aside of approximately 20-30%

of reef, mangrove, and sea grass habitats as no-take areas, as well as solving the root causes of environmental decline. As part of these community management plans, various restoration options were presented to the communities, such as improved rubbish collection and disposal, replanting or farming corals, restocking of giant clams and other shellfish, removing coral-killing crown of thorns starfish, replanting mangroves, coastal reforestation work, wastewater management, etc. Communities decided on which activities were most appropriate to their needs and incorporated the activities into their plans, which were then facilitated by community fish wardens and village committees. The process was designed to help strengthen existing local governance structures (village and district committees and councils) and served to identify and train government-recognized Fish Wardens as a new system for environmental governance in the sites. Five new reef sites in two districts have been restocked with threatened giant clam species (*Tridacna gigas*, *T. derasa*, and *T. squamosa*) during the project, with the juvenile clams being provided by the Fisheries Department from the government hatchery, a highly positive collaboration with government, very encouraging to the communities, and of great interest to the resorts, who have funded transportation to make the work possible.

Measures to increase benefits of reef tourism to the resource owning communities were undertaken in conjunction with local resorts, and included promoting the establishment of permanent marine parks, training "reef guides" from local communities to serve as tour guides to the reef, training of "coral gardeners" as a new profession for resorts, to carry out activities to protect, enhance, and restore local reefs and the coastal environment, and working to establish visitor-supported financial mechanisms for long-term project sustainability. Marine parks and establishment of environmental trust funds proved to take longer than the USAID project cycle. Turtle Island Resort hired a full-time local University of the South Pacific Marine Studies Program graduate marine biologist, to carry out the project activities and to serve as the resort coral gardener, reef guide for guests, and to care for the restocked giant clams. Other resorts are now interested in following this example, building more permanence into the project outcomes while creating new jobs and professions.

Global dissemination of the results through film media and the design and launching of a 'Corals for Conservation' website www.coralsforconservation.com became a new emphasis of the program in the last year of the project, taking advantage of an experienced UK volunteer film maker, as well the visit to the project sites by BBC TV, with the first BBC TV film on the project "The Coral Gardener" being broadcast in the UK and international satellite globally March 18th 2008, and featuring the project scientist, Dr. Austin Bowden-Kerby. Other footage is slated for use in the production of a five-part series on the South Pacific Islands, with community aspects of the work, coral work, no fishing areas, and communal fishing methods all being a focus of the filming.

IV. USAID STRATEGIC OBJECTIVES AND INTERMEDIARY RESULTS

SO1 – Number of policies and model actions applied and replicated

Over the three year duration of project implementation, ten (10) customary fishing area (qoliqoli) Marine Management Plans (MMP) were developed and implemented in project sites during the project in 7 Districts: Nacula, Yaqeta, Yasawa, Malolo, Moturiki, Serua (4MMAs), and Cuvu Districts, with support and buy in from a range of stakeholders, aimed at improving environmental protection and enhancing management of marine resources and terrestrial resources. Each management plan was developed as a consultative multi-stakeholder process, addressing unique challenges and opportunities of each site, while meeting the needs and aspirations of the reef owning communities. Each MMP applied a series of ecosystem recovery measures, the most important being the establishment of no-take areas and the discontinuing of destructive fishing practices, with species restocking and coral restoration work also implemented in selected sites. Monitoring, evaluation and enforcement procedures were part of each MMP, with shared responsibility for effective adaptive management amongst the local chiefs, trained fish wardens, fishers, provincial fishery officers, tourism industry and local communities, each having an active role in managing their shared resources and planning for the long-term. The project's deliverables were greater than expected, with an increase from the expected 5 Marine Management Plans to 10 MMPs, in 7 District sites versus the expected 5 District sites.

SO2 – Number of beneficiaries with improved environmental services

The project started in 5 municipal Districts: Nacula, Yasawa, Yaqeta, Malolo, and Motoriki and then expanded to Seruva and Cuvu, generating benefits for 32 villages, totaling approximately 24,000 individuals with direct and indirect benefits from the USAID supported Coral Gardens – Living Reefs Initiative. Direct beneficiaries included village communities who received increased economic prosperity through increased fish catch and jobs creation and enhancement. The tourism industry benefited directly as value was added to the tourism product. Indirect beneficiaries include community members living in the urban areas, tourists, and society in general through increased local stability and less urban drift in response to rural poverty.

IR1.1 – Number of policies, laws, plans or model actions strengthened, developed, adopted, and/or implemented (terrestrial component of SO1)

Five (5) Environmental Management Plans (EMPS) addressing reforestation and waste management within terrestrial ecosystems at the village level were developed and implemented in particular villages of the project area.

IR1.2 – Number of non-governmental stakeholders engaged in environmental governance

Ten (10) individuals from Non-Governmental Organizations (NGOS), forty-four (44) private sector representatives, two-hundred and twenty-four (224) specialized trainees, and one-thousand (1,000) community representatives participated directly in environmental governance through the development of

community coral reef management plans, with an additional 2,400 awareness workshop participants, totaling 3,678 stakeholders actively participating in USAID supported workshops and trainings, provincial and district meetings, youth group activities, awareness campaigns, monitoring, evaluation and enforcement of environmental governance.

IR 1.3 – Number of sustainable financing mechanisms established, strengthened or facilitated

Of the thirty-eight (38) marine protected areas established through the USAID project, Counterpart and PCDF were able to advance Community–Resort partnerships in four (4) of the seven (7) main project sites, achieving significant levels of co-financing from eleven (11) resorts, both in-kind and in cash. The project also developed three proposals to establish permanent marine parks, each supported by an Environmental Trust Fund, legally registered as formal partnerships between resorts, resource-owning communities and government. Each of these proposals is currently in the process of multi-stakeholder input, endorsement, and approval, with the potential for replication at the national level.

IR1.4 – Amount of funds from non-USAID sources mobilized and applied:

Over the three year life span of the project, Counterpart and PCDF raised US $529,500 worth of supporting funds and leveraged US $113,100 of in-kind services, totaling US $642,600, greatly increasing the outcomes of the project. Private foundations such as Packard and MacArthur awarded the project US $150,000; government funds from Germany, Canada and Australia totaled US $245,000; and the Shangri-La's Fijian Resort donated $65,000 in cash to continue and expand the work of USAID. Leveraged resources entailed community housing, workshop venues, and volunteer time provided by local communities and the tourism industry, donated boats, gas, and staff time from the Ministry of Fisheries and Provincial Offices, lodging, meals and transportation provided by 11 different resorts in addition to materials and staff time for coral restoration, MPA marking, and giant clam restocking.

IR2.1 – Number of environmental initiatives undertaken by civil society organizations

In total, thirty-eight (38) no-take Marine Protected Areas (MPAs) were established throughout Fiji; two (2) in Yaqeta District, eleven (11) in Nacula District, six (6) in Yasawa District, ten (10) in Moturiki, five (5) Serua, and four (4) in Malolo. Each MPA was established through a multi-stakeholder, co-management process, supported by the provincial and nacional government agencies, local communities and tourism industry. Delineation of no-take zones by the traditional leaders involved the community first, coming to a collective decision on closing approximately 20–35% of reefs to all fishing. Other regulations included the outlawing of destructive fishing practices such as fishing with chemicals and explosives. Once the chiefs decided on the no-take areas, the District Councils ratified the management plans. Fish wardens were trained and registered with government, and functioned under the guidance and authority of the community chiefs.

IR2.2 – Number of key national and local institutions with increased capacity

Fifty-Six (56) national and local institutions gained an increased understanding in marine conservation and they used awareness materials to deepen community understanding in preparation to decision making, as well as an increased understanding of working with communities in participatory resource governance and management planning. This included the (4) Ministries/Departments of Environment, Fisheries, Tourism

and Education; four (4) provincial offices (Ba, Nadroga, Serua, Lomaiviti), six (6) district councils (Yasawa, Nacula, Malolo, Serua, Moturiki, Cuvu), and thirty-two (32) village committees. Each of these institutions was to a greater or lesser extent actively engaged in the participatory learning, action workshops and vision building exercises. Ten (10) non-governmental organizations were also involved, especially Pacific Blue Foundation in Serua and the Fiji Locally Managed Marine Area Network. As a result of USAID funds, each of these institutions has an increased capacity to promote community-based environmental management and governance.

IR2.3 – Number of people trained

The Coral Gardens – Living Reefs Initiative provided training to 3,980 individuals in several critical areas through both formal and informal sessions, covering all aspects of natural resource management. Awareness involved training in basic coral reef ecology, land-sea connectivity, overfishing impacts, and the importance of no-take areas to fisheries restoration. Technical training included giant clam restocking, coral farming, Fish Warden training protocols and scope of work, and coral reef monitoring. Approximately 2,500 students, teachers, hoteliers, fishers, and the general community were trained. Representatives from both the tourism industry and local communities were trained in monitoring and evaluation of coral reefs and 12 representatives from the non-governmental sector were trained in the facilitation and application of the Participatory Learning and Action Methodology. Trainings geared toward socio-economic activities entailed 32 individuals trained as Coral Gardeners; 12 community members as Reef Guides, 154 Fish Wardens; 70 commercial coral farmers; and 1,200 community members and officials trained in community organization, vision building and decision making processes.

IR3.1 – Number of people with improved access to adequate safe water that meets sustainability standards

N/A

IR3.2 – Number of people with improved access to adequate sanitation that meets sustainability standards

N/A

IR3.3 – Number of hectares of biologically significant area under improved management

As a direct result of the USAID funded program, there are 265,100 ha of biologically significant marine area under better management in Fiji, broken down by Nacula/ Yaqeta 60,000 ha, Yasawa District 70,000 ha, Serua District 44,000 ha , Malolo District 60,000 ha, Moturiki District 30,000 ha and Cuvu District 1,100 ha. These areas include near-shore areas with seagrass beds and mangrove forest, as well as the main coral reef areas. Measures of improved marine and coastal management include the banning of destructive fishing methods, establishment of no-take marine protected areas (MPAs), restocking of three threatened giant clam species, adaptive management systems targeting marine conservation and incorporating monitoring and evaluation protocols, ecosystem restoration activities, education and awareness program targeting tourists to minimize impacts on coral reefs, measures identified and adopted by the tourism and resort industry to reduce negative impacts, and more effective land based management addressing run-off and sedimentation.

IR3.4 – Number of target species with population stabilized or increased

Numerous rapid environmental assessments were carried out, based on a Reef Recoverability Assessment (RRA) protocol designed specifically for identification of non-recovering coral reefs. It was determined from the RRA that restoration of *Scleractinian* Corals would be beneficial within 14 of the project sites. It was also determined that three other ecologically important species needed assistance to stabilize and increase their population sizes, through restocking activities and/or harvesting restrictions. Restocking of *Tridacnid clams* (Giant Clams) was supported at 8 project sites. The rare and ecologically important species *Chironia triton* increased within no-take areas at four project sites, while Humphead Wrasse an equally rare and important fish species recovered within at least 3 sites, as measured against baseline data sets from the project start.

IR3.5 – Number of model wildlife law enforcement activities / protocols implemented or adopted

N/A

IR4.1 – Number of regional environmental platforms created or strengthened

Counterpart and Partners for Community Development Fiji, as implementers of the Coral Gardens – Living Reefs Initiative, assisted in strengthening regional and international environmental platforms in the efforts to share experience, information and lessons learned. Together, CPI and PCDF plotted six (6) regional and global platforms through two presentations at the International Tropical Marine Ecosystems Management Symposium III (ITMEMS 3) in Mexico in 2006 on the USAID project results; one presentation on the participatory community management process and one presentation on coral reef restoration as part of management. An additional presentation took place on resort-community partnerships for coral reef conservation and management at the United Nations Environmental Program Oxford Seminar on Sustainable Tourism and Climate Change. Throughout these exchanges, Counterpart and PCDF team members were able to make contact with organizations from around the world, developing common approaches, action plans, and discussed the potential for drafting policies for addressing regional challenges and issues. As an example, a local NGO in India published the poster set in a local Indian dialect as the direct result of these contacts. In addition to these international conferences, the project created the "Corals for Conservation" website; www.coralsforconservation.com highlighting various aspects of the project and including downloadable posters, coral work as part of management, etc. A major platform established was through the filming and creation of "The Coral Gardener" documentary which broadcast internationally on BBC television March 18th and August 7th 2008.

IR4.2 – Number of new members in regional environmental platforms

N/A

V. SUMMARY & ASSESSMENT OF PERFORMANCE INDICATORS

Indicator ***NOTE: Numbers are Cumulative per Year***	**Fiscal Year (Oct 1 – Sep 30)**						
	Base line 2006	**FY 2006**		**FY 2007**		**FY 2008**	
		Target	**Actual**	**Target**	**Actual**	**Target**	**Actual**
SO1 – Number of policies and model actions applied and replicated	0	2	4	4	10	11	**10**
SO2 – Number of beneficiaries with improved environmental services	0	10,500	10,500	13,500	24,000	24,000	**24,000**
IR1.1 – Number of policies, laws, plans or model actions strengthened, developed, adopted, and/or implemented *(terrestrial component of SO1)*	0	2	3	4	5	6	**5**
IR1.2 – Number of non-governmental stakeholders engaged in environmental governance	0	1 NGO	1,988	1	2,912	1	**3,678**
IR 1.3 – Number of sustainable financing mechanisms established, strengthened or facilitated	0	0	0	1	0	2	**0**
IR1.4 – Amount of funds from non-USAID sources mobilized and applied	0	$205,000	$211,750	250k	$296,500	350k	**$642,600**

Number of resorts collaborating actively with communities on resource management plans and conservation actively supporting reef conservation	2	4	6	10	10	11	**11**
IR2.1 – Number of environmental initiatives undertaken by civil society organizations	0	6	15	15	36	36	**38**
IR2.2 – Number of key national and local institutions with increased capacity	0	17	20	25	30	37	**56**
IR2.3 – Number of people trained	0	1,020	1,448	2,080	2,076	2,700	**3,980**
IR3.1 – Number of people with improved access to adequate safe water that meets sustainability standards	0	NA	NA	NA	NA	NA	**NA**
IR3.2 – Number of people with improved access to adequate sanitation that meets sustainability standards	0	NA	NA	NA	NA	NA	**NA**
IR3.3 – Number of hectares of biologically significant area under improved management	0	60,000	130,000	130,000	264,000	264,000	**265,100**
IR3.4 – Number of target species with population stabilized or increased	0	2	2	4	3	4	**4**

IR3.5 – Number of model wildlife law enforcement activities / protocols implemented or adopted	0	NA	NA	NA	NA	NA	**NA**
IR4.1 – Number of regional environmental platforms created or strengthened *Plotting Global Platforms*	0	0	2	2	2	2	**6**
IR4.2 – Number of new members in regional environmental platforms *NOT A REGIONAL PROJECT*	0	NA	NA	NA	NA	NA	**NA**

VI. DETAIILED PERFORMANCE REVIEW – ORIGINAL PROPOSAL INDICATORS

Upon project start-up in Fiji, and throughout Year 1 of program implementation, Counterpart reported on activities as outlined in the original proposal reviewed and approved by USAID in 2004. Counterpart utilized the below list of indicators and evaluated success of the project based on results achieved in these categories. Upon request by USAID, and in negotiation with the Contracting Technical Officer (CTO), Counterpart's monitoring system was revised to more accurately align with the Strategic Objectives (SOs) and Intermediary Results (IRs) of the USAID Regional Development Mission for Asia (RDMA). For this reason, the Annual Project Reports have reported on both sets of indicators to more accurately relay the scope of the project, program activities, and the valuable participatory processes involved in the Coral Gardens – Living Reef Initiative.

Original Proposal Indicators:

1.1 Comprehensive community marine resource management plans will be established in all five of the new tourism focal sites in Fiji by the project midpoint (three to eight villages per site).

1.2 Workshop reports for each workshop in each district will record community and stakeholder participation, record plans to be carried out, and with specific assignment of roles (to Fish Wardens, local village chiefs, District Council, Provincial Fisheries Officer, Resorts, PCDF, etc).

1.3 All project communities and village chiefs will better understand the condition of their marine resources, and will have an increased knowledge and ability to manage and better utilize their reef areas. This will include a measurable decline in destructive reef extraction activities by both coastal communities and industries in all three primary sites by the end of year 3.

1.4 A minimum of six new community-based no-fishing marine reserves will be established in the new Fiji sites, as part of community resource management plans

1.5 At least three no-fishing marine parks established by resource owning communities in association with resorts.

1.6 A minimum of ten youth trained as ecotourism field guides from each of the three primary site areas, to accompany tourists into the reserves for a fee (by year 3).

1.7 Coral Gardening established as an activity in at least three resorts, to enhance the reef experience of guests, to repair reef damage, etc.

1.8 An increased numbers of local people and trainer reef guides hired as resort staff for duties associated with reef-based tourism.

1.9 Restoration of coral cover in at least five damaged reef sites. Reef sites with 0-3% cover will be restored to a minimum of 20-30% cover, as recorded in baseline and follow-up data, by the end of Year 3.

1.10 Restoration of fish and invertebrate stocks in all no-take MPAs and nearby control plots, as established by monitoring data.

1.11 Establishment of sustainable, village-based coral aquaculture enterprises in all three communities by the end of year 3. A minimum of 20 village men and women will be trained in coral aquaculture techniques in each of the aquaculture sites, and at least five individuals from each site will have a successful coral aquaculture farm, dependent on marketing to existing exporters or to resorts for replanting within coral gardening sites.

1.12. Increased prosperity at the village level, based on statistically significant increases in rural incomes and fish consumption in a minimum of five Fijian villages.

1.13 Illustrated manuals addressing coral reef conservation and community resource management, coral reef restoration techniques, and sustainable coral aquaculture, will be produced and distributed by the end of year 3.

1.14 At least three no-fishing marine reserves with coral restoration, crown of thorns starfish removal, restocking, and other measures to accelerate resource recovery within the reserves

1.15 At least ten fish wardens selected and trained per each of five districts, with at least 30% of these trainees being female.

1.16 Effective governance processes ongoing in all five districts at the district council level, and in 80% of villages in the project sites, at the community level (village committees, Fish Wardens, etc), with active implementation and monitoring, as based on a minimum of twice annual visits to each village of each district, and the resulting field reports.

Results:

Participatory- Multi-stakeholder Co-Management Approach to Marine Conservation

At the onset of the project, Counterpart prioritized meeting and consulting with government ministries, traditional chiefs and community leaders, reef based tourism operators, marine industries, and resorts at the Fiji implementation sites to identify local needs, establish priorities, and set a time frame for the management of the coral reefs and near-shore waters in these areas of major tourism activity. Project staff recorded information on local governance structures and directions on our primary contacts, the appropriate procedures and protocols of the District or village area, leading to the planning of preliminary activities. Subsequent presentations took place to schedule awareness workshops, management planning workshops (including venues and accommodation in the villages), monitoring activities, appointing and training the fish wardens, enforcement, and follow-up. Each level of chiefs was involved, with the paramount, district, and vanua chiefs involved earlier than the village chiefs. Activities included:

- Frequent Meetings with National Ministries of Environment, Fisheries, and Tourism
- Integration of Traditional Sevusevu Protocols with the Appointed Chiefs
- Presentations to the Roko Tui (each of three provincial offices and district councils)
- Presentation to resorts and local tourism associations
- Preparation and planning session with the three Provincial Fisheries Officers
- Stakeholder identification and conflict analysis for each site of the seven sites

Community Marine Resource Management Planning Process

CPI utilizes the Participatory Learning and Action Methodology (PLA) in order to build a unified vision and to prepare communities for participatory management and self-governance: raising awareness as to their options for management and the ecological and biological basis for establishing no-take MPAs and other management measures. The first part of the process involves awareness-raising on basic problems and solutions, including coral reef ecology and best management options. The second part of the process was to carry out participatory workshops that helps facilitate the gathering of information, collective reflection, and community planning. Activities include:

- 35 one-day awareness raising and problem identification workshops across each village located in the 7 project sites
- 10 School awareness workshops
- 3 hands-on workshops carried out with resort staff: building fish houses, planting coral nurseries, and taking a guided reef tour field trip
- 12-poster curriculum set on environmental and resource management published and distributed
- Bookmarker on mangrove conservation printed and distributed
- Natural Resource Management Program Brochure printed and distributed
- Training of provincial and district staff as PLA workshop facilitators
- 7 District-level 4-day PLA management planning workshops
- Plan formulation, including regulations, no-take MPAs, enforcement procedures and governance structures.
- Evaluation of former management sites and renew or revise management plans as required (Moturiki, Malolo)

Implementation of the Marine Resource Management Plans

The following activities involved the implementation of the resource management plans developed during the PLA workshops, but only after their formal approval by the chief councils. The establishment of the legally recognized fish warden system was of vital importance to management plan implementation as it is the primary enforcement strategy of the community marine management areas and associated no-take MPAs. Therefore, the training and functioning of the fish wardens was a priority at all sites. The fish warden workshop curriculum was taught as a partnership between PCDF staff and Provincial Fisheries Officers. Training included familiarization with government of Fiji laws regarding size limits, prohibited species, closed seasons, and other regulations, as well as enforcement responsibilities, dealing with poachers, and educating the community (using the management poster set). Activities included:

- Review and endorsement of new plans by each District Council
- Selection by the community chiefs of men and women from each village as government recognized "fish wardens"
- Fish Warden training workshops conducted for each of 7 sites
- Renewal process for fish wardens established and carried out
- 3-day national workshop targeting replication and expansion of the fish warden training program
- Village implementation meetings
- Posting of maps at local shops and public places
- Marking of the no-take Tabu areas (MPAs)
- Coral reef baselines established, with follow-up monitoring conducted bi-annually
- Crown of Thorn Starfish (COTS) removal
- 11 Coral Restoration Sites established
- Restocking of Tridacna gigas, T. squamosa, and T. Derasa clams giant clams and top shells from government hatcheries to appropriate sites

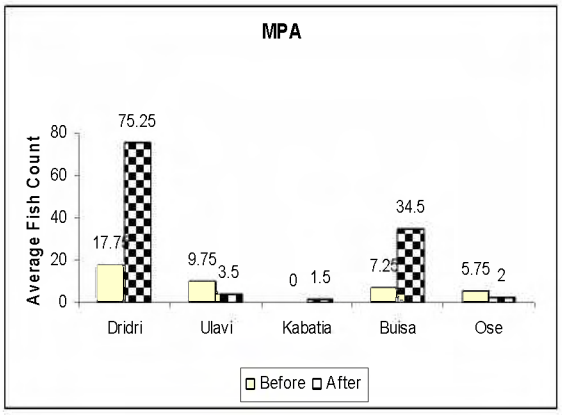
Environmental and Socio-economic Scoping and Baseline Data Collection

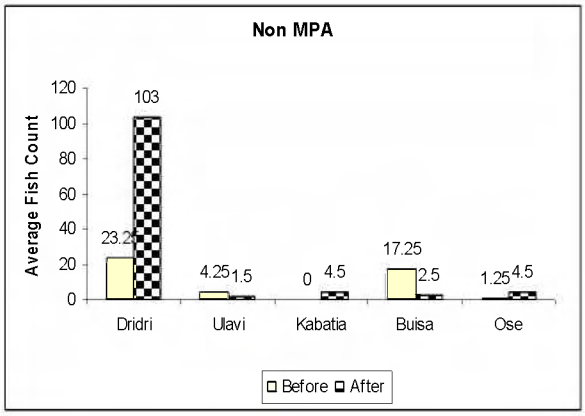
The goal of the monitoring was to establish baseline data to record information that could be used to indicate project impact by comparison of before and after data sets, quantifying positive change and project impact on the communities, resorts, and environment. General socio-economic baseline data was recorded during the PLA workshops and through individual surveys carried out throughout the community. Fish wardens were trained in fish catch surveys and biological monitoring. A standard one-page data form was designed and the wardens trained in how to use it. Extensive baseline work was carried out by the communities using simple "line transects" for counting fish, key invertebrates, and coral cover within and outside of the MPA sites to give a numerical indication for the success of the no-take "tabu areas". A protocol document was developed by the project scientist, a "reef recoverability assessment" to systematically analyze coral reefs at any given location to determine what interventions, if any, were advisable to get the health of the reef system in a more pristine condition (see Appendix). Activities included:

- Training in and implementation of fish catch and socioeconomic surveys
- Simplified community-based monitoring of protected and open areas
- Reef recoverability assessment and restoration plan for resorts

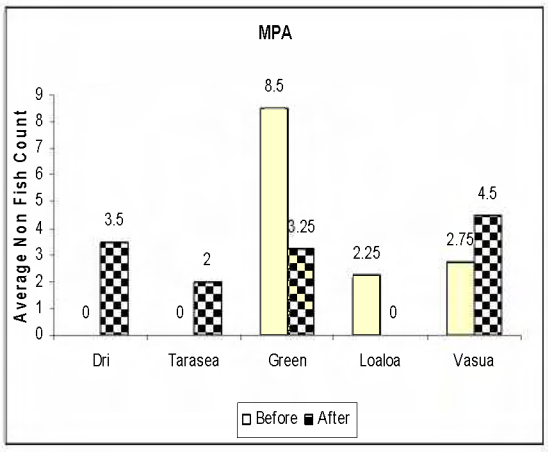
Initial analysis of the one-year results for the primary Nacula and Yasawa sites indicates that counts of valuable fish species have gone up by as much as 80 to 100 percent within the no-take areas, with some species having gone up by as much as 4-5 fold. Commercially valuable invertebrate species have increased by 30 to 75 percent over the one year monitoring period, with some very rare species becoming more common once again. The increase in coral cover from 40% to 60% in only one year was common for both districts for the same period, indicating a recovery rebound from the severe bleaching of 2000. Table 1 shows a representative data set from one of the permanent transects from the 10 MPA Sites in Yasawa and Nacula. This data indicates an overall positive impact of the project on valuable fisheries resources.

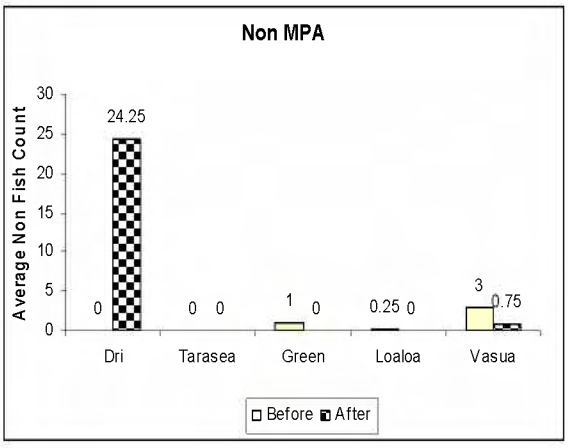
Table 1. Before and after data comparisons at one year for Yasawa District, showing changes in fish and invertebrate abundances both inside and outside the no-take MPA areas.





Yasawa-i-rara MPA and non MPA sites: Average fish counts at one year – Transect No. 4 (Dridri =Surgeonfish, Ulavi = Parrotfish, Kabatia = Grouper, Busa = Garfish, Ose = Goatfish





Yasawa-i-rara MPA and non MPA sites: Average invertebrate count before and after one year (Transect No. 4) (Dri = Beche de mer, Tarasea = Brown Sandsfish, Greenfish = Stichopus (not highly valued), Loaloa = Black Sandfish, Vasua = Giant Clams

There is evidence from the monitoring data that threatened species are stabilizing and returning to the managed reefs. Species of invertebrates and fish that were not observed during the first survey were observed in MPA sites during the second survey. These include Humphead or Maori Wrasse (Varevoce), Sea Turtles, Triton's-Trumpet shell (Davui) and the highly valued White Teat Fish (Sucuwalu) sea cucumbers.

Establishing Public-Private Partnerships in support of Marine Conservation

Initial communication with the tourism industry began with the Lead Marine Biologist, Dr. Austin Bowden-Kerby, offering to conduct rapid environment assessments of near shore reefs for individual establishments, identifying degraded areas on coral reefs around participating resorts and identifying measures that could be taken to revive reefs, for the purpose of tourist satisfaction levels. With support from the tourism industry, coral replanting began on a small scale, with maintenance, monitoring and evaluation provided by the community, in additional to small operational changes of individual resorts. Once the pilot projects proved successful, individual programs were scaled-up to include maps of reef degradation, GPS points established, and with support of the private sector, began the drafting of documents stating the need for formal Marine Park status. Legal arrangements are presently being made to lease the waters from the community, so that the no-take status can be legally enforced. Once all permissions and approvals are obtained from the community chiefs in each area, and endorsements made by the Provincial Fisheries Officers, formal proposals will be submitted for "gazetting" each marine park area with the Fiji Government, a process established within existing Fiji law.

In total, eleven (11) resorts are currently collaborating actively With communities on resource management plans and conservation actively supporting reef conservation, including Musket cove, Turtle Island, Coral View,Nanuya Island, Oarsmans Bay, Navutu Star, Leleuvia Island, Cagalai Island, Welesley Resort, Crusoe's Resort, and Shangri-La. Activities included:

In Cuvu, Shangri-La's Fijian Resort has signed a MOU with PCDF and Counterpart allocating US$65,000 for environmental activities at the resort and in the surrounding communities.

- Resort selection based on interest and leveraging of resources
- Leveraged contributions from resorts formalized with contracts on a resort by resort basis
- "Coral Gardening" training conducted at 11 resorts, with trainees becoming resort staff to care for the reef
- Training manuals in coral gardening and reef restoration drafted and distributed
- Baseline data and coral replanting in reef restoration sites sponsored by resorts
- Ecotourism "reef guide" training for duties associated with resorts
- Community-resort sponsored Marine Parks established
- Establishment of environment trust funds associated with resort-sponsored marine parks

Sustainable Coral Farming to replace the destructive coral trades in project sites

Fiji is a major exporter of both aquarium and curio corals globally, which almost entirely rely on wild harvested corals, damaging coral reefs. The project has developed and refined sustainable methods and sustainable standards for farming second generation corals, and has made several attempts to interest the industry during the project. Marketing trials were conducted and an untapped market within Fiji was identified, in the form of tourists in search of unique handicrafts, with corals not presently available anywhere on the planet in a form appropriate and suitable for purchase by visitors. Aquarium Fish Fiji and Waterlife Fiji, two local aquarium coral and fish exporting companies visited the Moturiki coral farms and were provided with farmed coral samples for trial export in 2006. With encouragement from the Fiji Department of Environment, the project launched coral sales trials in June of 2007, *"Corals for Conservation – Buy a Farmed Coral-Help Save a Reef",* targeting cruise tourists. Attached to each coral was a small color-illustrated booklet explaining the project, with the last page having a coral identification number, the species name, coral farming site and date and place sold, stamped with the official CITES seal and individually signed by the CITES Officer from the Department of Environment. Activities included:

- Aquarium coral market research conducted
- Curio market research conducted, identifying local markets within Fiji
- Development of marketing plan and materials for corals
- Generated approximately 3,000 corals ready to harvest
- Applications for permits or exemptions completed and awarded
- Curio marketing trials overseas
- Community training in coral farming as appropriate
- Establishment of 8 coral farms
- 60 Coral Farmers trained
- Formation of cooperatives
- Monitoring of coral farms
- Training manual in coral farming drafted and distributed

Communications and Information Dissemination Strategy

The project hosted a volunteer film maker from UK for a year, Ms. Emma Robens of AmosBlue Productions, and with her underwater and land cameras she filmed over 40 hours of footage of all aspects of the project. Parts of Emma's footage were provided to BBC TV for their production and editing, to produce a ten-minute film, "The Coral Gardener", broadcast through satellite globally on March 18th 2008. Repeat broadcasts will occur throughout the year.

In September 2007, BBC TV came with a producer and cameraman to Moturiki and Nacula project sites to film the community mobilization and coral restoration work for broadcasting internationally, as part of a five-part series on the South Pacific Islands, to be broadcast in 2009. This filming provides the project with several million dollars of free publicity, and opens up the possibility of sharing the innovations and lessons learned of the Coral Gardens-Living Reefs model throughout the planet.

In June 2007, the formal launch of the coral trials "Corals for Conservation" was conducted in Civic House, Suva, with the Minister of Tourism and Environment as the chief guest and keynote speaker. The Website

www.coralsforconsevation.com was launched in January 2007. The site was launched to connect the BBC TV film with additional information. On the site is another short video clip on the coral work, in addition to background information on the team, a media page with downloadable jpegs of some of the posters, and contact information. Activities included:

- Documentary production, recording and international broadcasting of the project
- Corals for Conservation website created
- Formal launching of the Corals for Conservation Initiative
- 2 Presentations at ITMEMS III in Cozumel, Mexico sponsored by ICRAN, the International Coral Reef Action Network
- 1 Presentation at the UNEP Seminar on Climate Change and the Tourism Industry at Oxford University, UK, funded by UNEP
- 1 Presentation at the National Oceanic and Atmospheric Administration, November 2006.

VII. ACTIVITY SUMMARY AND MAJOR OUTPUTS PER ORIGINAL PROPOSAL

Province	District	Village	Activities Conducted	Outputs	Resource Staff/ Stakeholders
Ba	Nacula /Yaqeta	Nacula, Malakati, Navotua, Naisilisili, Namatayalevu, Vuaki, Matacawalevu	• Marine awareness workshops at each village • PLA Management Planning workshops • Socio-Economic Surveys • Fish Warden Training • Biological Monitoring training and Survey • Fish catch data training • Demarcation of Tabu no-take zones • Presentation to Ba Provincial Administration • Presentation to NTTA • Coral farm training and basic reef maintenance at Resort • Schools awareness • Video Shooting of PLA workshops and Coral Restoration at Resorts • Special meeting for discussions on "Qoliqoli" Bill with chiefs, elders and NTTA members (Yasawa and Nacula District), proposing an more sustainable and unifying alternative • Fish Wardens Training in Vuaki Village • Presentation to the Ba Provincial Committee • Coral Gardening Workshop at Oarsmans Bay Lodge funded by Resort • Follow up for coral gardening sites plus Donor visit to site • 1 year biological monitoring for a all marine protected areas and associated open areas • BBC Filming of coral farm sites at Oarsmans Bay and NIR • Establishment of Marine Biologist Position at Turtle Island Resort • Establishment of Environment Programme • Restocking of Giant Clams at Turtle Island Resort for GC nursery • Awareness raising in Matacawalevu, communities selected area for MPA • Presentation at District Meeting in October • Fish Warden training at Matacawalevu • Marking of new MA site for Matacawalevu • Restocking of Giant Clams at Resorts	• Establishment of 7 Marine Management Plans • 7 Awareness workshops • 3 Primary Schools visited for Awareness • Establishment of 8 MPA sites • 14 Fish Wardens trained and certified • 14 trained in Biological Survey techniques • Baseline survey conducted for 4 MPA sites • 72 homes surveyed for socio-economic data • Completed video shooting of village life and the project's progress (11 hours of tape) • New concept of Marine Management Authority and Marine Park considered • 7 Fish wardens trained • 6 Resorts participated – 12 participants including 2 females • Presence of endangered humphead wrasse juveniles, considered now a rare sighting due to the extreme overharvest of this species. • On average, survey shows 40% increase in fish abundance; 20% increase in invertebrate abundance and 50% increase in coral cover within MPAs • BBC Footage will be compiled for South Pacific Documentary series to be aired in 2008-2009 • Margaret Fox, USP graduate now Turtle Islands Marine Biologist • 500 juveniles and 30 large clams	• PCDF/Counterpart • Cuvu Site Representative • Fisheries Dept, Lautoka • Ba Provincial Administration • Traditional Chiefs • Amos Blue Production • NTTA(Nacula Tikina Tourism Association) • BBC Television • Fish Wardens

			(Oarsman, NIR and Coral View) and also at Matacawalevu • Small juvenile Giant Clams caged at Coral View for further deployment to communities MPA's after 6-8 months • Last Visitation of Sites (MPA) at Yasawa and Nacula Districts (includes Yasawairara, Bukama, Tamusua and Nabukeru: Navotua, Naisisili, Nacula, Vuaki and Yaqeta MPAs. • As a result of this last visit, the remaining villages of Dalomo and Teci in Yasawa will be setting up their MPA after their CLAN's meeting.		
Ba	Yasawa	Tamusua, Nabukeru, Teci, Dalomo, Bukama, Yasawa-i-rara	• Marine Awareness workshops at each village • Management Plan workshop - PLA • Socio-Economic Survey • Fish Warden Training • Biological Monitoring training and survey • Demarcation of Tabu Sites • Schools awareness • Fishing Activities data collections • Video Shooting of Fish Warden Training and Survey • Presentation to Ba Provincial Administration • 1 year biological monitoring	• Establishment of 5 MPA sites • 6 villages visited for Awareness • 3 Primary schools visited for Awareness • Marine Management Plans for the 5 villages established • 17 Fish Warden Trained and Certified • Baseline survey conducted for 4 sites • 63 homes surveyed for socio-economic • Video Shooting completed • Presentation to Ba Provincial was successfully conducted • On average, survey shows 40% increase in fish abundance; 20% increase in invertebrate abundance and 50% increase in coral cover within MPAs	• PCDF/Counterpart • Moturiki Site Rep • Fisheries Dept Lautoka • Provincial Administration • Amos Blue Productions • Fish Wardens • Traditional Leaders
Lomaiviti	Moturiki	Uluibau, Niubasaga, Daku	• Farmed Coral harvesting and processing • Launch of "Corals for Conservation" by Interim Minister for Tourism and Environment • Sale of Farmed Coral and Market Scoping • Schools awareness programme • Established partnership with Caqalai and Leleuvia Island Resort • Trial farming at Leleuvia • BBC Filming of Coral Farms • Coral Farming workshop • Establishment of new farms in Moturiki	• Leleuvia partnership formed • Gained local and international recognition for farmed coral • 2 schools (Uluibau Primary and Moturiki District) with a combined total of 40 students now participating in the programme • 6 trays with 33 cookies per tray and 198 pieces of coral established in Leleuvia Island Resort • BBC Footage will be compiled for South Pacific Documentary series to be aired in 2008-2009 • 18 participants (17 males and 1 female) trained in coral farming techiniques and maintenance of coral farms • New farms include Niubasaga (2) , Daku (2) and Yanuca (2)	• PCDF/Counterpart • Fisheries Dept Levuka • Lomaiviti Provincial Administration • Amos Blue Productions • BBC Television Productions • Leleuvia and Caqalai Island Resorts • Dept. of Environment • Ministry of Education • Divisional Education Officer Eastern • Staff and Management of Uluibau primary and Moturiki District schools

Serua	Serua	Yanuca, Serua, Culanuku, Korovisilou, Navutulevu, Namaqumaqua, Naboutini, Vunaniu	• Awareness raising session • Socio-economic survey • Participatory Learning and Action workshop • Fish Warden and Bio. Monitoring workshop • Biological Monitoring • Coral Farming workshop • Schools Awareness Programme • Presentation to District Committee	• In total, 239 participants (170 males and 69 females) have undertaken this awareness session • 91 households surveyed for socio-economic status • 78 participants (64 males and 28 females) participated in PLA workshop • 7 Management plans established • 35 (31 males and 4 females) participants trained and licensed as Fish Wardens • 5 MPA established • 25 participants (All male) trained in Biological monitoring and survey • 28 participants (22 male and 6 females) trained in coral farming • 2 tables established (250 coral cookies made). •	• PCDF/Counterpart • Serua Provincial Administration • Na Gone Turaga na Vunivalu, Ratu Peni Latianara • Divisional Fisheries Eastern • Fisheries Dept. Navua • Pacific Blue Foundation • OISCA • Crusoe's Retreat and Wellesly Resort • Ministry of Education • Moturiki Community Representative • Traditional Fishing Clan *Gonedau Turaga na Kalevu*
Nadroga	Malolo	Yaro Solevu Tavua Yanuya	Add more 2006 and 2007 activities • Coral Gardening Demonstration Site • Meeting with the Mamanuca Fijian Hotelier's Association (MFHA) • Meeting with Mamanuca Environment Society (MES) • Plantation Island Resort environmental assessment report • Crown of Thorns Removal activity with MES • Resource monitoring at Malololailai Island	• Coral Gardening Demonstration Site established at Musket Cover Resort, with two coral tables and one coral frame • Crown of Thorns Starfish removal at Sand Bar reef and in Tavua Village • Report with recommendations for altering planned construction that would interfere with long-shore transport of sand and lead to beach erosion • Interest generated among hoteliers with plans for expanded coral gardening workshop in 2008, supported in full by the resorts	• PCDF/Counterpart • Fisheries Dept • Nadroga Provincial Administration • Amos Blue Productions • Musket Cove and Plantation Island Resorts • MES • MFHA
Nadroga	Cuvu Tuva	Cuvu Navuevu Yadua Rukurukulevu Sila Tore Hanahana Voua Yalanaua	• Meetings and negotiations with Shangri-La's Fijian Resort • Meetings with Paramount Chief Na Ka Levu Ratu Sakiusa Makutu • Fish warden assessment and new appointments • Fish warden training, registration, and graduation ceremony • Hydrology restoration oversight, Yanuca Channel • Orientation meetings with US Peace Corps Volunteer	• Grant secured from the Resort of $98,000 for 1-2 years of work. • MOU approved and signed • Fish wardens issued with official government badges • Beginning of channel restoration work • Peace Corps volunteer assistance with follow-up on the project	• PCDF/Counterpart • Fisheries Dept • Nadroga Provincial Administration • Amos Blue Productions • Shangri-La's Fijian Resort • Paramount Chief • Community Chiefs • Fish Wardens • Traditional Fishing Clan *Gonedau na Ka Levu* • US Peace Corps

VIII. SUSTAINABILITY

The goal of establishing permanent marine parks as resort-community-government partnerships is of paramount importance for marine conservation in Fiji, providing a workable model for equitable benefit sharing from the tourism industry for their use of customary native fishing grounds. This will help dissipate the present situation of friction and ethnic tension resulting from the lack of direct benefits going to the reef owning communities and thus will help ensure the long-term future stability of Fiji's government and tourism-based economy, and as such may be the single most important contribution of the USAID project. Although the marine park and trust fund work is still underway, a good foundation has been layed, with the board of Shangri-La's Fijian Resort fully recognizing the importance of the work, with ongoing funding for the program in the Cuvu site.

The establishment of environment trust funds in association with resorts, to raise funds for running the marine parks and to fund community development, environmental, and educational projects will be a crucial element in any workable system, collecting funds as fees for water-based activities and as voluntary contributions from guests. Communities often have great difficulties handling funds, but as resorts have accounting capacity and are accountable to government, it is expected that the resorts can absorb this role of maintaining the Trust Fund accounts, gathering the funds, reporting amounts collected to the marine park administration or trust fund board, and disbursing funds as required. The process will undoubtedly have some challenges and will be a multi-year process.

The resort and tourism outputs of the project are designed to build long-term sustainability into the project and to bring about permanent change. Due to limited resources and instability in the national government (ie: a series of political coups), the tourism industry must be encouraged to take on a greater role in conservation of the marine environment that it so much depends upon, caring for the coral reefs in their areas of operation in collaboration with the reef-owning communities and with the support of the Provincial Offices and District Councils. The resort activities are also designed to add value to the tourism product at the various sites, encouraging active guest involvement with the coral reef environment, as well as heightened awareness and appreciation.

Prior to the coup on December 2006, a great disturbance was predicted by the tourism industry, should the Quliqoli Bill have become law, which would have relinquished governmental control over the beaches and near-shore waters, turning them over to the traditional reef-owning clans. PCDF/Counterpart understood the numerous unresolved conflicts at the community level in our sites, and in particular on Moturiki, where another clan was claiming more than half the Moturiki waters, including the sacred reef sites so important to the people. As comments on the legislation were invited by the government, we devoted considerable time to writing a position paper that detailed some of the problems and conflicts that the Bill would likely cause (see Appendix). The potential seriousness of the situation with the Bill to seriously affect national stability by impacting negatively or even closing down the tourism industry, causing civil strife and communal fighting, cannot be over-stressed, although it seems to have been largely overlooked by the international community. Due to the probability that this matter will raise its head again in the future, we are committed to establishing by the project a model of the way forward for the nation, establishing formal, legally gazetted marine parks as win-win partnerships between resorts and communities, with full community, resort, and government involvement, with the establishment of legally registered trust funds to ensure that benefits from tourism use of the marine areas are channeled back to the environment and to the communities.

The project always worked within the Fijian traditional and governmental protocols, with presentations to Provincial leaders, who would in return send a representative to the management planning workshops at each community site, with the project assisting with travel and local per diem, as government funds were usually not available. This process helped build capacity in Government fisheries staff.

Cost-share funding for Malolo came from the MacArthur Foundation, while cost-share for Serua and Moturiki came from EED (Germany), AUSAID, and the Canada Fund. The Cuvu site was cost-share funded by Shangri-La's Fijian Resort. The Cuvu site was chosen in 2002 as the ICRAN (International Coral Reef Action Network) model site for coral reef conservation for Melanesia, based on the work of PCDF in 2000-2004, but the site was floundering and very much in need of renewal as far as management plans and governance structures. The Moturiki, Serua, and Cuvu USAID sites will extend beyond the grant time frame, helping preserve project continuity in the country, and so that lessons learned can be incorporated into the work as the Coral Gardens–Living Reefs program concept matures and thus increases in its effectiveness.

The Cuvu site has the greatest potential of obtaining permanent and legally recognized marine park status, with a marine park trust fund, with funding for this eventuality continuing through the Shangri-La Resort. Discussions have already begun with Shangri-La's management regarding the possible international expansion of the model through Shangri-La resorts in the Philippines, Malaysia, Maldives, and Seychelles in the Indian Ocean, depending on the outcomes of the present project in the coming year or so.

IX. LESSONS LEARNED

Participatory Co-management Approach - This process continued throughout the project and can never be seen as being completed, as it is part of an ongoing site management process, sharing of reports, problem solving, and drawing support from resorts, community, government, and traditional leaders. A good system of local communications is a vital aspect of project development and plan implementation at each site. A dependency situation can be avoided by conforming to local governance and communication structures, rather than trying to create new institutions and committees, although they may operate on a slower time frame than one would hope for.

Reviving Traditional Practices - Selection by the community chiefs of men and women from each village for training as government recognized "fish wardens" proved to be very successful, strengthening an existing system of resource governance at the community level. The Paramount chief of Cuvu appointed the Fish Wardens from among members of the "Qonedau", clan members with the traditional responsibility for marine management and fishing for the community under the chief. This is the first time in Fiji that a long dormant customary system of fisheries management through the Qonedau has been resurrected to serve in a modern context. This action helps to strengthen the project culturally, as many Fijians strongly believe that more "mana" (divinely ordained power) is now able to flow through the fish wardens to protect and restore the ocean resources.

Frequent Renewal or Refresher Courses for Fish Wardens - With the particular case of Fish Wardens in Fiji, some Fish Wardens died and others moved to other areas during the project, while other fish wardens proved to be too busy for the role or are otherwise unsuitable for the tasks required. We clarified with the

Fisheries Department that the term for Fish Wardens is dependent entirely on the appointing authority- the chief in charge of the respective water area. A Fish Warden is a permanent volunteer position, and as such does not require renewal, but the chief is able to make changes to the Fish Warden positions in a community, appointing new Wardens and revoking others, as long as the Provincial Fisheries Office is informed and the paperwork and photo of the new wardens are supplied. With this clarification of the process, we have been able to work with the chiefs to facilitate a review of the existing Wardens, determining who should be replaced and whether or not additional Wardens should be appointed.

Monitoring and Evaluation - Implementation of fish catch and socio-economic surveys did not reach the intended results as many community trainees did not follow through with the promised surveys, not being accustomed to writing and recoding things. The second weakness the project experienced was the lack of time among PCDF staff to analyze the data into usable form, due to over-subscribing the work. Without any reporting back to the communities, the communities did not understand the importance of keeping up the surveys, and were not able to determine the specific percentage increase in the fish catch. However, it became apparent during the project that most of the emphasis on fisheries and biological monitoring is due to pressure from the scientists and managers among the team, while the community is less concerned with quantitative measures of success and more concerned with qualitative changes in their lives, as long as they perceive a positive change, they are happy, and the project continues to receive a high level of support.

During the monitoring process, we learned that an over-emphasis on establishing a large amount of transects is not wise, but that follow-up and analysis of the data is essential for comparisons. Due to the expense of biological sampling, and the need for NGO assistance with community re-surveys, project staff determined that fish catch data, if it can be made to work, would be better for monitoring the specific impacts of the project on community fishing.

However, sites without any numerical data appeared to work equally as well as sites with good numerical monitoring data. Communities without exception perceived that fisheries resources were much easier to catch in the open fishing grounds due to spill over after only one year, strengthening the long-term possibility of success.

One nearly universal problem in all sites is that most expect the no fishing tabu areas to be re-opened periodically, which in turn will set back recovery of slow growing shellfish species. Permanent no-take areas are needed for maximum biodiversity and conservation value of the management plans, and thus permanent marine parks may serve as this solution. More emphasis on this must be made in our curricular materials and workshops. We did find out during the project that permanent no-take "sacred reef" areas existed in several of our sites prior to the modern era. This needs to be shared with the community and these areas re-established as part of the plans where possible (Davetalevu in Moturiki, Sacred Point in Cuvu, and Mamanuca-i-cake in Malolo).

Establishing Public Private Partnerships - While most resorts have made only verbal promises, much of which they have been forthcoming with, assisting with our travel and boat support, staff assistance, rooms and meals, it is suggested to formalize the relationship with contracts on a resort by resort basis. A formal and quite significant contract has been signed with Shangri-La's Fijian resort, at the Cuvu site. While it is expected that at least some of the resorts will come forward with their promises to carry the burden of the project work forward after the USAID project stops, if the Cuvu site continues to develop all of the various aspects of the project: coral restoration, staff development, and environmental work, then a vital model will

be available for other resorts and communities to emulate. Coral Gardening training took place for staff of eleven resorts during the project. Follow up training is needed, funded by the resorts.

Identifying Economic Incentives for the Aquarium Trade - Aquarium Fish Fiji and Waterlife Fiji, two local aquarium coral and fish exporting companies visited the Moturiki coral farms and were provided with farmed coral samples for trial export in 2006. However, we discovered that these companies had no real economic incentive to convert to farmed corals to replace the wild trade they are engaged in. They are not willing to pay more for the sustainably farmed second generation corals than they are for those taken from the wild- about US $3.00 each. However, from marketing trials, we have found that can sell the corals for considerably more as bleached or colored curios, and so the replacement of live aquarium corals with farmed corals, one of the long-term goals of the project, does not seem achievable unless and until changes in the global markets occur. It should be noted that the aquarium corals sell for exorbitantly high prices in overseas markets but the present system is enriching expatriate exporters and retailers in Fiji and in other countries but not sharing the wealth justly with the collectors.

On the heels of the BBC TV broadcast in March 2008 and prior to the Oxford Seminar in April, a presentation was made in London to the Society of Reef Keepers, a UK-based 10,000+ membership association of aquarium enthusiasts and businesses (http://www.ultimatereef.com). Many of the UK Reef Keepers had seen the BBC presentation and had begun internal discussions on how to link with the Fiji project. As a result, Reef Keeper members have offered to fund the Fiji project, should we register as a UK charitable trust. A new NGO, "Just World Partnerships" is presently in the process of being formed in order to take advantage of this interest. Discussions have continued and we are also working on new ways to get the desired live farmed corals to the UK industry.

From the economic standpoint, the result of our marketing trial was quite successful. The farmed corals with permits attached sold for $10-20 Fijian dollars for small sized corals (4-6 month old), $30-50 dollars for medium sized corals (9-12 month old), and $70-150 for larger sized corals (18-24 months old). However, these high prices are thought to be in part due to the marketing method used, tying the coral sales directly to coral reef conservation and poverty alleviation, and thus encouraging generosity on the part of the buyer.

The marketing activity did identify some weak points in the process, which have mostly been resolved. Among these problems was a misunderstanding that arose between the Ministry of Environment and the Ministry of Fisheries over the CITES permitting process and as a direct result of the coral marketing trials. This was cleared up to everyone's satisfaction by mid 2007. The underlying misunderstanding was that Fisheries had thought that we were exporting corals, while in fact we were selling corals to tourists for them to carry out of the country. The process of permitting of second generation farmed corals for export versus local sales is now better understood by all; with Fisheries controlling export permits, and Environment in charge of permitting for local sales and permits to allow tourists to carry out farmed corals from Fiji.

One concern of Fisheries was that a woman was found selling painted coral curios in the handicraft market, saying that they were farmed corals from Moturiki. After investigation, it was determined that the corals were in fact wild caught and the woman was not being truthful, and she was stopped from selling the corals and warned that it was illegal. PCDF has resolved to keep Fisheries better informed of our future marketing trials, and to better educate the vendors about the standards for coral farming and CITES permits, etc. The farmed corals are clearly differentiated from wild caught corals by the cement "cookie" they firmly grow onto. We can expect future attempts at counterfeiting the corals and so strategies to head

that off will need to be developed under the new Canada Fund grant to PCDF that is funding the marketing and governance structures for curio coral farming.

We have met with Jack's handicrafts senior management, the largest handicraft marketing chain in Fiji, and they are quite interested in marketing second generation farmed corals to visiting tourists. We also have met with Pure Fiji and they are interested, and are offering us assistance with packaging. The last company we met with was the high-end marketing chain Prouds, whose executives are very interested, and have since contacted us to pursue the possibilities further. They prefer to market a product housed in a small glass casing with hardwood base, and so we plan to work more on this once the next crop of corals is ready for harvesting, funded by a new grant from the Canada Fund.

SeaKing Trading Fiji met with us several times, proposing that they become the exclusive exporter of the farmed curio corals from Fiji, drafting a MOU to this effect in their attempt to partner with PCDF. While they have for many years been given CITES permits through Fisheries to export wild corals from Fiji, and have the equipment for packaging and shrink-wrapping, plus retail markets already identified overseas, their reputation as an environmentally damaging industry due to former rampant wild coral harvesting will be hard to overcome. Through SeaKing Trading, we also met with a group of doctors from the USA interested in the medical uses of corals in bone grafts and permanent artificial eyes, and that possibility still exists as a partnership with SeaKing, although they require slower growing massive corals, and so developing second generation farmed corals for that industry would take some time and would need to be financed by the industry.

We have since made the decision to not deal with exporting corals overseas at this time, unless conditions change, but to focus on marketing curio corals within Fiji, as a fund-raising venture to raise money for coral reef conservation and to support the poor communities practicing good coral reef management.

Training manual in coral farming drafted – project staff determined that the publication of a training manual for coral farming is not appropriate, as we don't want communities to try marketing corals outside of the program, and not with the high reef conservation standards that we have set in association with the commercial farming of corals.

Development of Sustainable Standards for Second Generation Farmed Corals - Other than the below standards, removal of coral-predators from the wider area around the coral farms is encouraged, as is locating coral farms within no-take marine reserves, as a permitted economic activity, as fish care for the corals and keep them healthy and free of seaweeds and silt. Giant clam nurseries are also encouraged in association with the coral farms due to the increased security they clams will receive from regular visits. Aggregating the clams helps increase their reproductive success during spawning

PCDF Coral Farming Protocols and Environmental Standards:

1. Coral farms must be established only in area practicing good coral reef management- that includes a minimum of 25% of the reef area closed to Fishing.

2. Coral farms must have an associated reef restoration site, where extra bits of coral are placed or wedged, to restore the reef patch over time.

3. All corals marketed must be second generation, third generation, or higher, with mother corals cultivated in the coral farm site and trimmed to produce the coral seed for planting the corals destined for sales..

4. For every coral harvested, an equal or greater amount of coral must be replanted back to the reef restoration site, so the coral marketed pays for the planting of another farmed coral into a reef restoration site.

5. Corals must be cultivated in a manner so that it can be verified as farmed: with cement disc or ingrown plastic line embedded within.

6. Coral farms must be located in back reef areas, above rubble or sand, not above living coral reefs or on the reef proper.

National Government Involvement and Information Sharing - Due to the military coup of December 2006, the Ministers and CEOs were all newly appointed, and contact with the new officers had to be made. Tourism and Environment were combined under one ministry. We met several times during each year with the Ministry of Environment and Tourism to discuss the project. This ministry is the GEF focal point for Fiji, and we continued to work with the Ministry to develop a large GEF concept paper for Fiji through GEF. The Ministry was also very supportive in the launching of the farmed coral marketing trials. The Minister of Environment and Tourism was replaced in January 2008, and more work needs to be done to catch him up with the ongoing work funded by new donors. We met with the Ministry of Fisheries and Forests several times during the project, but the CEO and top staff were also replaced in January so we need to do more follow-up at that level as well. On the positive side, mid level civil servants have remained constant during the project, and we have focused our attention at that level. The director of Environment in particular remains our stalwart supporter.

Late in the project, we met with a representative of the Ministry of Education who is very interested in our community awareness curriculum, and using coral farming as an educational hands-on tool for rural secondary schools in the outer islands, to attract Fijian students to learning more about their environment and encouraging them towards pursuing higher studies. An Australian Overseas Volunteer is following up with us on introducing coral farming as an educational activity for Kadavu Secondary School.

Conflict Resolution - A conflict with particular hoteliers involved in funding and directing the Mamanuca Environment Society (MES) arose in 2007, with the hoteliers somehow thinking that the USAID work was competing with them or making them look bad, and that conflict prevented more of the resort-focused work from being carried out in the Malolo site, with a decision made to withdraw from active partnering with MFHA for the time being, due to the stretched resources of the project and to the strong personalities involved. However the local Fijian staff of MES, continue to have an informal working relationship with PCDF. No resolution of the conflict is expected in the short term, as this site has no funding beyond the USIAD grant. We regard this as an internal matter for the MFHA. In spite of the misunderstanding, three resorts contacted us, and Musket Cove resort sponsored a coral workshop for their staff. Plantation Island Resort with the input of USAID staff solved a major beach erosion problem that unwise coastal development was causing, understanding of the processes involved and correcting past mistakes.

Major conflicts were uncovered in the Moturiki site during the project as well, with over half of the Moturiki traditional waters being claimed by another clan. We were able to avoid this problem for the most part, and

we have introduced the concept of a permanent no-take "Davetalevu Marine Park" to include all the disputed waters for the benefit of all. Negotiations are in process between the conflicting clans, with the goal of everyone agreeing to set aside the area, much of which is sacred to the Moturiki people, and that is still not fished by them today out of respect.

Crown of thorns starfish (COTS) - This coral-killing species is naturally controlled by triton's trumpet shells and hump-head wrasses, but in areas where these species are overfished, COTS are becoming a plague. Overabundance appears to be a serious problem in Malolo, and a developing problem in Moturiki and Serua. We recommended removing COTS to the MFHA and a major removal activity was carried out by MES subsequently, with PCDF being invited and sending a staff member to assist

X. RECOMMENDATIONS

1. Project Time Frame - A project life of three years is too short for marine management projects in Fiji. Five years would be the ideal time frame, to build the capacity of local self-governance structures and to allow for adaptive management and modification of resource management plans as determined by monitoring.

2. Resolving Marine Ownership Issues to Prevent Serious Social and Economic Breakdown - Fiji has the potential for continued turmoil on the political and social fronts, which has serious potential to result in racial strife and near complete economic breakdown. Therefore, serious consideration should be made to supporting equitable and participatory partnership solutions developed in this project, expanding this work throughout the tourism areas of Fiji and beyond.

3. Funding - With the exception of this completed project, USAID has not been an active donor in the South Pacific since 1982. In the meantime, serious problems have arisen in the region, and we suggest a re-evaluation of this situation. With its small population, Fiji and the Pacific Islands would not require tremendous amounts of funding to help stabilize the situation for Fiji with the qoliqoli and tourism issue. The primary source of conservation funds internationally is GEF, however the Pacific Islands nations and Fiji have yet to access any other than small project funds in spite of several attempts to access funds or to streamline the system within the GEF Secretariat. Long-term project sustainability may be possible by involvement of the tourism and marine curio and aquarium sectors in the developed world in the coral work that they are so interested in supporting.

4. Corals for Conservation - Working with corals has proven to be a point of great tourism and community interest, and the methods should be promoted in other sites around the world, not as a stand-alone project, but fully integrated into coral reef management and community awareness programs.

5. Climate Change Adaptation and Coral Reefs - Temperature tolerant corals can be propagated for use as part of a comprehensive climate change adaptation program for coral reefs. New work has begun along these lines at the Cuvu site with the Shangri-La. A solicited concept paper on coral gardening for climate change adaptation was drafted and submitted to the World Bank in April 2008, for work in the Caribbean.

XI. CONTACTS

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APPENDICES

Appendix 1. Fish Wardens, Coral Gardeners, and Coral Farmers Trained

	Fish Wardens	Resort Coral Gardeners	Coral Farmers
Fiji Total March 2008	***154***	***32***	***70***
Moturiki Total	***22***	***2***	***27***
• Yanuca	3		19
• Daku	6		4
• Uluibau	6		4
• Niubasaga	5		2
Serua Total	***44***	**0**	***43***
• Culanuku	11		6
• Yanuca Island	12		15
• Naboutini	6		
• Namaqumaqua	5		22
• Serua	5		
• Navutulevu	5		
Yasawa Total	***19***	**0**	
• Tamusua,	2		
• Nabukeru	2		
• Bukama	2		
• Yasawairara	13		
Nacula Total	***27***	***28***	
• Nacula	5		
• Navotua	5		
• Naisisili	2		
• Matacawalevu	7		
• Vuaki	8		
Malolo	***36***	***2***	
• Solevu ad Yaro	12		
• Yanuya and Tavua	24		
Cuvu	***6***	**0**	
• Cuvu Village	3		
• Navuevu	3		

Appendix 2. Environmental Awareness Building for Schools. *Note: for 2006 figures represent a single session, but for 2007 and much of 2008 the numbers represent monthly sessions with the same youth.*

	Number of Students		
	2006	2007	2008
Project Totals	1,552	184	113
Moturiki			
• Uluibau Primary School	75	18	18
• Moturiki District School	138	32	32
Serua			
• Ratu Latianara Primary School	310	70	20
• Ratu Latianara High School	436	64	
• Yanuca Island School	53		53
Yasawa			
• Ratu Namasi Primary school	60		
• Bouwaqa Village School	38		
• Bukama Village school	70		
Nacula Tikina			
• Ratu Meli Primary School	186		
• Nasomolevu Catholic Primary School	80		
• Yaqeta Village school	106		

Appendix 3. Workshops Co-financed by AUSAID and EED Grants to PCDF *(USAID provided transport, staff assistance, and expertise)*

Key Activities	Participants per Village	Achievement and Impact
Serua Environmental Education and Awareness Workshops	Namaqumaqua: 20 15 males and 5 females Vunaniu: 40 26 males and 14 females Naboutini: 32 24 males and 8 females Korovisilou: 20 17males and 3 females	In total 112 people have undergone the awareness workshops. Each village has received a set of 12 Marine education posters for their community hall
Serua Marine Management Planning Workshop	Vunaniu: 29 25 males and 4 females Namaqumaqua: 29 23 males and 6 females Yanuca: 37 15 males and 22 females Serua Island: 25 23 males and 2 females	7 Management Plans 6 Marine Protected Area established (2 demarcated) *Crusoe's Retreat and Wellesly Resort funded materials for the marking of Namaqumaqua MPA.*
Serua Fish Warden Workshop	District Level: 26 22 males and 4 females	District has mobilized their own environment support team including key participants from all 8 coastal villages of the District
Serua Biological Monitoring Training Workshop	District Level: 26 22 males and 4 females	Capacity built in biological monitoring techniques.
Coral Farming Workshops *Note: this doesn't include Nacula and Malolo trainings, same methods but focused on growing corals to enhance coral reef tourism*	Serua Site: Culanuku and Namaqamaqua 22 (6 females and 16 males) Yanuca (Serua) 15 (7 females and 8 males)	Two farms established: four tables in total-600 pieces of coral planted One farm established: 2 tables of 400 pieces, plus1 table of mother corals
	Moturiki: (Dec 2007 training): 18 (1 female and 17 males) 25 (about half male half female) 2005-06 trainings	One New Farm (2 tables- 300 pieces of corals planted) *As part of the workshop, an exercise was given to participants to set up their own farms after the workshop ended which was evaluated on the follow up in Dec 07* *The follow up saw additional tables in Niubasaga, Daku and Uluibau and an additonal two tables in Yanuca (Moturiki). The communities had grasped the technique and a job well done!* *2,000 new corals planted in total*

Appendix 4: A Guide to Coral Gardening

Hands-on Methods to Care for Corals and Coral Reefs

Austin Bowden-Kerby, PhD,
Coral Gardens-Living Reefs Initiative, Counterpart International
March 2007 Draft

Major Focus of the Workshop:

Training in coral gardening, and reef care methods to help bring the corals and fisheries resources back while educating resort staff, and guests in the active caring for coral reefs

Field Sessions: Coral Care, Coral Planting and Coral Farming Methods

1. How to make coral growth frames and coral farming trays and tables
2. Transplanting corals to A-frames, "cookie" trays, and to lines
3. Replanting dead reef areas with coral branch tips
4. Restoration site selection
5. Obtaining corals without damaging the reef
6. Selection and handling coral fragments for transplanting
7. Maintenance of coral farms, coral gardens, and restoration sites
8. Field observations of problem species for corals: Stegastes damselfish, COT and predatory snails
9. Demonstration of COTS removal techniques
10. Obtaining corals without harming reefs (rescue from extreme shallows and thinning from conditions of overgrowth)
11. Avoiding reef damage while in the field and repairing small-scale damage
12. Dusting and weeding of corals to increase their health and to prevent disease

Expected Outcomes of the Workshop`

1. Resort staff trained as certified Coral Gardeners to care for resort reef areas
2. A work plan for each participant developed, including fish houses, coral farming, and regular coral care activities
3. A plan for regular monitoring and coral care activities at reef sites
4. Dive and tourism industry support of coral reef protection and damage repair
5. Partnerships developed and strengthened and plans made for follow-up and moving the work forward

Introduction to Coral Reefs

Coral reefs are vitally important biodiversity resources for the planet, home to thousands of beautiful and interesting creatures. Coral reefs build beaches and protect shorelines from wave erosion, and attract tourists in large numbers, forming the foundation of the Fiji economy. Coral reefs also provide Fiji with a significant portion of high protein food resources, in the form of reef fish, octopus, clams and other sea shells, and lobsters and crabs.

However, coral reefs are facing a crisis. These important systems are declining I Fiji and almost everywhere around our planet, and at the hands of people and industries that are largely unaware of the long-term consequences of their actions. Coastal pollution and muddy runoff causes seaweed overgrowth and coral disease, while destructive fishing by coastal communities have lead to corals being smashed and over-fishing has resulted in coral death by over-abundant coral predators that attack the corals. Add global warming and coral bleaching to this already bleak situation, and the balance has now been tipped in favor of a future where beautiful coral-dominated reefs of high biodiversity will be replaced by degraded reefs of dead corals covered by algae in only a few decades.

Can anything be done to reverse this situation? ...who has the answers: Governments? Scientists? Aren't these problems much bigger than us as individuals? Or is there something that we ourselves can do to help turn the tide in favor of coral reef survival and health in our own communities?

The purpose of the course is to train resort staff and fish wardens to become more directly involved in caring for and saving corals. It is the time for resorts and communities to begin working together to protect and improve the shared resources that are so important to tourism and food security on our islands. We hope to train an army of resort staff, divers, and fishers in how to recognize corals that are in trouble and what to do to save them. This type of small actions to save corals that will otherwise soon die we refer to as "reef first aid", while doing things to lower stress on corals we refer to as "coral care". Coral reef management, on the other hand refers to the bigger picture of making plans to deal with the bigger and longer-term threats to the coral reef system. Good coral reef management will be required in order for corals and coral reefs to regain their health over the long term, and therefore should be the ultimate goal of conservation. In the mean time reef first aid and coral care programs are very important in raising awareness and mobilizing concerned people to action.

Carrying Out Effective Coral Gardening

Before planning any coral gardening plans, we should consider what killed the particular reef in the first place, and if restoration activities have a good chance of long-term success. For many reefs we may have to work towards solving the root-causes of why the reef declined at the site first. Sites where problems such as poor water quality due to pollution is a problem or where conditions are worsening rapidly may not be successful as coral gardening sites, however a small trial may be useful before deciding that coral gardening is not helpful in an area.

While any reef area can potentially be adopted, those reef areas of particular value to the community for purposes of fishing or tourism should be considered priorities for coral care and reef first aid programs. Heavily used reef areas are impacted by fishers and visitors, and so a coral care and reef first aid program may be effective in lessening the long-term impact of small-scale but constant impacts that otherwise would lead to coral decline at the site. At such areas, certified coral gardeners can help organize and stimulate a program between tourism operators and local volunteers to care for the reef at important dive sites and snorkeling areas. Coral care methods such as "dusting" and seaweed removal can be taught to reef guides, scuba divers, and resort staff without worrying about negative outcomes because the corals are not touched. However, reef first aid methods that replant broken corals need more training because they involve

handling corals, and should be limited to or at least closely supervised by those properly trained in the full coral gardening workshops.

Before learning how to replant corals to restore damaged reefs, it is important to consider the following precautions:

1. Planting corals is NOT a "quick-fix" solution to coral and reef decline because it does not solve the root causes of coral reef decline.
2. Coral planting is only effective as a management tool when combined with other conservation strategies, such as no-take marine protected areas and measures to decrease reef damage.
3. Coral planting is only effective in some areas and under certain conditions.
4. If whatever killed corals at a particular site in the first place continues to be a problem, it is useless to replant corals, only to watch them die later.
5. Most importantly, in our work we must not give the impression that we have found a quick-fix solution to coral reef decline, that it has somehow become okay to destroy reefs because they can be easily replanted...*NOT*!

Basic Information for Coral Reef Managers and Coral Gardeners:

Before going further into coral gardening or coral care and reef first aid, we need to all have the same basic level of understanding. The following is a review of the basic information that all people involved in coral reef conservation should know.

What are Corals?

What are corals?.... are they stones?, are they plants?, or are they animals? Boat operators and fisherman will usually tell you that corals are a type of sea stone. This is true, because when a boat engine hits a coral, the propeller breaks. Corals scratch the body and cut the feet.

However, there is more to corals than just being pretty stones; unlike land stones, corals are alive and grow bigger over time. Corals also need sunlight in order to live and grow, just like plants. So are corals plants? Well sort of... corals have tiny plants inside their flesh, *(single-celled algae called zooxanthellae, but don't use this word with most audiences)*. The very thin layer of flesh covering the otherwise white skeleton of living corals is normally golden brown in color because of the presence of thousands of these tiny plants in each millimeter of coral tissue.

But there is more still...corals need to eat food in order to live, just like animals. Corals have tiny (nearly-invisible) mouths for eating, surrounded by tiny arms "tentacles" for catching their food. Each mouth is located over a small hole on the surface of the coral skeleton, and these small holes can easily be seen on close inspection of the coral. Each mouth and ring of arms forms a tiny flower-shaped unit called a "coral polyp". An individual coral usually has many hundreds of polyps covering its surface. Each coral is composed of a group or "colony" of coral polyps, so it is called a "coral colony".

Why are Corals Important?

Corals are important to fishing communities because they provide homes for fish, lobsters, and other valuable resources on the reef, and these animals can be caught for food or sold for cash. If a reef is covered with beautiful corals, it is also attractive to visitors, and tourism can help bring jobs and money to communities. When corals die, they don't make such good homes for fish, and they look less beautiful. Healthy corals and abundant fisheries resources help lead to healthy and prosperous communities.

Where Have all the Corals Gone?

Corals need clean water in which to live and grow, and they are easily damaged and killed. Careless people often break and kill corals when they go fishing: throwing anchors and nets onto corals at favorite fishing sites, breaking corals to get to speared fish, and walking on corals in shallow reef areas. Many reefs have been damaged by these sorts of impacts over the years. Natural events like hurricanes can also cause serious damage to reefs. Smashed corals often become rubble beds that do not recover coral populations for many generations. Whether smashed from storm waves or by careless people, broken corals mostly die and broken coral areas on the reef often do not recover, even after many years. Anchors, coral harvesting, and unwise fishing methods like dynamite over the years have damaged many coral reefs. Today there are less fish in the sea than in the old days, and reef damage is a big part of this problem.

Over-fishing Harms Corals

Fish and other reef animals help to keep corals healthy. Predatory fish like groupers help keep farmer damselfish (*Stegastes* or in Fijian "guru") under control, that otherwise kill corals by cultivating hairy seaweeds on the corals, often spreading coral disease as they bite and wound the corals. Lobsters and crabs keep the coral-eating snails (*Drupela* and *Coraliophila*) under control. Sea cucumbers clean the sand, while sea urchins, surgeonfish, and parrotfish clean the reef of excessive seaweeds which can smother living corals and provide and harbor coral diseases.

Over-fishing of groupers, lobsters, and other species on some reefs have resulted in an over abundance of animals that kill corals. Coral killing "crown of thorns starfish" are over-abundant on many reefs due to over-fishing of their predators. Over-fishing of seaweed eating fish and sea urchins on some reefs has resulted in the death of corals through overgrowth by seaweeds, while on other reefs seaweed overgrowth has prevented coral recovery after storms.

Poor Land Management Harms Corals

Land-based threats to reefs are serious factors as well, especially near larger land masses. Sewage from communities and fertilizers from agriculture empty into the sea, and these land pollutants compound the problem of seaweed overgrowth on reefs, increasing coral disease and causing coral death. Where land has been cleared for development, logging, or agriculture, rivers become muddy and this mud empties into the sea. This muddy water smothers and kills the corals, sometimes traveling with the currents to affect reefs many kilometers away. These land-based problems may take many years to solve.

Coral reef restoration will require dealing with each of the root causes of coral reef decline for each reef. On many reefs, increasing fish populations alone through proper fisheries management will do much to increasing coral and reef health. For other reefs, coral planting may help accelerate the process of reef recovery. For yet other reefs, those with serious chronic land-based threats, the root cause of the problem may take many decades to solve, and these reefs should be regarded as non-restorable over the short-term.

How do Corals Reproduce?

Plants in our gardens reproduce in two ways: sexually by seeds and asexually by cuttings. Corals also make babies in two ways: sexually by producing very small babies (coral larvae) and from broken pieces called *fragments*. It is very hard to see coral babies because they are small and are made only at certain times of the year, almost always at night.

The tiny coral larvae swim in the water and look for good places to settle down and grow, especially clean dead corals. If you look closely at dead coral rocks on the reef, you will sometimes see the tiny baby corals that have settled down and planted themselves, about the size of a pencil rubber, or smaller (coral spat). If a tiny baby coral survives, it will be the size of an orange in about 2-3 years. Many newly settled corals do not survive for even a year, as they are easily eaten, covered by sand, stepped on, or overgrown by sea plants and bigger corals. Good places for coral babies to survive are clean seaweed-free rocky areas with clean sea water.

When coral larvae settle onto dead broken up corals, the dead coral pieces later turn over from currents, stingrays, and etc. When this happens, the tiny corals are buried underneath and die. This is why broken reefs (from storms, dredging, trampling, or blasting) may not recover coral populations. Likewise, if dead coral rocks are covered with seaweeds, coral larvae can not settle, and the coral population will not recover.

Helping Coral Babies Survive

While coral babies may be too small and too hard to catch to be planted easily by people, there are some things that we can do to increase the settlement and survival of the baby corals, such as keeping the seawater clean and free of rubbish. Some types of fish also help baby corals survive by cleaning small sea plants from the dead coral rocks, helping the coral larvae settle down and survive. This is why making a no-fishing area can help corals return to a damaged reef on their own, as the fish begin cleaning the reef more effectively as they increase their numbers and size.

GUIDELINES FOR TRANSPLANTING CORALS

Coral work should be undertaken under the guidance of staff trained in the *"Coral Gardens"* methods. Other types of restoration interventions that may not require much training can be also be done by volunteers, such as removing coral-killing snails or *Crown of thorns* starfish, and removing seaweeds overgrowing corals. These actions help coral populations regain a more healthy state, with no handling or planting of corals needed.

Where and When Should Corals be planted?

Dynamite fishing, reef dredging, and severe storms can leave behind broken and dead coral gravel mixed with sand, that can not easily recover coral populations. Once reefs become poor in corals, they usually become poor in fisheries resources. But where dredging or blast fishing has smashed the reef to bits and pieces, there is still hope: corals can often be replanted to shorten the natural recovery period from hundreds of years to only a few years. However, if the cause of the problem is not solved before the coral planting is begun, it might be useless to replant corals, as they will only be killed again. Coral replanting should therefore only be used in conjunction with proper coral reef management and the implementation of effective conservation plans.

Perhaps the most effective use of coral replanting is within well-established no-fishing Marine Protected Areas. Such areas are protected from coral harvesting, fishing net damage, and other things that work against coral replanting. Restoring damaged reef areas can help speed up the natural reef recovery process and help the reef regain lost fisheries resources, providing increasing numbers of homes for fish. In this way coral replanting could help make no-fishing MPAs more effective.

Restoration Site Selection Guidelines

a. The transplant site should be of similar light quality to the original site, especially during summertime. However, during the wintertime, corals taken from 10 meters deep may do well when planted to only 2 meters.
b. Corals taken from dark bottoms should not be planted onto bright sandy bottoms in the summer months.
c. If corals bleach seriously, they are not yet dead, and sometimes do recover, but it is much better to avoid this sickly condition, as it stops the corals from growing until the corals regain their color, showing that the tiny brown algae are back.
d. The best restoration sites have cool, clean, full-strength seawater, with good current flow but sheltered from storms. Avoid difficult sites, such as areas prone to very rough seas, shallow closed lagoons that heat up during summer months, areas with freshwater runoff from the land, and muddy environments.
e. Survey the transplant site well before the day of transplanting, so that the best sites are located within the general area and the best method is chosen, allowing the corals to be immediately planted, rather than delaying while the specific sites are chosen.

Selecting Corals for Replanting

Corals for planting should be carefully selected. Some corals, such as finger-shaped and rounded *Porites* corals, can be used where the water is a bit dirty or mixed with fresh water, as they survive better in these more difficult conditions, but they will grow more slowly. Other species are very sensitive and die in dirty water, while some corals may be sensitive to warm water or bright sunlight. The corals chosen must be able to survive well in the planting site, so it is important to use corals growing in areas similar to the planting site. For example, if a dirty-water lagoon area is to be replanted, corals from a similar dirty lagoon need to be located first. Corals brought in from cooler, cleaner waters of the outer reefs may look very much the same as the corals that live well in the

lagoons, they may even be the same species, but they are more likely of dying if they are planted into the calm, warmer, muddier water.

Taking Corals for Planting without Hurting the Reef

Just as with gardening on land, corals and coral branches can sometimes be pruned back without hurting the coral or the reef. Corals that are growing very close together often fight with each other as they increase in size, and the faster growing coral will overgrow and kill the slower growing coral. Pruning back the branches can help the corals have more room, and the branches can then be used for planting.

Another place where corals can sometimes be taken for planting without hurting the reef is in the very shallow areas of the reef flat, where the tops of the corals sometimes touch air during extremely low tides. These corals usually are killed every few years during very low tides by high temperatures, drying out, or from heavy rain. These shallow reef areas are often good places to find the slower growing rounded corals and branching corals that are naturally strong against high temperatures and freshwater. Taking some of these corals for planting in 1-3m deep reef restoration areas may allow them to survive much longer and grow to a large size.

Still another place where coral branches can be borrowed from are "farmer-fish" damselfish gardens. These coral thickets have hairy brown sea weeds covering their lower parts. The sea weeds are farmed by the small brown farmer fish. This fish kills the lower parts of the coral and allows the seaweeds to grow. They chase fish away if the try to eat from their gardens, so corals with farmer fish make poor homes for parrot fish and other seaweed-eating fish, as they are chased away.

Starting the work with a Coral Planting Test

Before planting a lot of corals at any site, it is very important to do a test planting first. This means taking a few branches of each type of coral that will be used from the source corals, and planting them into the restoration site, to observe for six months to a year.

One experiment for restoring a broken coral rubble bed might use three small plots of each coral to be used: five small branches <10cm, five branches between 10-20cm, and one or two branches >20cm. If the results turn out very well, more work can be done with the coral types and sizes that survived and grew the best. If the overall results don't turn out very well, the reason should be considered. More tests might then be done using different types of corals or different planting methods, depending on the seriousness of the problem, only expanding the work when the result is very good. Corals attached to wire mesh A-frames might survive where corals placed on the bottom die.

An exception to the long waiting period can be made if branches of corals are trimmed from corals already growing in the site for replanting.

Planting Corals on Broken Reefs

We now understand that when coral larvae settle onto broken coral gravel, that the dead coral pieces will within a few months be turned over so that the tiny baby corals die. However, planting corals from coral fragments into these broken reef areas can be very effective, as they are much larger. Coral fragments sometimes survive very well even

when just scattered onto the broken reef areas. The smaller the coral fragment, the less likely it will survive, so large fragments are recommended. Nearly 100% of hand-sized coral fragments can survive on clean coral gravel of the calm back reef. However, a test planting should always be used before a wider effort is attempted.

If the currents on a reef that is in need of restoration are very strong, small hand-sized corals sometimes stay put and are better than larger branches, which stick up and catch the current and are more often carried away. For broken reefs with very strong currents, all coral branches may be swept away, regardless of size. If this is the case, two methods can sometimes work. One method is to tie 10-15cm coral branches onto fishing line and then tie this "coral necklace" to stakes driven into the broken up area. Another effective way of restoring corals to high current areas uses rocks from the land or cement blocks, scattering them onto the broken reef area. Coral larvae then can settle onto these rocks and blocks, which are too heavy to be moved or turned over easily by the currents.

Planting Corals in Sandy Places

Where the sea bottom is very sandy, small coral fragments placed onto the sand will always die. However, for these sandy areas, larger corals and larger coral branches can sometimes grow very well when planted directly on the sand. Corals for planting on sand must be at least as big as a basket ball (30cm wide x 30cm high) in order to stay above the choking sand, and bigger may be even better. Smaller branches can be planted successfully in sandy areas if they are supported above the sand, such as on top of broken fish traps, tied to wire frames, or the like.

A two-step process for planting corals into sandy areas can sometimes be used. Corals can be grown from small branches on broken coral gravel areas, and after about 2-3 years, a few of these larger coral colonies can be moved to the sandy restoration sites for testing the site. If conditions are right, the corals will grow rapidly in the sandy area, as they slowly sink into the sand and until they finally become strongly anchored, and better able to withstand strong currents. In some places, especially when planted out of sight from the main reef, the coral colonies can sometimes become very crowded with small fish. The isolated corals are very good nursery areas for baby fish, which arrive when they are very small (<1cm), soon growing to finger size before moving to the main reef.

If many stingrays live in the sandy coral planting site, they may damage the corals. The shellfish that the stingrays hunt for food sometimes hide under the corals, and so the stingrays may push the corals away, breaking them into smaller pieces that may then die. If this is a problem, planting the coral colonies close together (closer than the diameter of a stingray), in groups of five or six colonies, can protect them from most of the damage.

The Season of Planting can sometimes make a Difference

Sometimes the season that corals are planted in can make a big difference in success. If storms or strong wind-driven currents are a seasonal problem, it may be best to try planting corals during the calm season. Coral fragments cement themselves to the rocks that they touch as they grow, and they begin cementing the dead coral stones together. Coral fragments in this way become more attached and more stable over time.

Corals often transplant best during the coolest part of the year, having a lower death rate and growing faster. However, the coolest part of the year may not be during the calm season, so the best time for coral planting at a site may not always be easy to decide.

If corals die after transplanting at a site, it might not be due to a problem of the site, but perhaps it could be due to some problem with the corals. The problem could be related to season: planted during the warmest time of year, or during the time for coral reproduction and larvae formation, when the corals are weakest. Also if the corals are already fighting a disease, the extra stress of transplanting my be too much for an infected coral to endure.

Sometimes several trials may be needed to determine the best time of the year to plant corals at a particular problem site. If there are strong seasons, it is important to allow the coral planting trials one full year before proclaiming success and doing more coral planting work. Corals may grow very well during one season, only to be killed in a later season by fresh water draining off the land, by high temperatures, seasonal storms, or other factors.

Coral Planting Guidelines

a. Coral branches should be planted with the up-side up. Close inspection shows a lighter color and distinctive "reaching towards the light" polyp pattern on the bottom side of horizontal branches

b. The bigger polyps at the end of each coral branch should face upward as much as possible when planted

c. If exposure to air is necessary during transplanting, keep them shaded and out of the wind. Splash the corals at least once per minute. Be vigilant.... corals are not just pretty stones, but are very much alive and are easily damaged

Coral Handling Guidelines

a. Wash your hands with simple soap and water, and then rinse your hands well in seawater before handling the corals. If in the ocean, simple non-conditioned shampoo or baby shampoo works well. Coral handlers must have very clean hands: no gasoline, sunscreen, oils, or soap on the skin. Don't touch your face or other areas that might be contaminated with lotion or oils. Keep the boat clean and free of gas and oil pollution.

b. Gloves are not recommended unless they are very clean and non-absorbent otherwise they can trap foreign proteins that can cause corals to react.

c. The part of the human body most similar to coral tissue is the surface of our eyes, so show the corals some sympathy as you touch and handle them.

Coral Transport Guidelines

a. Corals survive best and for longer if kept in buckets of clean seawater or in baskets hung in the water from a boat
b. Corals can often be transported exposed to the air if they are shaded from bright sunlight, kept out of the wind, and splashed every few minutes with clean seawater, even for over one hour

c. Corals from the same mother corals do well close together and touching each other in the same container, however, if different types of corals touch each other for a long period of time, they don't like it, and they will begin killing each other.
d. Corals should best be moved during the winter months when the burning rays of the sun (ultraviolet radiation) are less strong (from May to September in the Southern hemisphere). The closer the site is to the equator the less important the season of transplanting is. If corals are transplanted during the summer months, special care should be taken to keep them cool and shaded.

Coral Selection Guidelines

Corals for planting should be carefully selected. Some corals are very sensitive and die in dirty water, while other corals may be sensitive to and die in warm water or where fresh water mixes with the seawater. The corals chosen must be able to survive well in the planting site, so it is very important to find and use corals growing in areas very much like the planting site. For example, if a dirty lagoon area is to be replanted, corals from a similar dirty lagoon need to be located first. In order to restore the reef it is important that some corals have survived somewhere in similar water conditions. Corals brought in from cooler, cleaner waters of the outer reefs may look very much the same as the corals that live well in the lagoons, but they are more likely of dying if they are planted into the calm back reef. Corals to be planted into shallow areas should come only from shallow areas. Corals should not be moved from deeper reef areas to shallow reef areas, unless the planting site is shaded, (like under a wharf). Corals from deeper areas planted to shallow areas often become sunburned, and they can then die. Coral fragments taken from an upright position and planted in a flat position sometimes also suffer from sunburn on the upward facing side, becoming very pale and bleached, but usually they recover. Corals taken from shallow reef areas and planted to deeper reef areas seem to usually do fine.

If corals die in the first two weeks of transplanting at a site, it is most likely due to a problem in transporting the coral fragments (drying out, exposure to too much hot sunshine, contamination with petrol, etc), or due to the environment being quite different in their new home from their original home. If you suspect a handling problem, it may be important to try another test, being more careful when handling the corals, or trying a cooler season when the corals are less stressed, before pronouncing the reef area non-restorable.

Where Should Corals NOT be Planted?

Solid, clean, reef areas should recover corals naturally without any help. Too much energy should not be spent on planting corals where reef areas have been recently damaged, as coral larval should be able to return on their own without any help. However for rocky areas where corals have died and where new corals are not returning, planting corals may speed up recovery. Tiny corals coming from larvae are hard to see, and people could be tempted to plant fast growing corals in areas already recovering, interfering with the natural process of reef recovery, as the planted corals overgrow and kill the small, slower growing corals. If for some reason corals do not return after several years, some underlying problems of coral settlement or small coral survival may be

responsible. If coral fragments have a better chance of survival than do small corals coming from the larvae, then coral planting may be able to solve these problems.

Corals should not be planted where corals have never done well, such as near river mouths or near muddy mangroves. Corals should also not be planted where long-standing problems continue to kill corals, such as in murky and polluted harbors, areas of active dredging or dynamite fishing, and the like. No-take MPAs often make ideal restoration sites, due to the added protection for the corals and the increased fish abundance and reef health.

Coral Planting as Part of Coral Reef Management

Coral planting should not be done alone, but should become part of an overall resource management plan developed and approved by the reef owning community, the fishers, and local and national government. These management plans should include the establishment of permanent no-fishing MPAs, monitoring to measure changes. The plans may also include the restocking of conch and other shell fish into the no-take MPAs, especially if the species are found not to recover well due to severe over fishing.

In many cases the coral planting work will be small-scale and mainly experimental, to learn why corals are not returning to a particular reef area, and to see if a solution can be found. However, where dredging has destroyed large areas of reef, and where such activity has been discontinued, there may be no hope for recovery without an active coral planting program. For non-recovering areas, long-term work may be needed over many years, little by little restoring the reef. Reef managers must also make sure that the donor reefs are not damaged and ensure that many kinds of corals are used in restoration sites rather than only a few types, making the reefs more natural, stronger against disease and stress, and better homes for fish and shell fish.

Coral Planting as an Educational Activity

Planting corals and observing them over time is a good way to learn how corals grow and how corals give fish good places to live. Youth groups, reef rangers, scouts, and schools can sometimes be involved in ocean clean-up activities and coral planting, assisted by a qualified fish wardens and resort staff trained in the methods. If communities and resorts are going to be involved in coral planting to restore corals to damaged reefs, is very important that they understand the details of the information contained in this book and have undergone the entire course and the field training.

Definitions

The various types of work on the reef to increase the health of corals and of the reef are for the purposes of this training manual defined below. The definitions are listed from the simplest intervention to the most complex, and each definition may encompass the elements of the one before it.

Coral Care: Routinely caring for corals without touching them, such as the weeding of choking seaweeds from around the bases of corals, dusting the sand and silt kicked up by bad weather or by divers and snorkelers from off of corals, or removing overabundant coral predators found around the coral care site.

Reef First Aid: Urgent interventions to save the life of a coral that is in the process of being killed, such as re-planting broken coral fragments scattered on the sand, replanting sea fans torn off the reef by storms, or removing a coral killing predators that are actively killing corals.

Coral Farming: Propagating and cultivating corals in coral farms, raising first generation "mother corals" for trimming as second generation "seed corals". Elements of both coral care and of reef first aid are required for coral farming.

Coral Gardening: All of the above, plus thinning corals that are growing too close together for survival or rescuing corals exposed to air during low tides for planting to deeper waters, propagating heat tolerant corals for transplantation into heat stressed restoration sites, placement of artificial structures on which to plant corals, adding or removing sea urchins to obtain the ideal balance for coral survival, and other types of activities to enhance coral cover and to increase reef beauty in a site.

Coral Reef Restoration: Any type of intervention to restore the ecological health to a coral reef, such as transplanting corals to non-recovering or dead reef areas, destroying overabundant coral predators or grazers, or cleaning patches of reef of seaweeds to encourage natural coral recruitment. Coral reef management is the foundation of coral reef restoration, and establishment of no-take marine protected areas (MPAs) is an important part of effective management plans, restoring the ecological balance on the reef necessary for healthy corals and fish populations.

Appendix 5: Coral Reef Recoverability Assessment

How do we identify reef areas where coral gardening is most needed, and which areas where coral gardening might be a waste of time?

Stressed and degraded reef systems have been placed into categories below, from more serious to less serious types of reef damage, followed by a discussion on whether or not restoration interventions are advisable or are likely a waste of time and resources.

1. Chronic Environmental Problems Causing Permanent Environmental Change

Definition: Conditions exist that prevent reefs from reverting to a natural healthy condition even after the implementation of proper fisheries management plans.

What to look for: 1. poor water quality (murky or green water), 2. formerly clean areas becoming muddy, 3. areas formerly with abundant corals having mostly dead corals

Root causes: Land-based pollution, muddy run-off

How to measure: Interviews with older community members about former conditions, monitoring for water clarity, nutrients, salinity, etc. A consideration should be made for determining whether acute rather than chronic problems are behind the degradation, events that are either not natural or that have a much higher frequency due to some change. Such rare events more likely identified by interviewing the community than through scientific monitoring.

Possible restoration interventions: No potential exists for effective restoration unless the root-causes are effectively addressed. If monitoring and interviews indicate that the problem may not be so severe as to be without hope, coral replanting trials can be attempted, using limited numbers of fragments of silt and freshwater resistant coral species (*Porites, Pavona, Montastrea*), tied on lines or frames. Coral recruitment studies using stones as hard clean settlement surfaces, deployed during coral spawning season, can be undertaken as well to determine if a lack of larval recruitment or whether post-recruitment survival is preventing recovery. If these experiments give good results, the particular reef area would fall into the alternative steady-state category below.

2. Changes in the Bottom "Substrata" Prevent Recovery

Definition: Water quality does not appear to be the basis of the problem, rather changes in the sea bottom prevents recovery (rocks covered by seaweeds, rocks converted to gravel, bottom covered by thin layer of mud or sand, etc.).

Root Causes: Dynamite fishing, dragging nets, reef mining, over-fishing of seaweed eaters, moderate land-based pollution, dredging activities

What to look for: 1. corals crushed into rubble, 2. overgrowth by seaweeds, 3. a fine layer of silt covering rocky or gravel bottom

How to Measure: Determine the area of the reef area affected and look for signs of recovery at the edges of the damaged zones, look for corals on stable boulders and nearby areas, indicating that coral survival is not the problem. Monitoring to look for signs of natural recovery reef (or the lack thereof): increasing abundance of juvenile corals >3-5cm, increasing abundance of herbivores, long-term improvements in water clarity, etc.

Possible Restoration Interventions: If interviews with older people confirm that the reef was indeed in a better condition in living memory, and that the causes of the problem are no longer continuing, restoration may be possible. Methods may include replanting staghorn coral branches or simply throwing 30-40cm rocks into unstable rubble areas. Establishment of no-fishing MPAs will increase the population of herbivorous fish and sea urchins, which in turn clean excessive seaweeds from the reef, direct removal of seaweeds by hand from particular reef areas prior to the coral spawning season may also be an option.

Potential Complications: Species imbalances (see below) may become a problem in the survival of corals in the area to be restored, and if so coral replanting and encouraging natural coral recruitment may not be effective restoration measures. Example of this type of species imbalance problems are:

a. Crown of thorns starfish have been know to attack and kill coral transplants and newly recruiting corals. Even when only few COT are observed, they may be lurking unseen in complex-bottomed areas. *Stegastes* (farmerfish) protect corals from COT, so a greater abundance of corals (especially *Acropora*) inside *Stegastes* territories, as compared to outside the territories, may give an indication of this potential problem. Close monitoring (daily or weekly) of coral transplants may be required, with removing the COT when found. Pilot work should be done to determine the relative amount of energy required before attempting a wider restoration.

b. Establishing no-fishing areas may sometimes result in greatly increased numbers of parrotfish, which in turn may target coral transplants and naturally recruiting corals as a food source, suppressing the recovery of the coral population. The potential for this particular ecological imbalance to develop after establishment of a no-fishing area is highest for reefs where there is ample shelter habitat for parrotfish, low abundance of predatory fish (which may take longer to recover), and where coral cover is low.

3. Unhealthy Coral Reefs due to Species Imbalances

Root causes: Over-fishing of fish or lobsters that are important in keeping other species from becoming over-abundant

What to look for: Coral killing crown-of-thorns *Acanthaster* starfish "vula walu or bula" outbreaks, over-abundance of coral eating *Drupella* or *Coralophilia* snails, over-abundance of *Stegastes* "guru" farmer-fish and associated seaweed patches and coral damage, overabundant sea urchins and associated excessive bio-erosion, other types of imbalances due to too many or too few individuals of a species.

How to measure: Reef surveys looking for these particular species and for the particular predators of each of these species, as well as checking for the abundance and health of

corals, especially staghorn *Acropora* "ravu", a coral type that is the favored food of COTS, coral eating snails, as well as the preferred habitat for farmer fish.

Possible Interventions: Establishment of no-fishing tabu areas to encourage recovery of key predator species, removal of overabundant COTS and coral-killing snails from reef areas where they are a problem, laws banning the harvest and sale of Triton's trumpets, restocking of triton's trumpet *Davui* shells into MPAs to serve as brood stock for the reestablishment of the species, enforcement and community awareness as part of the longer-term solution.

Potential Complications: When a shallow reef area is closed to fishing, particular species can become over-abundant in the months before their predators become reestablished. A primary example is when the predators of octopus are absent from the reef (moray eels and black-tip reef sharks). This can result in an over-abundance of octopus, which in turn eat up the remaining shellfish, interfering with the recovery of these species. If monitoring shows that an imbalance like this is developing in a tabu area, an organized octopus fishing (one or two days of fishing every 3 months for ONLY octopus, as a fund raiser for the community) may be used to encourage the recovery of shellfish species eaten by octopus, until the animals that eat octopus return to the reef.

4. Over-fishing: Fisheries Resources Important to Reef Health Have Become Rare

Root causes: too much fishing, small mesh nets, use of poisons for fishing, and loss of habitat due to destructive fishing

What to look for: 1. low fish and shellfish abundance, 2. predominance of herbivorous fish and smaller individuals of all harvested species, 3. dominance of species not harvested for food or for sale.

How to measure: Monitoring of fish and shellfish stocks for abundance and size, post-catch surveys, interviews with older fishers.

Possible Interventions: Establishment of permanent no-fishing MPAs, restocking of MPAs with formerly abundant species if their prospects for natural recovery otherwise appear to be low, gathering together the few remaining individuals of a species into aggregations to increase the chances of successful spawning, ban on the harvest of severely overfished species, closure of reef areas on a rotational basis, size limits for commercially harvested species, nylon gill net bans, net mesh size restrictions, destructive fishing bans, SCUBA spear-fishing bans, night torch fishing bans, multi-year ban on key overfished species, ban on commercial sale of particular species important for local subsistence, etc.

Potential Complication: Aggregating surviving individuals of a species may potentially make them an easier target for predators (if any predators in the area have survived), or make them an easy target for poachers, and this should be factored into the restoration strategy.

Appendix 6: Recommendations for Crown-of-Thorns Starfish Removal as a Reef Management Option

The COTS Problem

In years past, this spiny, poisonous sea animal was much less common. COTS have now become so common on many reefs that they are the major cause of coral death. A single COTS can eat a medium-sized coral a day, and so it can kill hundreds of corals in a year. Removing COTS may be more important as a reef management option in many areas than replanting corals, especially if the COTS remain a threat.

Root-Causes of the Problem

Each COTS can produce thousands of tiny floating babies (larvae), but normally only a few of these survive to settle out onto the reef. Pollution of coastal waters allows many more of the larvae to survive. Seawater becomes greenish in colour when wastes from the land fertilize it. This green colour is due to teeny tiny plants called phytoplankton. COTS larvae eat these phytoplankton, so green lagoon waters are perfect environments for COTS larvae to live and grow. In addition to thousands of COTS settling onto reefs where before there were only few, the natural enemies of COTS are now mostly over fished: porcupine fish, puffers, large wrasses, and Triton's trumpet shells.

Indicators of the Extent and Seriousness of the Problem

Coral cover is not always a good indicator of past COTS damage, as other things can kill corals. The community usually knows what has killed the corals, so ask their opinions first. However, if *Acropora and Pocillopora* corals are abundant within damselfish territories and are mostly absent out of these algal gardens, a former or long-standing COTS outbreak is indicated. This is because *Acropora* and *Pocillopora* corals are among COTS favorite foods, so these corals are eaten first by COTS before they resort to eating *Porites* and massive corals. *Stegastes* damselfish chase COTS away and protect the corals inside their territories, so even if they hurt the coral some by growing seaweed and spreading coral disease, they sometimes save the *Acropora* and *Pocillopora* corals lives.

Developing an Effective COTS Management Strategy

If in a one-hour swim you see no more than 1-2 COTS, no removal efforts are required, unless coral cover is very low and trying to recover. However, if there are many times more starfish than this, removal should be considered a management option. It is generally impractical to remove COTS from large reef areas, therefore it is better to work to save the most beautiful or important reef areas inside no-take MPAs. Bringing these starfish pests under control by regular removal in a limited area can help create pockets of high coral cover and reef health in MPA sites that otherwise would be more seriously impacted by COTS, and these pockets of coral health can be expanded over time if the manpower is available.

The long-term management solution to COTS epidemics is reduction of pollution from the land, and increasing the animals that eat COTS. Land-based waste management and permanent no-take MPAs are therefore better long-term solutions. One possible way

to increase the predators of COTS is to ban their harvest everywhere, even in the open fishing areas.

Resort Partnerships for COTS Management may be Possible

If a few thousand dollars can be obtained from a donor, such as a resort, a small bounty of 10-20 cents per animal might enable the removal of many thousands of COTS, raising community awareness, protecting tourists and children from danger, and earning funds for youth groups. Resorts can sometimes be convinced to sponsor regular COTS removal from reefs around their areas of operation, so 1-2km of reef might receive long-term protection in this way with support from a resort, increasing the benefits to communities as well. SUCBA diving businesses can also be encouraged to do the same for their regular dive sites.

If people find live Triton's trumpet shells in the fishing areas, rather than killing them for food or decoration, they should be encouraged be put these into no-take areas where COTS are abundant and where the shells will be safe from harvest. Resorts might be convinced to purchase these animals for putting into nearby MPAs. A possible educational activity for the community and tourists would be to put Triton's trumpet shells into underwater cages and to regularly feed them COTS, watching the exciting results! Several of the shells in one cage might result in increased breeding, so breeding populations might in this way be re-established with assistance from the tourism industry.

COTS Removal Methods

Early morning can be better than afternoon for finding COTS, as they tend to hide during day. A bright white, recently killed coral indicates the general area where a lurking COT is located. For monitoring, record the numbers and relative sizes of the COTS removed or killed, and whether any are missing arms, indicating predation by triggerfish.

COTS can be killed one by one in the field by complete smashing the central disc and bottom or each arm, not allowing the arms to fall off. A large glass bottle works well for this. After smashing they can be left to decompose or to be eaten by fish. This method might help train reef fish that COTS make good food, and could be tested. However, if the COTS are dense, it saves time to put them in a bucket or boat for drying or burial on shore (they stink, so do this far from where people will complain).

While some people have used dry acid or poison injection, leaving the COTS to die, this adds harmful chemicals to the environment and also could be dangerous for volunteers, but worst of all, it could harm or kill the few COTS predators that are left, should they try eating the dying animals.

Uses of COTS

Chickens like to eat COTS when they are dried, and COTS also make excellent fertilizer for upland gardens, providing calcium and other nutrients, especially good for use in for acidic clay soils.

Appendix 7. Marine Park Proposals and MPA Maps

ESTABLISHING A YANUCA-CUVU MARINE PARK

Proposal to the Paramount Chief, Ratu Sakiusa Makutu
Na Ka Levu, Tikina Cuvu, Province of Nadroga

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Background

Partners in Community Development Fiji and Counterpart International (USA) have been working in partnership with the traditional chiefs and people of Tikina Cuvu since 1999. This partnership has focused on the management and restoration of the marine environment and qoliqoli resources of the district, as well as support for sustainable livelihoods through reef-based tourism.

Marine environmental awareness and planning workshops were conducted in all seven villages and two schools of the district, and communities participated in the development of marine resource management plans for the district. As part of the marine management plans, large areas of coral reefs and mangroves were set aside in 2000 as no-fishing "Tabu" areas for three years, the first time the reefs were rested in many years. Community members were also selected by village chiefs and trained by PCDF and Government as registered "Fish Wardens" to educate the community and to enforce the regulations and carry out the management plans.

As part of our work in the district, PCDF helped the resort to improve their waste water treatment with a "waibulabula" constructed wetland treatment system. Coral regeneration work was also conducted at the Resort, and the findings indicate that Cuvu Bay is not a suitable long-term habitat for corals and other reef animals unless and until the Voua River is restored to its original pre-1959 condition, as the fresh water and mud from flooding kills the reef every year or so. For the shallow reef flat areas, corals do well, but hot water kills all but the strongest varieties. Crown of thorns starfish "vulawalu" are a major problem on the Cuvu reefs, and over 5,000 crown of thorns starfish were removed from the reef in 2000-2003, saving the lives of over 1.5 million corals. Over 150 "fish houses" were constructed at the Shangri-La Resort, and corals planted on these wave absorbing structures.

Staff training at the resort was done to increase the understanding of local staff about the qoliqoli resources, corals, and fish. The tabu area established at Yanuca Island increased the tourism value of the waters around the resort, and fish became much more abundant and began cleaning the reef of seaweeds.

A "Coral Gardening" program was begun, but never completed at the resort. This program when fully established trains resort staff to care for the reef, while involving the guests in coral reef activities, such as guided reef tours, the making of fish houses, and the planting of corals.

The Need for Permanently Closed No-Fishing Areas

According to the best coral reef science, for maximum conservation and fisheries enhancement of the qoliqoli, a minimum of 25-30% of all marine habitats should be closed to fishing PERMANENTLY as Marine Protected Areas (MPAs) *"sususu"*. This is to ensure that all types of fish and shellfish are protected so that they can reproduce their babies effectively- both fast growing fish and slower growing animals like seashells. If all of the tabu areas are opened for fishing every few years, much or most of the progress made will be lost. It is much more effective to keep some areas closed and to rely on the increased reproduction and spill-over from permanent MPAs, rather than opening them up to fishing. Up to **five times** more fish and shellfish will be caught in the open fishing grounds if 25-30% of the qoliqoli is permanently closed to fishing. In only a few years the larger fish and shellfish will begin spilling-over into the community fishing areas where they are caught.

Temporary tabu areas should also be part of the community management plans, because all reef areas need to be rested every few years, and because the opening of these temporary tabu areas can be very important to the culture, for funerals and special celebrations and feasts.

Proposal to Establish a Permanent "Yanuca-Cuvu Marine Park"

After studying the various management options for Cuvu and the Coral Coast area, I have concluded that Yanuca Island and Cuvu Bay are ideally situated to become the core of a system of permanent and legally registered Marine Protected Areas or "Marine Parks" in Nadroga-Navosa Province and throughout Fiji (Figures 10.1 and 10.2).

Figure 10.1 Option one- rotational reef zones with three no-take core areas.

The reasons for this recommendation are as follows:

1. Cuvu Bay is one of only three large coastal bays of the Coral Coast (in addition to Sovi Bay and Natadola Bay). The prevailing wind and currents of Cuvu Bay help to re-circulate the water once it enters the bay, giving time for tiny baby fish and shellfish to complete their development in the water as they drift, settling as tiny babies onto coral and sea grasses. (Sususu vinaka dina!)
2. Once the natural water flow (hydrology) of the Yanuca Channel and Cuvu Bay system is restored, Cuvu Bay will become the ideal nursery area for marine species, and an ideal place to establish breeding populations of fish and shellfish, including the establishment of populations of giant clams and pearl oysters through restocking.
3. Cuvu Bay and Yanuca Island include all major marine habitats: coral reef, sea grass, and mangrove. The large calm Cuvu Bay shelters species not found on higher energy reefs, so the area can best serve as a breeding ground for all marine species of importance, as long as each of these habitats is included in the Marine Park, and as long as the Voua River mouth is restored to its pre-1959 condition, flowing into Nadiri Bay.
4. Workable Enforcement: Shangri-La's Fijian Resort has human resources, boats, and communication and will be able to help with the enforcement of the no-take status of a permanent Yanuca Marine Park, in partnership with the paramount Chief and community, carried out by properly trained Marine Park Staff.
5. Sustainable Financing will be possible through establishment of a Marine Park Trust Fund, details to be worked out during negotiations, but likely to include usage fees collected by the Resort and earmarked to improve and operate the Marine Park, as well as to increase benefits to the community.
6. Coral gardening and reef care have the potential to become standard procedures in Fiji through a program to be established in collaboration with the Resort, providing employment to trained community members, increasing guest involvement and the value of reef-based tourism in the district.

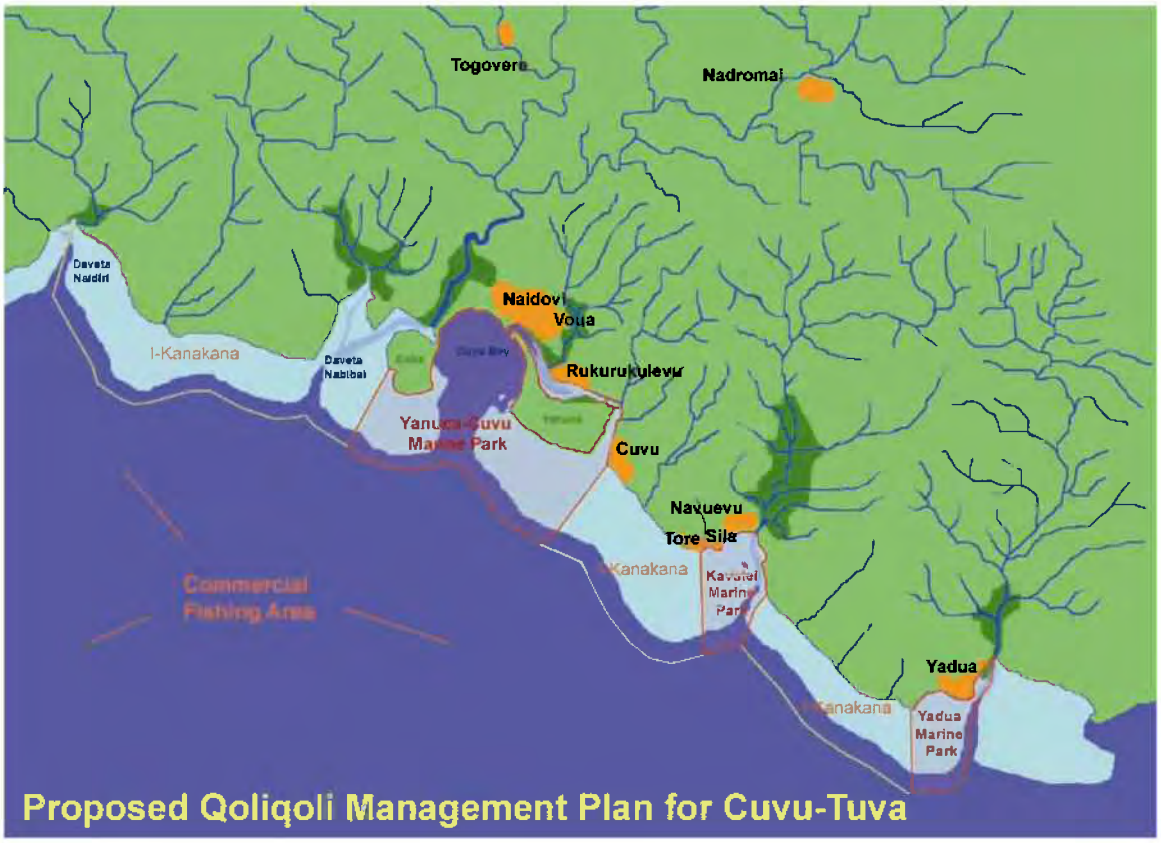


Figure 10.2 Latest marine park option proposed in discussions with the Paramount Chief, February 2008.

Next Steps

Most important will be obtaining permission to carry this further by the Paramount Chief. Next a formal request will be developed and translated into the Fijian language, addressed to the Fiji Government and the Traditional leaders of Cuvu and Tuva Districts, asking them to work together with PCDF/Counterpart, Shangri-La's Fijian Resort, and the Government, to establish a permanent Marine Park at Cuvu, with Yanuca Island and Cuvu Bay at its core.

What will be required is the formation of a conservation plan that will stand the test of time and that will protect the qoliqoli resources for the present and into the future generations; with a legally-recognized and permanently gazetted Marine Park to enhance tourism, feed the beaches with sand, provide the Fijian resource owning communities with abundant sea foods through increased breeding and spill-over, and to provide these same communities with equitable benefit-sharing through this partnership between the resort, government, and community.

If this concept is approved, mechanisms and plans will then need to be developed, approved, and implemented to finance the effective long-term operation and enforcement of the Yanuca-Cuvu Marine Park, for maximum benefit to the environment, tourism industry, and communities. All of this is possible only if we work together in good faith; with God in our heart, and with the needs of the present and future generations of children as well as the environment our primary concern.

What is needed is a best-practice model that can lead Fiji to a better future..... a better way of working and living together in harmony and shared prosperity.

Vinaka sara vaka levu. ABK 3 October, 2007

STATEMENT OF NEED AND SUPPORT FOR THE FORMATION OF A PERMANENT TURTLE ISLAND MARINE PARK

Background

Counterpart International and Partners in Community Development Fiji have entered into a working partnership with the traditional chiefs and people of Tikina Nacula, as well as the Nacula Tikina Tourism Association and its affiliated members. This partnership was formed in 2005-2006, and focuses on the management and restoration of the marine environment and qoliqoli resources of the district. USAID funding for the work has been matched by significant contributions in-kind from the community and by the various NTTA members, covering lodging, workshop venues, transport, and volunteer fish wardens, coral gardeners, hiring of a local marine biologist staff member, etc.

Marine environmental awareness and planning workshops were conducted in all seven villages of Nacula district in 2006, and communities gave their recommendations in the development of a comprehensive marine resource management plan for the district. As part of these marine management plans, the Paramount Chief of Nacula, Ratu Epeli, na Tui Drola, has set aside large areas of coral reef, sea grass beds, and mangroves as no-fishing "Tabu" areas for an initial period of five years, to be reviewed for possible extension in 2011. All reefs and near-shore waters around Nanuya Levu Island "Turtle Island" have been closed to fishing as a no-fishing area as part of these ongoing plans. For enforcement and monitoring, community members have been selected and trained by Government as "Fish Wardens", and a fisheries monitoring system has been established by PCDF.

Justification for a Permanent Turtle Island Marine Park

Based on current scientific information, for maximum conservation and fisheries enhancement, a minimum of 25-30% of all marine habitats should be closed PERMANENTLY to fishing as Marine Protected Areas (MPAs). This is to ensure that all habitats are protected from fishing so that all fish and shellfish species are protected so that they can reproduce effectively, including the slower growing species.

After studying the various options for Nacula Tikina, I have concluded that Turtle Island is ideally situated to become the core unit of a system of permanent Marine Parks in Nacula District.

Figure 4. Map of Nacula and Yaqeta marine management areas, showing no-take MPAs established by the USAID grant. The proposed "Turtle Island Marine Park", presently a no-take area, is also indicated.

The reasons for this recommendation are as follows:

1. Workable Enforcement: Turtle Island Resort has the resources (human, boat, and radio communication) to be best able to enforce the no-take status of a permanent marine park
2. Location and Ecological Factors: Turtle Island is centrally located and has all major marine habitats well represented: coral reef, seagrass, and mangrove, as well as a large calm lagoon that shelters species not found on higher energy reefs, so that Turtle Island can best serve as a breeding ground for all marine species of importance. The coral reefs are also particularly resistant to climate change and warm water bleaching.
3. Turtle Island is the ideal place to establish a secure population of giant clams and pearl oysters through restocking.
4. The land of Turtle Island has been actively reforested over the past 3 decades so that less

silt runs into the sea, with less damage to the corals

5. Turtle Island has hired a local Marine Biologist, Margaret Fox to carry out a coral reef restoration, restocking, and a guest awareness programme.

With this recommendation, I request that the Fiji Government and the Traditional leaders of Nacula work together with PCDF/Counterpart and the NTTA and Turtle Island to establish a permanent Marine Park at Turtle Island as a possible model for replication throughout Fiji. We require the formation of something that will stand the test of time; a legally-recognized and permanently gazetted Marine Park, with equitable benefit sharing with communities and with mechanisms and plans in place to finance its effective enforcement and operation for the maximum benefit to communities and the tourism industry.

ABK 12 August, 2007

DAVETA LEVU - NASAUTABU MARINE PARK

Proposal to the Chiefs and Leaders of Moturiki and Bau

Background

Partners in Community Development Fiji and Counterpart International (USA) have been working in partnership with the traditional chiefs and people of Tikina Moturiki since 2004. This partnership has focused on the management and restoration of the marine environment and qoliqoli resources of the district, as well as support for sustainable livelihoods through reef-based tourism and the development of coral farming as a possible income-generating industry.

Marine environmental awareness and planning workshops have been conducted in all ten villages and the two schools of the district, and communities have participated in the development of a comprehensive marine resource management plan for the district. As part of these marine management plans, large areas of coral reef, sea grass beds, and mangroves have been set aside as no-fishing "Tabu" areas. For enforcement and monitoring, community members have been selected by chiefs and trained by PCDF and Government as "Fish Wardens", and a fisheries monitoring system has been established. Giant clams were also restocked into the qoliqoli in 2005 from the government hatchery at Makogai. Three coral farms were established at Daku, Uluibau, and Cagalai Island.

In 2007 trial marketing of bleached and colored corals directly to tourists was conducted in collaboration with the Department of Environment, and based on this success, expansion of the three coral farms will occur in late 2007, with the establishment of two new coral farms in clean water sites and with over 3,000 new corals planted in the five coral farms. We have also begun negotiations with the major coral exporting companies in the USA and Fiji. Assuming that we can find the funding, PCDF and Counterpart are fully committed to continuing our work with the district, until such time as a coral farming industry is fully established.

More emphasis now needs to be placed on supporting tourism in the district. The tabu area established at Cagalai Island has already greatly increased the tourism value of the resort. Now a "Coral Gardening" program for resorts is being established in collaboration with the three small resorts at Leleuvia, Cagalai, and Yanuca Lailai. This program will train resort staff to care for the reef, while involving the guests in coral reef activities, such as guided reef tours, the making of fish houses, and the planting of corals. Unfortunately, Lomaiviti is a second-choice destination for tourists to Fiji, despite the

much greater beauty of the corals and reefs of the province, as compared to the Yasawas, the Mamanucas, and the Coral Coast. Much more will have to be done if we are going to draw larger numbers of tourists to the area.

Proposal for a Permanent Nasautabu - Davetalevu Marine Park

According to the best coral reef science, for maximum conservation and fisheries enhancement of the qoliqoli, a minimum of 25-30% of all marine habitats should be closed to fishing permanently as Marine Protected Areas (MPAs). This is to ensure that all fish and shellfish species are protected so that they can reproduce effectively- both fast growing species like fish and slower growing species like seashells. If all of the tabu areas are opened for fishing, much of the progress made will be lost. It is better to rely on the spill-over from permanent MPAs, and up to five times the fish and shellfish will be the result from spill over into the community fishing areas. Temporary tabu areas should be included as part of the management plan, because all reef areas should be rested every few years, and the opening of these temporary tabu areas is very important to the culture.

After studying the various management options for Lomaiviti and Eastern Viti Levu, I have concluded that Davetalevu is ideally situated to become the core of a system of permanent Marine Parks in Lomaiviti Province and throughout Fiji.

The reasons for this recommendation are as follows:

1. Davetalevu is the largest ocean pass into Eastern Viti Levu from which clean ocean water flows into the near-shore areas of Tailevu, spreading southward and northward, and reaching as far as the coast of Ra, carrying with it baby fish and shellfish. Because of this, Davetalevu is the ideal place to establish breeding populations of fish and shellfish, including the establishment of populations of giant clams and pearl oysters through restocking.
2. Davetalevu and surrounding areas on Moturiki and in Verata include all major marine habitats: coral reef, seagrass, and mangrove, as well as a large calm Tailevu lagoon that shelters species not found on higher energy reefs, so the area can best serve as a breeding ground for all marine species of importance, as long as each of these habitats is included in the Marine Park.
3. Workable Enforcement: The two resorts at Cagalai and Leleuvia have human resources, boats, and communication and will be able to help with the enforcement of the no-take status of a permanent marine park.

With this recommendation, I request that the Fiji Government and the Traditional leaders of Moturiki, Bau, and Verata work together with PCDF/Counterpart, to establish a permanent Marine Park with Davetalevu as its core. We require the formation of something that will stand the test of time; a legally-recognized and permanently gazetted Marine Park, with equitable benefit sharing with communities and with mechanisms and plans in place to finance its effective enforcement and operation for the maximum benefit to communities and the tourism industry.

ABK 12 September, 2007

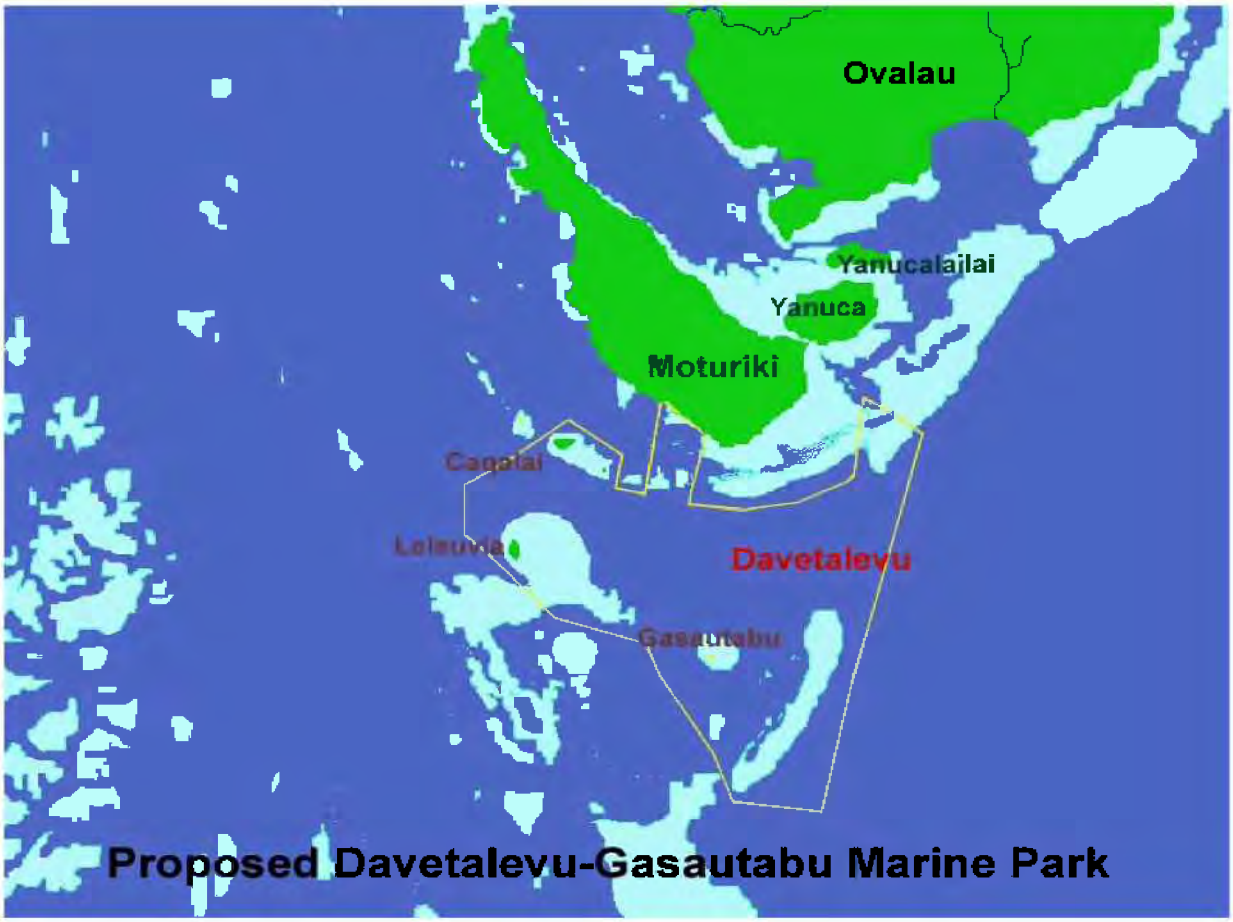


Figure 5. Proposed Marine Park for Moturiki District.

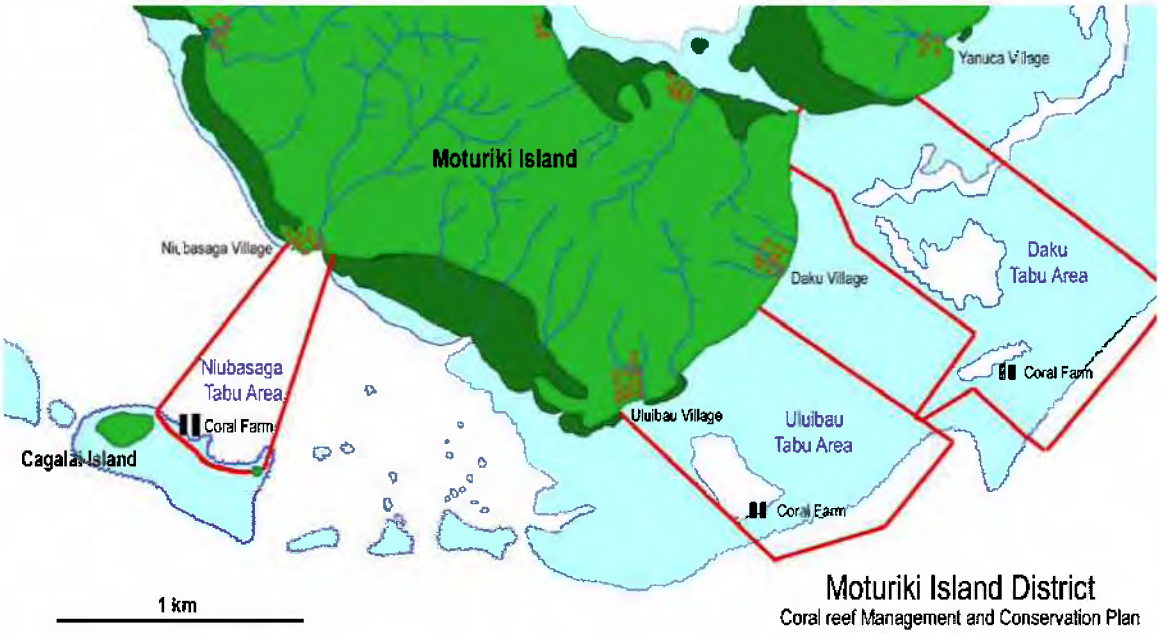


Figure 10.3. Moturiki MPAs as renewed by the USAID project. ***Note: seven additional MPAs (off the map area) have recently been established, and are not included here.***

Figure 10.4 Map of Yasawa District MPAs established by the USAID grant. ***Note: three additional community-based no-take Marine Protected Areas were in the process of being established for the three villages on the East Coast at project close (March 2008).***

Figure 10.5 Malolo District no-take MPA re-established and enlarged during the USAID project. ***Note: an additional MPA is located off the map to the Northwest.***

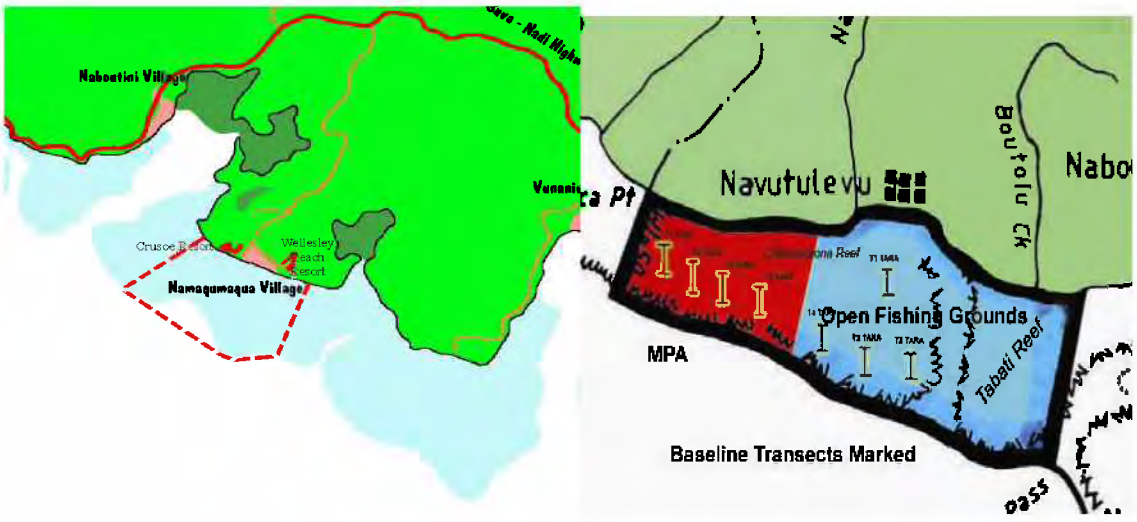


Figure 10.6 Namaqumaqua and Navutulevu MPAs, Serua District. Red areas (solid or dashed) area indicate the no-take MPAs.

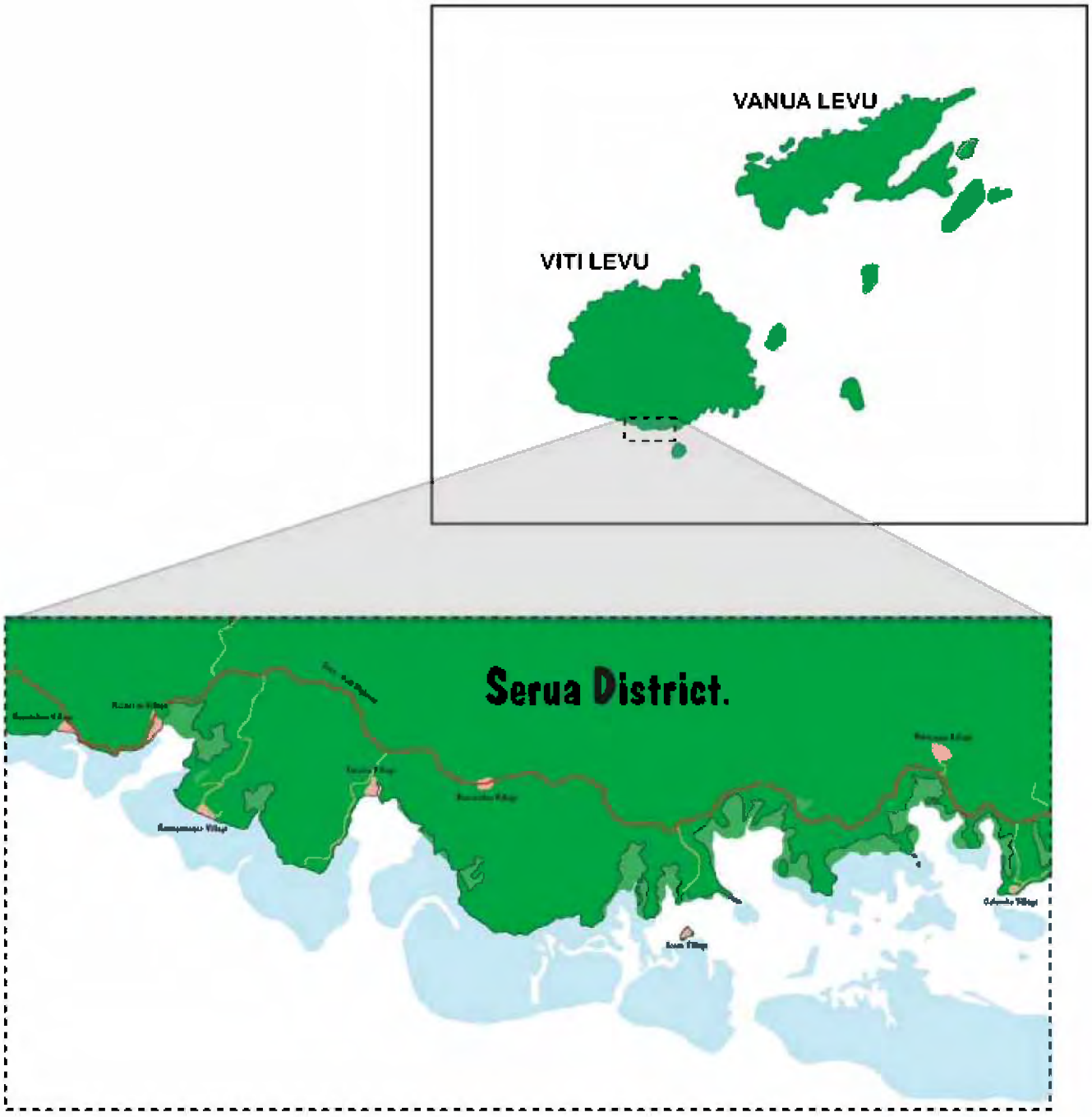


Figure 10.7 Overview of Serua District (minus Yanuca Island which is to the Southeast).
Note the position of Namagumagua and Navetulevu villages (Figure 10.6).

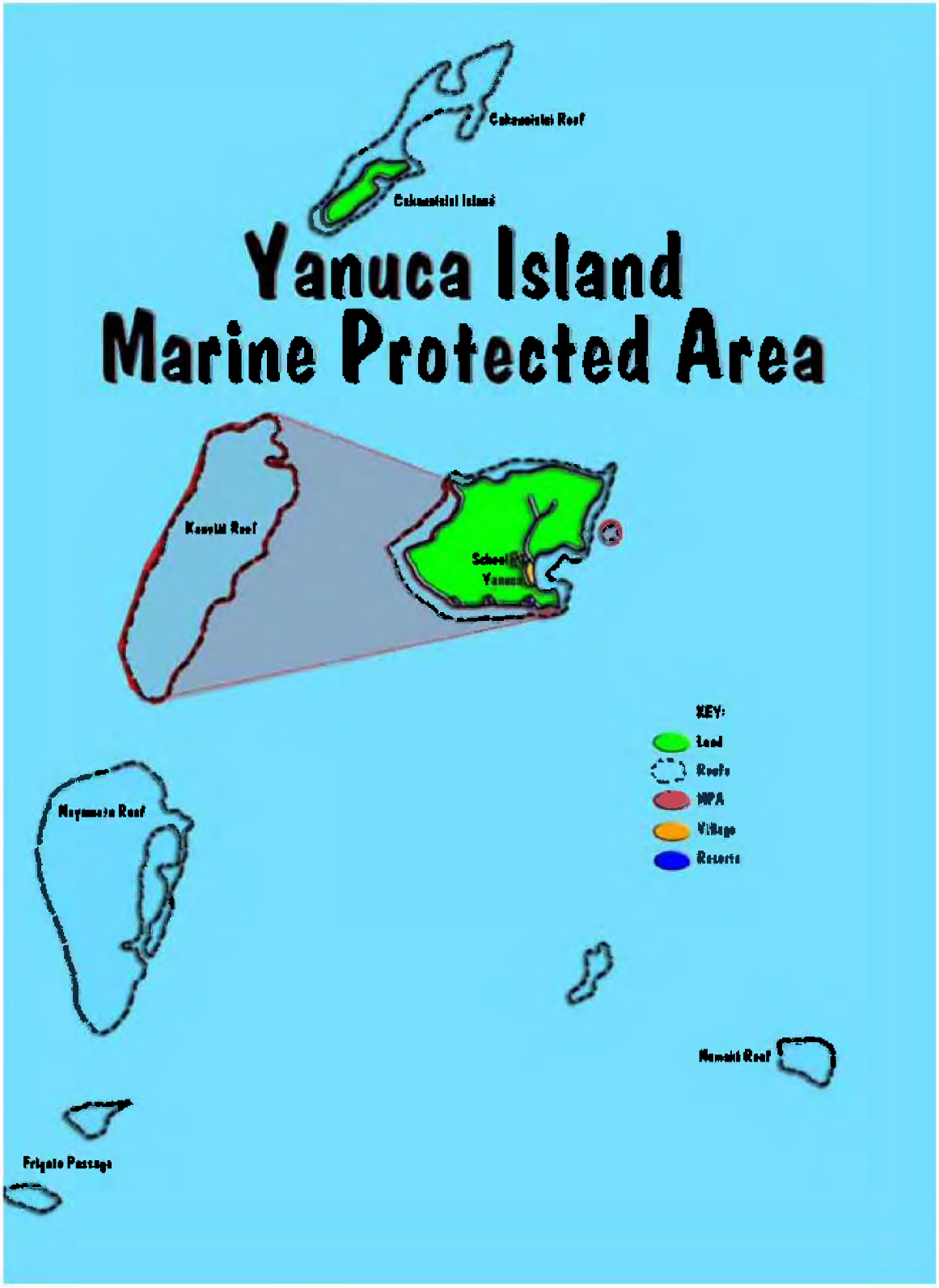


Figure 10.8 Yanuca Island MPA, Serua District. ***Note: Serua has five marine management areas, of which Yanuca is one.***

Appendix 8. Qoliqoli Bill Submission to the Government

August 2006
Partners in Community Development Fiji

Partners in Community Development Fiji (PCDF) welcomes the Fiji Government's invitation for public discussion of the Qoliqoli Bill. PCDF is pleased to register the following submission, which includes a brief background of our work and how some proposed changes to the Qoliqoli Bill would better contribute to sustainable livelihoods for island and coastal communities, while at the same time recognizing the contribution of the tourism industry not only to Fiji's economy, but potentially to the sustainable management of coral reefs in Fiji through direct engagement with resource owning communities to meaningfully support community-based marine resource management plans and activities.

PCDF's Qualifications as Advisor to Government on the Qoliqoli Bill

PCDF targets rural communities in Fiji under two thematic areas; Natural Resource Management and Human Resource Development. Disaster Management, Gender and Governance are cross cutting issues through both programmes.

Under PCDF's NRM Programme, over 30 marine protected areas (MPAs) have been established in the following Tikinas: Cuvu, Tuva, and Malolo (Nadroga Province), Moturiki, Batiki and Nairai island (Lomaiviti Province), Denimanu Village (Bua Province) and Nacula (Ba Province), with new work slated for Serua and Yasawa Tikinas in the coming months. Each of these marine protected areas is the outcome of participatory methods of consultation in meetings and workshops facilitated by PCDF, the result of which is a sustainable management plan developed by the community in collaboration with the Provincial Office, namely the Fisheries Officer and Roko Tui. As part of this participatory community process, environmental awareness workshops are conducted whereby the root-causes of environmental and resource depletion problems are identified by the community themselves, and where plans are made for restoring lost *i-qoliqoli* resources. Among these community-appropriate solutions are the re-establishment of traditional *Tabu* areas, whereby reef areas are given a resting period to allow the resources to recover. The community is encouraged to set aside some of these tabu areas to become permanently-closed MPAs, to serve as nursery areas for restocking the qoliqoli over the long-term. PCDFs work has discovered that permanently-closed reef areas were the traditional system of customary coral reef management before the arrival of Christianity, with particular reefs that were sacred to the *Vanua* being permanently closed to all types of fishing.

PCDF's work in the area of community-based management has received several international awards, and our Cuvu Tikina site was selected as the ICRAN (International Coral Reef Action Network) model site for coral reef conservation for Melanesia in 2003, one of only three such sites chosen for the Pacific region by the UNEP.

Support for Community-Based Management and Tabu Marine Protected Areas

In addition to restoring and protecting food security, the purpose of marine protected areas is multi-fold. MPAs help preserve Fijian culture by providing increased resources for feeding families and so that young people can continue to participate in meaningful cultural activities as fishers, becoming providers for their families as an early age, and thus gaining respect and meaning in the community. The process of establishing community-based MPAs also heightens community awareness and stimulates the custodial spirit required for the proper conservation, management, and wise utilization of God-given qoliqoli resources on behalf of present and future generations, and with due respect for of their Vauna forbears. The restoration of qoliqoli resources by establishment of sustainable management plans and no-fishing tabu areas (MPAs) also increases the options of capitalizing on communal marine resources through fishing and other income generating activities, and this indeed needs to be regulated. However, the bill lacks recognition for the importance of part-time or seasonal commercial activities, which would best be permitted at the district level. The present system of fines and imprisonment are inappropriate and out of step with local ownership, being centralized control rather than by the resource-owning communities and their chiefs.

While much progress has been made by PCDF and other NGOs in Fiji with full Government support, the 'tabu' or MPA protection placed on specified marine areas identified by the resource custodians is cultural and based on customary practice, and is not fully legislated. Hopefully the Qoliqoli Bill will address this deficiency, however, presently no reference is made in the bill to supporting or strengthening resource-owner based management, with no reference at all to the setting of permanent or temporal tabu areas/MPAs of other sorts of management activities. A legally-binding mechanism is needed for supporting community management plans that can be amended as needed by the community (eg. rotating tabu areas). Such a mechanism is not obvious in the present Bill, rather the focus is on government control and permitting.

Support for the Government Fish Warden System

Since 1999 under PCDF, we have taken a government system of "fish wardens", legislated and on the books in Fiji, but a system which was rarely implemented and even more rarely functional, and made this good idea work for the resource owners. Over 100 fish wardens have been appointed by the traditional leaders in our sites and trained in association with Provincial Fisheries Officers. The fish wardens are tasked to monitor and carry out the community management plans, and to ensure that there is no poaching within MPAs by both local and external fishers. To date resource custodians continue to report poaching of MPAs, which tends to increase as resources become more and more abundant. Enforcement begins to take more and more time at this point, and we find that the only MPAs that function well are those within visible range of communities, or associated with a resort, where security staff from the resource-owning community can be trained as fish wardens, and where boats are available. The Bill speaks of "qoliqoli guardians" and "qoliqoli officers", but it is unclear if this is a reaffirmation of the present system or a new creation.

Matters of Custodial Ownership and Conflict

In our work with communities, conflicts in qoliqoli boundaries and over chiefly control have come to light. From these experiences and on discussions at community-level, PCDF has come to realise that rather than a purely traditional system, the present qoliqoli system has been altered by the British colonial administration, in part as a convenience on their part. In many areas, apparently much smaller reef areas than the present qoliqoli units were delineated, each controlled by a lesser *yavusa* or *tokatoka* chief. These areas were gathered together by the colonial administration and put under a Vanua chief to simplify matters of control. In many cases the present "custodial chief" who receives fees for fishing licenses did not have a traditional role in management of the qoliqoli, while those who did have been entirely cut out. In one of our community sites, Moturiki, the sacred reefs of the Vanua (Davetalevu and Nasautabu) have been entirely assigned to the qoliqoli of Bau, as a misinterpretation over a gift of the coconut trees of Cagalai and Leluvia islands to the Vunivalu in the 1800s. Our point in raising these issues is that there has been no assessment of the present system, and of potential conflicts that may be opened up by the passing of the Qoliqoli Bill.

PCDF strongly suggests that before any area is returned to full indigenous ownership, through the passing of the said Bill, that a careful assessment be done for each area, to clarify issues of ownership and with adjustments made as indicated. This may include breaking the present qoliqoli units into smaller units and re-drawing particular boundaries to resolve conflict. In this process, all sacred reefs should be recorded and slated for possible designation as permanent no-fishing reserves exempt from all fishing activity.

A Valid Role for Government

In studying the Qoliqoli Bill, we find that while being a worthy attempt, it misses many critical issues and follows an outworn top-down model of legalistic, centralised government control, rather than in fact giving communities full control of their resources. However, it is the feeling of PCDF that the government has a valid and important role to play in qoliqoli management, which is entirely missed in the document: namely to ensure that corruption is kept to a minimum, that resources are equitably allocated and shared among the community, that commercial activities are indeed permitted and do not conflict with subsistence activities or with qoloqoli management plans, as well as stepping in as required if a community is unable for any reason to fulfill their custodial obligations to the qoliqoli area through management or enforcement, so that the qoliqoli will pass in a healthy condition to the next generation. This valid role for government is a facilitation and support role, more akin to the role that NGOs have taken in the establishment of locally managed marine areas in Fiji in recent years.

The uncontrolled use of explosives and commercial poisons for fishing has not been dealt with effectively by government, and these problems should be dealt with more effectively at the national level as a new priority, as the root cause of supply is a national rather than local problem.

Qoliqoli Trust Funds

The Qoliqoli Trust Fund as laid out in the Bill is a welcome introduction and part of PCDF's vision however, these funds need to be used for the management and protection of natural resources as a priority, with education and health needs of communities given

secondary importance, and other types of community development being third. The present system whereby NGOs such as PCDF obtain external funds for facilitating the management of the qoliqoli resources can not continue indefinitely. The government must take on this facilitation role, and this is not recognized in any way in the proposed legislation. A new system is required, and the trust funds should be primarily earmarked for facilitating community-based management of qoliqoli resources, otherwise the use of trust funds and may risk becoming side-tracked, particularly if their use is decided by the more powerful elements in the community, rather than based on a system of prioritisation.

Native Lands Trust Board Involvement

The primary goal of the NLTB is to issue leases for native land, and to provide payments to land owning units, while the primary objective of the new qoliqoli trust should be to fund the management of the qoliqoli and to provide funds for community development, rather than cash to mataqalis. Therefore, it might be more effective and wise to create a new public trust, fund rather than "pouring new wine into old wine skins".

Resource Owners or Resource Custodians?

The terminology "resource owner" may be misleading. In the Fijian context, "resource custodian" would be a more appropriate term given its cultural connotation of wise stewardship and cultural obligation on behalf of both the present and future generations. The "resource owner", similar to "landowner" reflects a more materialistic cash-based viewpoint. This traditional context would favour cooperative arrangements and partnerships with the tourism industry rather that lease agreements.

Based on our extensive experience with qoliqoli custodial communities, PCDF has found that these Fijian communities are fully capable of managing their communal natural resources for themselves, once they are provided the resources and training to do so. PCDF and other non-governmental organisations have in recent years led the way in the recent breakthrough of qoliqoli management, and this experience should be considered before institutionalizing the more top-down money-driven management system proposed in the Bill.

The Toursim Industry and the Qoliqoli Bill

PCDF receives funding from external sources for our work. We have been successful in securing financial and other assistance from tourism operators in Fiji, for our work with respective resource custodians. Namely, Shangri-La's Fijian Resort from 2000 to 2004, the Mamanuca Hotel Association from 2003 to the present, and from the Nacula Tikina Tourism Association from 2005 to the present.

It is through our work with resorts, that we have come to realize that the tourism industry has much to contribute to the sustainability and wise management of the qoliqoli areas of Fiji. It is in the best interest of resorts to do all they can to help maintain healthy coral reefs and clean waters. While the traditional leaders and community must remain in the forefront of management, the resorts have resources that if effectively channeled can greatly increase the conservation and restoration of qoliqoli resources, not on behalf of the community, but rather in partnership with the community. We suggest that our Nacula Tikina site might provide the best example and model for the way forward for Fiji in this area, as over half of the resorts in that district are community-owned. The Nacula

community through the Paramount Chief *Ratu Epeli, na Tui Drola* has in recent months established tabu areas in association with all villages and resorts within the qoliqoli area. The resorts are fully aware that these tabu areas are community-owned and controlled, and in-kind assist the community work by providing resources for marking the MPAs, providing local staff at the resort for training as fish wardens, assisting with restocking of giant *vasua* clams, restoring reef areas with assistance from PCDF, hiring new staff as coral gardeners and reef guides trained by PCDF, Counterpart International, and Resort Support, and providing accommodation and transport to the PCDF team as their contribution to community workshops and environmental work in the district. A next stage in our work is to assist the NTTA and/or individual resorts with the establishment of a community trust fund for conservation, to accept voluntary donations (not user fees) from guests in support of the management of the tabu areas, reforestation, education, and other community development priorities of the district. The long-term goal is to raise the status of these conservation areas to that of permanent marine parks, and this will of course be dependent on that option being acceptable within the legal framework of Fiji and the final Qoliqoli Bill (see attached diagram "Qoliqoli benefits for all").

PCDF has learned many lessons that Government might wish to consider at this time, and we encourage the government that a win-win solution is indeed possible for Fiji through PCDFs model of community-resort partnerships for the benefit of all stakeholders.

In is clear to us that tourism's role, contribution, and specific concerns need to be clearly defined in the bill because of the potential negative impacts that any ambiguity in the bill may have. The potential contribution of tourism operators to sustainable marine resource awareness and management by qoliqoli owners should not be overlooked, and win-win partnerships between resorts and communities need to be supported, encouraged, and facilitated, rather than the focus being on lease agreements negotiated and applied by the NLTB, as is implied by the present bill.

Conclusions and Moving Forward

The Qoliqoli Bill is a good idea, but is on the wrong footing. If the present Bill goes forward without the above considerations, it could negatively affect the good work of the NGOs, the tourism industry, and the unity and prosperity of the Fijian people, rather than the intended aims.

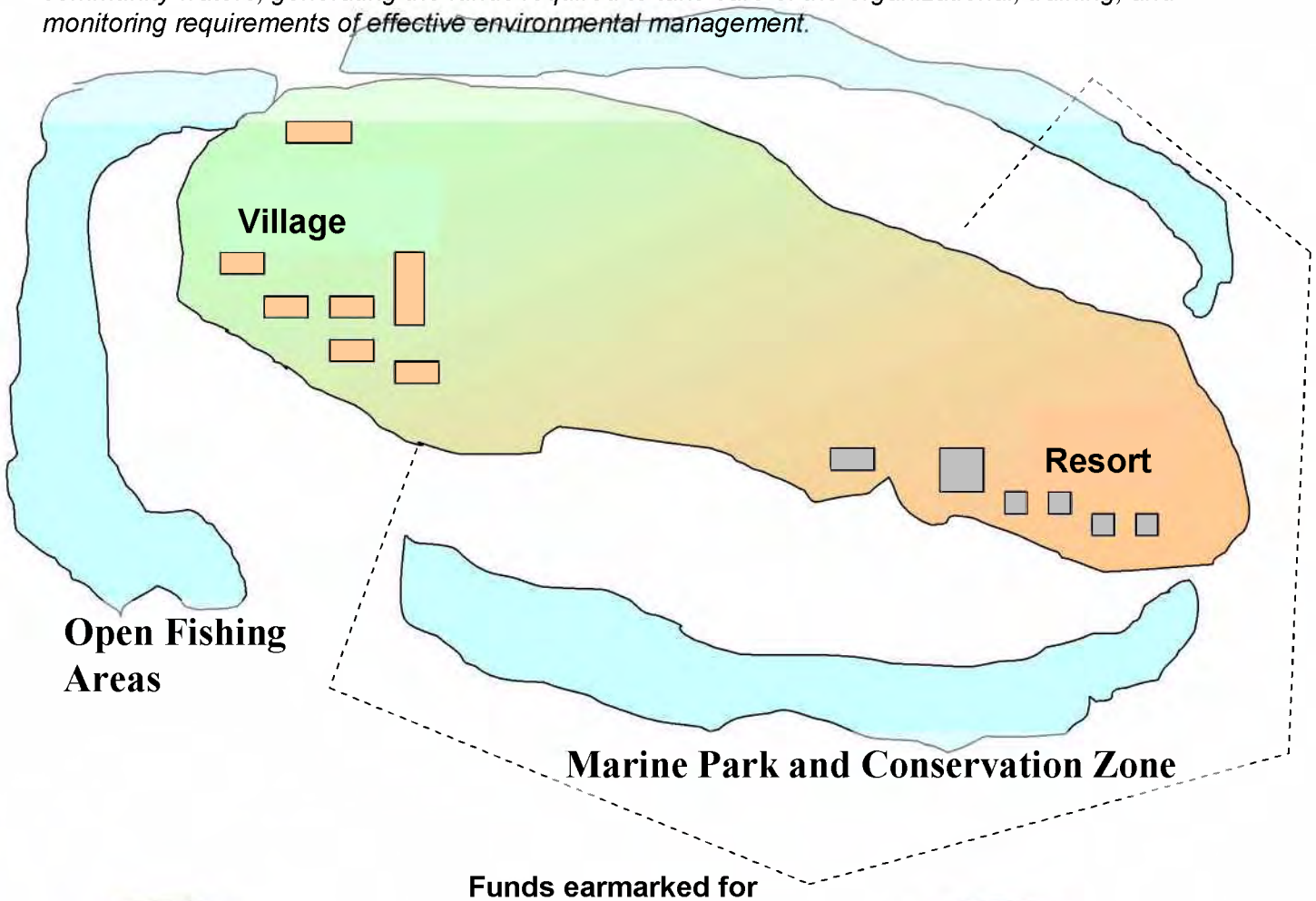
PCDF stands as a resource to the Government of Fiji, as do the other NGOS that are actively working with qoliqoli management and communities (WWF, WCS, USP). We strongly suggest that consultations with the experienced NGOs be sought, and that a newly drafted Bill be prepared based on deliberations and consensus, rather than going forward with the present flawed Bill.

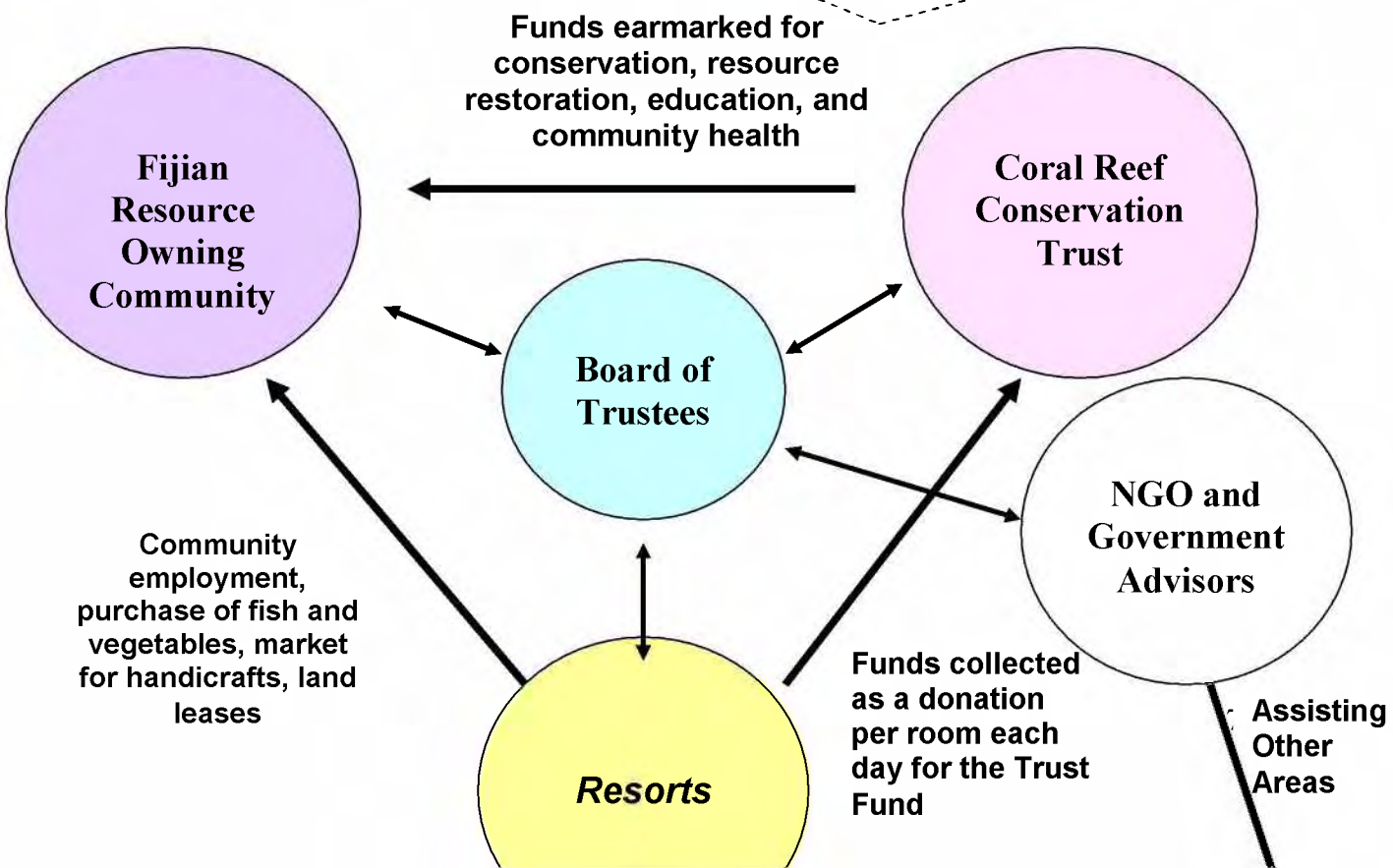
Submitted this first day of September, 2006

Alisi W. Daurewa, Executive Director

Proposed Qoliqoli Development Plan for Equitable Benefit Sharing in Fiji

Marine parks established to support community conservation and the restoration of fisheries resources in community waters, generating the funds required to take care of the organizational, training, and monitoring requirements of effective environmental management.





Appendix 9. Report of coral marketing launch and trial

PARTNERS IN COMMUNITY DEVELOPMENT FIJI

Field Report, USAID Coral Gardens-Living Reefs Initiative

Project Activity:	Formal Launch of Farmed Coral Sales
Date of Activity:	4th June 2007
Event Site:	Suva Civic Centre – for the official Coral Gardens Launch Suva Sea wall- for the Cultured Coral Sale
Lead Staff:	Fulori Nainoca, Mereoni Mataika, and Austin Bowden-Kerby
Support Staff:	PCDF Staff; Volunteers (Wesley Morgan; Eta Tuwai; Ema Robens).
Relevant Stakeholders:	Moturiki Representatives; Ministry of Tourism and Environment, American Embassy; USAID Asia Regional
Target Groups:	Pacific Cruise Liner tourists; general public, interested local business, and the local press and media.

Event Objectives:

- To launch the project to appropriate stakeholders, i.e. National Government, Project Donors, relevant Communities; Embassies; NGO's and other partners
- To assess the market viability of the cultured corals
- To assess which factors (size, color, suggested prices, etc.) determine sale
- To have media coverage that will facilitate general awareness on the "Corals for Conservation" project
- To create a strong sponsor database

Outcomes:

- The Minister of Tourism and Environment " Ms. Benedette Rounds-Ganilau and Ratu Vili Draunidalo- paramount chief of Moturiki were the chief Guests.
- PCDF/Counterpart was represented by Fulori Nainoca as the master of ceremonies and Austin Bowden-Kerby to introduce the project and its history.
- Minister Rounds-Ganilau and David Roth- External Affairs Fiji Waters were the first customers to buy a coral at the Corals for Conservation booth on the seawall

- A total of $665 was collected for the sale of twenty cultured corals. On the day of the launch 17 corals were sold at a price of $453; cultured corals were also sold during environment week (half price to local people).
- The smaller corals seemed to sell faster. This was probably due to the more convenient size and affordability (~FJ$20 dollars each).
- The Cultured corals were divided into price categories based on size and overall quality, ranging from $15. for the smallest corals to up to $150. dollars for the largest plate-sized corals.
- Many customers instantly saw the attractive and unique value of the second generation corals and were willing to pay the suggested price, while others thought they were over-priced.
- Many tourists from the cruise ship were quite reluctant to purchase the farmed corals due to their fear that they might be confiscated in New Zealand by customs officials. We were told by several the tourists that they were briefed on board not to purchase corals, shells and wood as customs from New Zealand will only confiscate these items.
- The small booklets stamped on the back by the CITES officer might not look "official enough", even though they are valid permits.
- An official letter should be sought from the customs officials of New Zealand, Australia, and the USA, to the effect that they are aware of the "Corals for Conservation" program, and that these corals (and these corals only) may enter their country, if they are accompanied by the booklet with the formal stamp and signed by the Fiji CITES Officer.
- We now have a clear indication that a very good market exists for the corals, especially if we can get over the fears of the potential customers
- The week after the launch, we were approached by a representative from Sea King, the Fiji Company exporting curio corals overseas, expressing their interest in becoming the exporter for the farmed corals. The farmed corals are apparently of exceptional quality and color. We will meet the owner of the company when he returns to Fiji from the USA in August.
- At least two newspaper articles appeared in the Fiji Times, including a large front-page color photo the day after the launch Fiji TV, ETC

Lesson Learnt:

- The Ministry of Fisheries have an assistant CITES officer under the Ministry of Environment, and we also need to involve the Ministry of Fisheries in what we are doing as a courtesy
- We need some proof to show the tourists that they need not fear that their coral will be confiscated by their customs officials.
- NRM staffs were given 2 weeks, to organize the official launch to coincide with the sale of the cultured corals, as the USAID officer plus the cruise ship would coincide in Suva. Given the time limit, limited staff and tight budget, organization of the event was rushed. Having 2 events coinciding at once proved to be hectic as well. This could have been improved by delegating tasks and involving the all PCDF staff better.

- We could have involved more volunteers especially with manual tasks, for example tagging, sorting and wrapping. The NRM team spent a lot of time on this.
- Given the limited time, we could have looked into tapping into the 'Trade Mission Fund" for sponsoring the event.
- The Banner should have read "Buy a **Farmed** Coral. Help Save a Reef", instead of the original version of "Buy a coral. Help save a reef".
- It was found that the location for the coral booth (near sea wall and bus stop opposite handicraft centre) prevented the attraction of the tourists. It is suggested for future sales that the stall be set up near the market bridge, opposite village six car park (which was our initial proposed site) as it would ensure that tourists from Cruise liners would have the opportunity to see the corals. This is the normal route taken by the passengers as they leave the Port Checkpoints.
- Producing a 'factsheet on the pro's and cons' of the Coral Project. Especially for communities that may want to set up similar projects. This can also be used as an awareness material for the general public.

Follow Up:

- With Department of Environment, Mr. Epeli Nasome and Manasa Sovaki, asking them to write letters to the CITES officials of potential recipient countries, explaining what is happening and asking for clarifications and assistance in helping promote the free flow of second generation farmed corals as verified by PCDF, sending an example of our booklet to each. *We need to prevent any potential problems on the receiving end.*
- The Embassies of NZ, Australia and USA to Fiji and their Trade Missions, to inform them and to gather any relevant information on how to better facilitate the cultured coral trade
- To meet with the communities involved and to provide them with a report and to encourage open discussion on how the sales went, what lessons were learnt, expenses of PCDF involved, and the way forward.
- To seek funding to do a more detailed cost analysis of each step in the market chain of farmed curio corals.
- Send appreciation letters to sponsors and donors who contributed towards the preparation of the event.
- Unsold corals to be recorded (for inventory purposes), and wrapped for storage.
- Follow-up on Businesses that are willing to market the coral at a price that is benefit the communities as well.

Acknowledgements:

On behalf of PCD Fiji the NRM team would like to thank the following individuals; groups and companies whose kind donations made this event a possibility: First of all a big Vinaka Vakalevu to PCDF staff and family. No words can really express my sincere gratitude to the great people we have in PCDF.

Sponsors

- Fiji Waters Ltd
- Westpac
- Noline Yap Florist- Ellery Street
- Breakers (Fiji)
- Suva City Council (SCC)
- FINTEL
- ASCO Motors

Volunteers

- Eta Tuwai
- Ema Robens
- Loma and Wayne Mataika
- Wesley Morgan
- PCDF staff on weekends

Community Stakeholders

- Moturiki Community Representatives
- Fisheries Officer Lomaviti: Mr Kuli

Donors

- USAID
- EED

***Corals for Conservation Launch* Budget Request**				
Date of Event- 4th June 2007				
Item (Original budgetted items)	**Cost**	**Expenses incurred**	**Expense**	**Reim**
SCC		**SCC**		
Foyer Hire ($100 Refundable)	390.00	Main Hall Hire (2 hours)	160	
Chairs @#1/chair x 30	30.00	Chair Hire @ $0.30 x 30 chairs	9	
Tables @$10/table x 3	30.00	Table Hire	30	
		Deposit		100
		Solo Hire		
		3 folding tables	45	
		Deposit		50
Banners	450.00		240	
Packaging	250.00	Noline Yap Florist-Packaging paper	25	
		MARCAO investment CO. Ltd: Foam (10 rolls)	43.6	
		Plastic Bags	10	
		Stationery: Post Fiji	14.71	
Garland @$20 each x 2	40.00	Garland	40	
Fiji Water Freight Cost	55.00	EMS: Delievery service	55	
Catering @$5/prsn x 40pax	200.00	Catering expenses	200	
T-Shirts	480.00	Breakers (Fiji)	480	
Community Reps		**Community Reps:**		
-				
Transport @ $200rtn	200.00	Boat fare from moturiki to Wadalice rtn	250	
Accomodation @ $40/room x 2 x 1 night	80.00	Travel Inn from 03/06 - 04/06	96	
Per Diem @$10/dy x 3 x 2dys	60.00	Perdiem @$10/dy x 5 persons x 2 days	100	
		Protocol:		
		Sevusevu (waka and Milk): Praveen Store (Fiji) Ltd	20.85	

		Sevusevu: Powdered grog	20	
		Lomaiviti Fisheries Rep: Boat fare	30	
		Protocol Consultant/ Jone Matakibau @$15	15	
		Travel: Office-Travel Inn-Office	10	
		Display		
		Photos for Display:FUJIFILM	42	
EY	50.00	Kundan BP Edinburgh (20$)	20	
		Kundan BP Nabua (30$)	30	
		Mobil Service Station	30	
Total	2,315.00		**2016.16**	150

Donations and In-kind donations	
Fiji Water (10 cases of water @$30.95)	309.5
Fiji Water -Cash donation	500
Fiji Water (Marquee @ $125 a day)	125
FINTEL (Marquee @$125 a day)	125
WESTPAC cash donation	200
Breakers	30
Private Vehicle hire and Fuel	220
Community Rep Meal Donation	
Dinner (03/06/07)	107.5
Breakfast (04/06/07)	10
Noline Florist- donated packaging paper	70
Volunteer hours	
2 vols (03/06/07)- 9 hours	
1 vol (04/06/07) -7 hours	
Total:	**$1,697.00**

Budget Requested:	$2,315.00
Expenses incurred:	$2,016.16
Variance	*$298.84*
Reimbursements	150
Total Variance:	***$448.84***

Coral Inventory

Included in this database is information of the cultured corals in storage. Each cultured coral is identified by a reference number, it species, size and color. Included are the suggested prices, date of sale and actual sale price.

Farmed Coral Inventory : Cultured Corals from Moturiki Site.

Data input: Mereoni Mataika and Julie Wasigitoni.20/06/07

Ref no #	Species	Size	Colour	Suggested price	Selling price	Seller	date of Sale
1	*Stylopora*	Large/18cm	Pink	100			
2	*Acropora plystoma sp.*	Small/12cm	White	30			
3	*Pocillopora*	medium/13cm	Pink/purplish(subtle)	40			
4	*Acropora gemmifera*	small/11cm	White	15			
5	*Acropora humilis*	small/8cm	White	15			
6	*Pocillopora verucosa*	small/8cm	pink/purple (bright)	20	10	M	4/6/2007
7	*A. gemmifera*	small/9cm	white	15			
8	*A.humilis*	small/8cm	yellow/blue	20	8	R	4/6/2007
9	*A.humilis*	small/ 10cm	white	20			
10	*A.humilis*	Large/20cm	white/light lavender	50			
11	*A.humilis*	small/5cm	pink/purple	15	5		8/6/2007
12	*A.humilis*	small/med/12cm	white	30			
13	*A.humilis*	large (16x14)	white blue tips	100			
14	*A.gemmifera*	large (22x18)	White	125			
15	*A.humilis*	Large (17x13)	lght yellow	75			
16	*A.gemmifera*	small (9x6)	white	15			
17	*A.polystoma*	med/large (17x12)	white	50			
18	*A.humilis*	med (14x13)	White	50			
19	*A.digitifera*	large (22x21)	cream/bright green	150	100	M	4/6/2007
20	*A.digitifera*	large(20x15x8)	White blue green tips	125			
21	*A.gemmifera*	large (20x13x13)	White	75			
22	*A.humilis*	Large (21x13x13)	white	75			
23	*A.gemmifera*	Large (20x14x11)	White	50			
24	*A.humilis*	large (15x13x15)	White	75			
25	*A.gemmifera*	large (15x9x9)	White	40			
26	*A.polystoma*	large (15x13x10)	White	50			

27	*A.humilis*	large (10x11x14)	pink/purple	75			
28	*A.polystoma*	large (21x19x11)	pink (bright)	125			
29	*Porites attennata*	Large/med (15x11x11)	bright yellow	50			
30	*A.digitifera*	Large (22x18x10)	White blue tips	125			
31	*A.formosa*	small(15x15)	White	15			
32	*Hydnopora viredis*	large (18x12)	white/green	100			
33	*A.digitifera*	large++ (24x23)	white/blue tips	150			
34	*A.gemnifera*	large+(21x16x12)	white	100			
35	*A.humilis*	large (17x17x15)	White	100			
36	*A.polifera*	medium(16x9x9)	white	15			
37	*A.gemnifera*	small (10x8)	white/blue	20			
38	*Acropora aspera*	med/small (13x12)	white	30			
39	*A.gemnifera*	med (14x11)	pink/purple	40			
40	*Stylopora subseriata*	med (13x10x10)	purple tips	30	30	P.K	4/6/2007
41	*A.millepora*	small (10x6)	blue tips	20			
42	*A.humilis*	small (9x7)	yellow	20			
43	*Stylopora subseriata*	large (21x18x15)	pink/purple	125			
44	*A.polystoma*	med (12x10x9)	purple tips	40			
45	*A.humilis*	small+ (9x9x8)	white	20	20	P.K	4/6/2007
46	*A.polystoma*	med (14x9x9)	maroon tip	30			
47	*A.cyathea (table)*	med (14x9x6)	pink/blue	40			
48	*Acropora gramulosa*	small (9x8)	pink/purple	20			
49	*A.digitifera*	small (11x7)	pink/blue	30			
50	*A.humilis*	small (10x8)	bright pink/red	20			
51	*A.digitifera*	med (15x13x10)	orange/blue/yellow, bright purple	30			
52	*A.humilis*	small (9x7)	bright red/purple	20			
53	*A.humilis*	small (10x7)	white	15			
54	*A.humilis*	small/med (10x10)	dark red	20			
55	*A.gramulosa*	small (7x6x5)	pink/purple	15	7		8/6/2007
56	*A.humilis*	large (18x11x16)	dark pink/purple/blue	100			
57	*A.gemnifera*	large (20x12x12)	pink/purple tips	75			
58	*A.polystoma*	med (14x11x10)	white/blue	40			
59	*A.humilis*	small/med (11x6x10)	light purple	20	20	P.K	
60	*A.humilis*	large (17x9x14)	white/blue				
61	*A.polystoma*	med (12x12x10)	pink/purple	30			
62	*A.humilis*	(double cookie) (26x16x12)	pink/purple	150			

63	*A.digitifera*	med (9x9x9)	pink/purple	20				
64	*A.humilis (double)*	large (23x17x16)	light blue/purple	150				
65	*A.polystoma*	large (21x13x10)	pink/blue tips	75				
66	*A.tenuis (fragile)*	large (23x16x14)	white	125				
67	*A.humilis*	large (22x20x10)	yellow/green/blue	100				
68	*A.gemnifera*	med/large (16x12x13)	white/lavenda tips	50				
69	*A.gemnifera*	large (19x13x14)	white	75				
70	*A.florida*	large (38x20x20)	pink/blue	100		80		4/6/2007
71	*A.humilis*	med/large (16x14x9)	light orange tan	50				
72	*A.digitifera*	large (14x14x14)	light orange	50				
73	*A.granulosa*	small (6x5x9)	maroon	20		10		7/6/2006
74	*A.polystoma*	med/large (13x12x10)	light pink	40				
75	*A.humilis*	med (13x10x9)	pink/purple	30				
76	*A.humilis*	med/large (18x9x9)	pink/lavender purple					
77	*A.polystoma*	large (17x18x10)	light pink/lavender purple	75				
78	*A.humilis*	small (8x7x10)	pink/blue	20				
79	*A.humilis*	med/large (17x12x8)		40				
80	*A.millepora*	med (15x14x10)	lavender with purple tips	40				
81	*A.gemnifera*	med (13x11x10)	brown blue tip	30				
82	*A.digitifera*	large (18x11x14)	white blue/dark blue	50				
83	*A.gemnifera*	med (12x10x8)	lavender/purple	20				
84	*A.humilis*	large (12x10x17)	dark blue/purple	50		20		8/6/2007
85	*A.gemnifera*	small (9x6x5)	white	15				
86	*A.digitifera*	small (9x7x6)	cream/pink	20				
87	*A.digitifera*	small/med (11x9x7)	pink/lavender	20				
88	*A.digitifera*	med (11x8x6)	white dark blue tips	30		20		4/6/2007
89	*A.digitifera*	med (13x7x8)	green/yellow light blue	20				
90	*A.granulosa*	med (13x10x9)	cream pink lavender	30		30	P.K	4/6/2007
91	*A.polystoma*	med (12x11x10)	pink/light blue/purple tips	30				
92	*A.digitifera*	med (14x12x10)	bright pink with lavender tips	40		20		8/6/2007
93	*Pocillopora verucosa*	med/small (10x9x6)	white/pink/lavender	20				
94	*A.humilis*	small (9x6x6)	pink blue	15				
95	*A.digitifera*	small (9x7x8)	white lavender	20				
96	*A.gemnifera*	med (9x9x10)	white lavender	20		10		4/6/2007
97	*A.gemnifera*	med (9x8x9)	white/blue	20	free		Presented to the Ratu, Motoriki	
98	*Pocillopora sp*	med (10x10x8)	pink/purple	30				

99	*A.gemnifera*	large (23x21x15)	yellow blue tip	150		150		8/6/2007
100	*A.humilis*	large (24x17x17)	white	125				
101	*A.humilis*	small (9x7x8)	light green blue	20				
102	*A.polifera*	small/med (10x8x6)	white	15				
103	*A.humilis*	med/small (9x7x5)	light blue purple	20		10	P.K	4/6/2007
104	*A.humilis*	small (7x6x6)	light blue/red tips	15		15	P.K	4/6/2007
105	*A.polystoma*	med (12x9x7)	white purple tips	20				
106	*A.humilis*	small/med (9x6x7)	white	15				
107	*A.humilis*	med (9x9x9)	white red violet	30		30	P.K	4/6/2007
108	*A.gemnifera*	small (10x6x7)	white/purple	15		15		4/6/2007
109	*Pocillopora verucosa*	small (11x6x5)	tan/pink	20				
110	*Pocillopora verucosa*	small/med (10x6x6)	white/red	20		20	M	4/6/2007
111	*A.humilis*	med/large (18x13x10)	white blue	50				
112	*A.polifera*	med (13x11x9)	white/pink purple					
113	*Pocillopora*	med (13x12x12)	white/pink					
114	*Pocillopora*	small/med (10x7x6)	white/pink					
115	*Psammocora sp*	small (10x9x	white					
116	*Pocillopora (damaged)*	med (12x10x8)	bright purple					
117	*A.humilis*	small (8x5x4)	white					
118	*A.polifera*	med (13x8x8)	light blue/purple					
			Estimated Amount:	***$ 5,335.00***	**Total:**	**$630.00**		
	Unaccounted corals (Reference number was not included in the receipt)		David Roth			20		4/6/2007
			minister of Env.			15		4/6/2007
						$665.00		