Pacific Blue Foundation Review of Fiji Operations 2007 UPDATE

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I. SUMMARY OF ACTIVITIES

Summary of Activities 2007

January, 2007

Pacific Blue Foundation (PBF) has started drafting plans for mariculture study for Yanuca Island. A report was provided by Dr. Amir Neori, of the Israel Limnology and Oceanography Research Laboratory, who spent a week with Dr. Mitchell at Scripps Institution of Oceanography (SIO) and developed this latest consulting report for our efforts.

Pacific Blue Foundation held its annual board meeting to discuss past activities and events.

March, 2007

With support from Pacific Blue Foundation, the Partners in Community Development of Fiji (PCDF) held awareness workshops, first at the school, where the children then took their enthusiasm home, drew the adults to the old church the first evening. Overhead slideshows, a movie and posters were presented, all telling of the decline in fish species and habitat in Fiji due mostly to the methods of humans on the land and sea. Then the PCDF facilitated the community working in small groups over the next 3 days to identify problems in the Yanuca qoliqoli, become aware of the causes, and create solutions. They drew maps of the qoliqoli, and drew on them the resources and MPAs.

The problems included illegal use of scuba to spear fish and take sea cucumbers, illegal use of duva tree bark poison, taking too many small juvenile fish that hadn't grown to breeding size, anchoring, walking on corals, breaking corals for aquarium trade, night poachers, over fishing and sewerage waste from resorts, village and pig pens.

In general, the overall outcome is the entire Yanuca community has been moved by the process, very similar in some aspects to Mark Calamia's May, 2006 small group workshops. The participants have to continue with some "homework" to define MPAs and guidelines for sustainable environmentally-supportive activity on land and sea, and they are to train **more** fish wardens to increase the momentum of awareness within the community, with the outlying areas of Beqa, the mainland villages and fishermen.

The community decided on their own VISION STATEMENT, "to replenish Yanuca to be greatly abundant, as it was before".

PCDF is to provide a report based on the findings at the workshop to be used as guidelines and recommendations based on the villagers own view of their sustainable steps towards the future (See Appendix A, PCDF Reports).

Probable MPAs

Thus far, there are four MPAs strongly desired due to the local knowledge of spawning aggregation sites and areas where juvenile fish grow. They are:

1. Waidaigia Bay, the small bay to the left of the village when looking to Beqa (growing area for the small ikavou and daniva, food fish for the trevally, barracouta and others). This is to be a no-take MPA with complete ban on use of the duva (poison from tree bark), not just here but in all the qoliqoli. More mangroves to be planted, the moka fish traps to be rebuilt.

2. Daqa Point, the first point on eastern corner of island when coming from PH to the village - a valuable fish aggregation area, many species including trevally.

3. Dakarukura Point, which is halfway between Korolevu and Daga Point, below the largest hill, Dalai (the old fort). This is a large fish aggregation area where fish grow after the larval stage. Many small stones on the sea floor offer great protection for the young tiny fish. Sireli is sure the current runs west to east most of time, bringing the juvenile fish (after larval stage) back from outer reef spawning areas.

4. A large no-take MPA from Wainidubu out to the Kauviti Reef pass (very large spawning areas June to August, and aggregation area for juveniles), then along the back of entire Kauviti Reef to a point in a direct line from Dakurukura, then back to Yanuca Island at Dakurukura, then along entire foreshore through Korolevu, Nukubalavu (Batiluva resort) to Wainidubu and including its small MPA. This large area includes many spawning areas but Kerry suggested to Sireli that more research and consultation be made to ensure other key spawning and aggregation areas are not forgotten or omitted. This area has NOT included Cakau Nisici (Bird Island) which, according to the elders, was never a turtle egg-laying area. The turtles used to nest their eggs at Korolevu, Nukubalavu and at Nukumalua (towards Daga point from the village). Overfishing has completely decimated the turtle and there are no survivors to continue the species. Cakau Nisici is recognized as a valuable fishing area, spawning sites have yet to be determined and it remains in the forefront of a probable MPA in the future, after they see how the current MPAs can be started and administered.

Coral gardens and Lumi

There was a keen interest in gardening both the coral and the lumi seaweed. There seem to be better sites for the coral rather than the lumi but more talks will define what they do. PCDF have said it takes about three months to grow a saleable coral, saves petrol and minimizes impact of human activity on the outer "wild" reef. There is a growing market for the lumi seaweed within Fiji and overseas.

Ecotourism

This came up as a resource for the community but was not discussed in a major way, not as much as the immediate concern to "protect the qoliqoli". There seemed to be a general strong consensus to take immediate measures to ensure bio-diversity and species numbers return to what they had seen 20-30 years ago. Then the ecotourism would simply grow as the environment grew back. There was not a lot of talk on "business" per se around ecotourism.

Summary

Vision statement defined making Yanuca marine areas as abundant as or more abundant than 20-30 years ago.

Many problems identified, causes understood, solutions sought.

Marine Protected Areas (MPAs) starting to be defined.
More fish wardens to be trained to create greater awareness, and provide greater policing of the activities on the waters.

More research to define as many spawning and fish aggregation areas as possible.

Planting of mangrove, rebuilding old moka fish traps.

Report to still come from PCDF, and further workshops still to come to smooth the processes. There will be further planning to ensure goals are defined and timeframes within which to complete.

April, 2007

On advice from Kini, Assistant to the Minister of Fijian Affairs, and advice from our attorney in Fiji, Chaitanya Lakshman, ex MP for Local Government, we visited the new Roko Tui with Tui Daga and Sireli Kago. He received us well, thanked Pacific Blue Foundation for our efforts and requested Chaitanya and I meet with him next week.

PCDF and Mr. Donovan went to Yanuca. PCDF held awareness workshops for the MPAs and new training for fish wardens. Austen Bowden-Kirby found an ancient adze wedged into the ground outside Pate's house. Sireli later found another. Sireli is to report on the workshops. PCDF are to provide an English report to PBF along with one for the first workshops. (See Appendix A, PCDF Reports.)

Didi Dulunaqio worked on Yanuca during May at awareness workshops and installing marker buoys for the intended MPAs.

May, 2007

Pacific Blue Foundation commenced a Rubbish Disposal Program for the removal from the island of all waste on beach at the village, and all batteries on the beach and in the village. The program went from 17 May to 4 July, with Pacific Blue Foundation paying 10 cents per battery and $1 per bag of rubbish (only non-organic rubbish-tins, glass, rubber, fabric). Total was 7,350 batteries and 400 bags of non-organic rubbish removed from the island to Naboro Landfill Waste Treatment Site. The several benefits to the community were removal of hazardous waste, money earned, and awareness of the hazardous battery waste that is so dangerous an NGO was

willing to pay to have it removed. A stronger respect for the environment has grown from this exercise.

June, 2007

Dr Greg Mitchell visited Yanuca with Didi Dulunaqio and Kerry Donovan to discuss further meetings with tokatoka elders and requested Didi interview them in following weeks. We visited Taito Tabaleka at his Suva office to arrange meetings the following week to discuss Yanuca Island business and environmental concerns.

Semiti, the drua builder, came to Deuba and visited the local forest with Sireli Kago, found a suitable mahogany tree for a drua, then returned to his village in Suva.

Greg Mitchell, Didi Dulunaqio and Kerry Donovan of Pacific Blue Foundation, met the Roko Tui, the Vunivalu and 15 provincial chiefs at Navua Provincial Office. Discussions focused on marine environment protection and the consensus was for each yavusa to be open to assistance from NGOs to enhance awareness of iqoliqoli issues, assess health of marine areas and take adequate steps to conserve the resources sustainability.

Dr. Greg Mitchell and family (wife Betsy and children Katy, Kristy and Michael) visited Wainidubu and stayed overnight. Greg discussed with Tui Daga the Yanuca possibilities for the future with focus on assistance from Pacific Blue Foundation in non-profit areas and assistance from him under proper Fiji guidelines in business areas. In the evening Greg had informal discussions with mataqali Batiluva. In the afternoon of the 14th, our group traveled to Suva and dined at an informal social meeting of the families of Greg Mitchell and Taito Tabaleka.

Dr. Mitchell visited people at various government departments, including Ministry of Education. Then met Director Kathy Walls, at Wildlife Conservation Society, and visited Joeli Vetyaki at Marine Studies USP. Greg met with Paul Geraghty, Language Studies USP, and Semiti, the Drua builder at Semiti's village. The drua discussions led to an agreement that the drua be built at Suva, their village. The Lau men would discuss whether to teach their craft to Yanuca men and would let us know.

In the evening there was an informal social dinner at JJs on the Park. Present along with Dr. Mitchell and his family were Taito Waqavakatoga and fiancée, and also Paul Geraghty, Kathy Walls, Didi Dulunaqio and wife Salome, and Kerry Donovan and Greg's family.

Kerry Donovan took Taito Waqavakatoga and fiancé to Nacewa village on Beqa for a 4 hour visit, then returned and met with Greg Mitchell at Deuba and discussed the greater area of Beqa Lagoon, its environmental future, and also discussed Pacific Blue Foundation sponsoring a PADI scuba workshop in July for some Beqa Lagoon divers, about three from each village. It was discussed that Didi Dulunaqio run the dive training workshops and Taito Waqavakatoga coordinate the Beqa and Yanuca men to meet and train at his village around July 8 or 9, depending on Taito's availability. Later Didi advised PBF he could not run the workshop up to PADI standard without their clearance and a lot more time for preparation.

On June 19, Kerry attended Fisheries/Provincial office workshop at Navutulevu village. Some of Serua's chiefs were present and people from Yanuca also attended. Each village reported their efforts on the coastal marine conservation. Kerry gave a brief talk on the iqoliqoli conservation at Yanuca.

PBF assisted Yanuca Council with $2909.35 loan to pay off hire purchase agreement with Courts Hardware, after village boat engine was repossessed due to loan repayments being overdue 4 months. Over the following months the loan was repaid in full and mostly on time.

July - August, 2007

PBF organized Yanuca Marine Reserve Committee with log books, stationery, and files to make the MPA administration more efficient

PBF sponsored independent consultant and anthropology scientist, Mark Calamia, to visit Yanuca village on Yanuca Island, villages on Beqa and Kadavu associated with Yanuca yavusa Nukutabua. Mr. Calamia's studies included interviews with elders and key community members to discover the old cultural sites, traditional stories and other cultural information in order to assist Yanuca community to move forward within their own lifestyle and island upgrade. Didi Dulunaqio assisted Mr. Calamia at Yanuca and Beqa while under contract to us and with the kind permission of Wildlife Conservation Society director, Kathy Walls. Didi's wife, Salome, assisted Didi on the Beqa and Yanuca trips. A researching student, Ms Keri Goodman, from the United States, also assisted Mark Calamia and conducted interviews with key elders about the effects of ecotourism in the area. An interim report has been submitted, with the final report to shortly follow.

Pacific Blue Foundation assisted with repair of Yanuca fiberglass boats, including the 25 ft Yanuca Princess owned by mataqali Batiluva for their Yanuca Island Resort. Fiberglass water tanks were also repaired at the village.

Assisted Yanuca Turaga ni koro, Sireli Kago, with stationery and filing system to optimize his administration of Yanuca Island community affairs.

Assisted Turaga ni koro and chief of Yanuca to visit government departments in Suva, write letters and emails, for assistance in government participation to ensure visiting yachts to Yanuca island do not anchor in the MPA and instead tie to a mooring. Government departments have yet to respond and moorings have still to be installed.

September, 2007

Kerry Donovan (PBF) called a meeting for Yanuca MPA, present were Sireli Kago, Seta Vulacadra.

Sireli Kago reported there are yachts still anchoring off Korolevu and Nukubalavu beaches, and the yacht people are diving and fishing in and around the marine reserve area. Sireli

Kago and Kerry resolved to visit again to the Department of Ecotourism and Department of Fijian Affairs to follow up August visit informing these departments of a permission letter given by Fijian Affairs to visiting yachts that does not inform the visitors of the marine reserve. Seta reported he has kept a good log book record of patrols. In the past six weeks he has met with five boats on the iqoliqoli, three towards Beqa, and two near the Bird Island side of Kauviti MPA. In all instances the fishermen had no licenses, and no permission to be fishing, and were warned to stay away.

Sireli and Seta reported that nine MPA marker buoys are already missing. It is believed that the strong current took all nine, three from around Daga Point, and three from north side of Kauviti reef, and three from south side of Kauviti reef.

Sireli reported that a Navua fisherman had been granted a commercial fishing license recently by Tui Daga for $800 so the patrol boat could be fueled. It was discussed and agreed this was not in best interests of Yanuca community nor what was agreed for the future of the qoliqoli. They agreed to meet Tui Daga by end of month so a letter from him could cancel the fisherman's license.

October, 2007

PBF sourced grant writing information from USP and PCDF about courses run by Caroline Pridham of Birdlife International. Further research was completed to plan for a research trip to the Lau Group islands of Moala, Totoya and Matuku. Our ethnological consultant, Mark Calamia, has been invited to study on Totoya by the chief's daughter.

PBF submitted its Annual Report to its legal advisers in Suva who informed PBF that no annual report had to be supplied to any department, except a letter to Registrar of Titles to say there has been no change to trustees or directors.

Pacific Blue Foundation met with Turaga ni koro each week to keep up relations, discuss MPA problems and support the new awareness for fish wardens. It is considered by the fish wardens that the marker buoys for MPA are being stolen, but not by local Yanuca people. Fisheries and Navy have been active on Beqa Lagoon and warned away one unlicensed fisherman and confiscated his catch, warning his boat is next to go. We are asking PCDF for assistance next week with a sign and posters they promised for the MPA.

The new Vodafone Tower, being built on the hill next to Dalai, is taking all the village work force and delayed the PCDF coral garden workshop until the new year.

Kerry contacted Lance Miller, the owner of Nanuya Island Resort in the Yasawa group. Lance is happy to have Kerry and Sireli visit and learn what we can of their building construction, sewerage recycling, desalination, water storage, garden composting and MPA, so we can apply principles and guidelines to villages.

Iliapi from PCDF delivered their Yanuca qoliqoli report to Yanuca and Pacific Blue Foundation. Mark Calamia and Pacific Blue commenced collaboration on compiling a paper to

be added into a book project by large conservation NGO, “Conservation International” (CI). Mark was asked to submit a case study on a marine protected area in Fiji involving indigenous peoples.

Kerry and Sireli visited Nanuya Island Resort in the Yasawa group for a two day field trip. They researched and took photos of building construction, sewerage recycling, desalination, water storage, garden composting and MPA, and filed a report so the information could be used for future island projects..

December, 2007

Pacific Blue Foundation added information about moorings to the PCDF report of Yanuca Island qoliqoli.

Totoya Research trip report was completed with expenses for travel. There were discussions with Yanuca Turaga ni koro, Sireli Kago, as to assistance for his expenses in his village work as he requested help so he can expand his MPA work. Sireli, Mark, and Kerry continued compiling the CI paper. Photos were sourced for the report. Kerry visited with Semiti, the drua craftsman in Suva, to discuss the quote for the building of one or two drua.

Pacific Blue submitted an MPA Progress Report from Yanuca Island to PCDF, and requested improvements and assistance for the MPA sustainability. Since the partner PCDF awareness workshops in April and the choice to designate MPAs, there had been good progress with village awareness, no community member is fishing in the no-take zone. The bi-annual reef surveys scheduled for October were not completed due to personnel being taken up by the Vodafone Tower project. The reef surveys will be completed in early January. PBF is donating the fuel towards this.

II. CONSULTANT REPORTS

CULTURE & ARTS IN FIJI

By

Heidi Siren

Prepared for Pacific Blue Foundation

November, 2006

Culture & Arts in Fiji

Introduction

Fiji's culture, economy, as well as a rich biodiversity inheritance depend strongly on traditional knowledge. These roots of Fijian society are endangered by modern urban-industrial development and education. To create awareness of cultural and ecological importance, and give tools and plans that will be available for use by future generations, it is important to maintain and strengthen traditional knowledge.

Based on this idea, to create a place where young Fijians can learn and develop their culture, this proposal will discuss selected cultural aspects of traditional Fijian life and how they can be conserved for future generations on a non-formal, community-based level.

Cultural Education

Family and community based transfer of knowledge plays an important role in Fijian cultural education. Therefore, many children who live in the city do not have access to cultural sources and/or knowledge. Even though Tewi Teaero (Senior Lecturer of the School of Education at USP) claims only few Fijian parents send their kids to summer camps, Paul Geraghty (Professor Art School for Language, Arts & Media) sees *potential* in this idea and underlines the need for Suva-kids to get out of the city and learn more about traditional culture. Indeed religious camps exist in Deuba, but aren't organized to teach several aspects of traditional culture.

Geraghty, as well as Teaero, mention the importance of cultural contexts and suggest a team of experts from different culturally-related fields be assembled to address this situation. Geraghty provides several possible contacts at the USP and other institutions that could assist in finding those experts. A list of potential contacts is attached. According to Geraghty, further information on cultural education is published by the Institute of Pacific Studies (IPS).
In the Republic of the Marshall Islands, Teaero mentions the NGO "Mission Pacific", that runs programs on cultural preservation, vocational training and environmental education with experts and multimedia technology. They also produced a video on canoeing.

In Fiji, the Shangri-La village/resort tries to link ecology and culture by giving community-workshops and promoting eco-tourism or coral reef restoration as part of the Coral Gardens projects from "Foundation of the Peoples of the South Pacific International" (FSPI) in Cuvu Tikina (Coral Coast). The project won the Green Apple Award from the United Kingdom twice, and has a clear focus on marine conservation. (http://www.fspi.org.fj)

The Japanese International Cooperation Agency (JICA) is focused on linking Fijian Culture with economic concerns. They are active in Fijian villages, farm coral fragments for the aquarium trade, and help set up distance learning through communication technology. (http://www.jica.go.jp/english)

As a governmental institution, the Department of Culture and Heritage (DCH) provides policy advice and administrative support to the National Trust, Fiji Museum & the Fiji Arts Council. The DCH promotes "Protection and Promotion of Fijian Culture & Heritage" and "Training and Education for Fijians and Rotuman's" as two of their key programs; both seem to focus more on handicraft such as basket weaving, pottery making, and screen printing. In collaboration with the Institute of Fijian language and culture (IFLC), the institution runs a cultural mapping program.

Crafts

Fiji's most well known handicrafts such as tapa-making, pottery, and wood carving are based on functional aspects of people's everyday lives. Most of the handicrafts are produced in local villages by people who learned these skills from their families. While the government supports workshops, where Fijians can develop skills such as basket weaving, pottery making, screen printing, there are only a few Fijians who have traditional knowledge in building canoes. To conserve their knowledge, those experts could teach locals how to make canoes.

Traditional Canoes

Traditional canoes are made out of the log of a natural hardwood called "vesi." Most Fijian canoes are made for use inside a lagoon. There are sea voyaging canoes, but these are based on Hawaiian navigation and boat making courses. According to Geraghty and Teaeri, there aren't many people in Fiji who know how to build these canoes, although some expertise can still be found in Fulaga, Lau Islands. Geraghty was confident that he could help the Pacific Blue Foundation connect with those experts.

Traditional Fijian canoes could be used for boat tours and to participate in traditional canoe races. Traditional canoe races currently occur on the Cook Islands, and Teaeri mentioned the race in Rarotonga, Cook Islands. Even though Fijians have the construction knowledge, they do not have adequate canoes and never enter the competition. Participating countries are usually New Zealand, Cook Islands, Hawaii, and American Samoa. The Pacific Festival of Arts also promotes "Navigation and canoeing" and the next festival takes place in American Samoa in 2008. (http://www.festival-pacific-arts.org)

There are two videos which provide information on canoeing:
1) "The Land has eyes": A video on canoeing on the Marshall Islands has been produced by Mission Pacific Video Production in 2004. (rmi@missionpacific.org)
2) "The canoe is the people" (Indigenous Navigation in the Pacific), UNESCO

Handicrafts

According to Teaero the best samples for basket weaving can be found in Vugalei district of Tevi Levu. Mili, an expert in mat weaving, and Paula Lega an expert in wood carving are at the Oceania Centre for Arts and Culture.

Fiji's most famous **masi or tapa**, the traditional paper art, comes from Vatulele Islands and is made from the bark of the mulberry tree, which grows all over the island. Other regions are the

Lau group, Buca Bay in Vanua Levu and some villages in Ra. Each region has its own particular traditional designs stencilled upon the masi. Masi cloth is used for decorating purposes as well as for traditional costumes.

The most famous village for for Lapita, Fiji's traditional **pottery-making** techniques is located in Nadroga, west of Suva towards Sigatoka. The potters create bowls, animal figurines as well as jewellery.

Performing Arts

Fiji's histories, as well as its myths are recorded in "mekes," a performance with dancing, playing and acting, as well as oral story-telling. According to Geraghty, many people do not understand a meke-story, or know how to produce one. To conserve that knowledge and pass it on to younger generations, a place could be created where kids can participate, learn and develop Fijian culture through songs and dances. Further it could become a place, where older mataqali (spokesperson) tell their stories to an audience, or are videotaped and shown to the children.

Geraghty mentioned few traditional plays are recorded. Another difficulty is Fiji's diverse culture. According to Geraghty and Teaero, several institutions try to promote aspects of Fijian culture, but take parts out of original context. He agrees more "mekes" should be recorded in their original

In the current situation, the research about Fijian performing arts is still at the very beginning. More information about the design of theatres, traditional plays, and story-telling is needed.

Secondary School Recommendations

By

Bridget Seegers

Prepared for

Pacific Blue Foundation

Secondary School Recommendations

Education in Fiji is a valued part of the community. This is shown by the community ownership of schools and very limited centralized control. Fijian law requires that children are given access to primary education and most communities provide a local school. Secondary schooling is not guaranteed for students, although the Ministry of Education has created a goal to increase secondary school attendance. Education can provide skilled labor in many areas including tourism and resource management, which can help protect and maintain traditional village ways of life. Secondary education is also important economically as education is closely related to economic growth and material wealth (Bertrand 1998, Clayton 2000, Evans 2001). Pacific Blue Foundation wants to work with the Village to improve access to secondary education for the children. Currently, there is difficulty in making secondary level education available to all children especially rural children. This report will cover the current secondary school situation in the Village including the opportunities and difficulties in providing secondary education. Recommendations are then giving for the most efficient and affective ways to provide secondary education for isolated villages.

Current Education Situation

There are a variety of factors that make providing secondary schooling opportunities to students in rural villages difficult. Secondary schools receive limited resources from the government and usually require support from the community and/or private or religious organizations. Rural and isolated village populations often practice subsistence living. Therefore, there are limited funds making it difficult to create well resourced secondary schools (Prosser 2006). The small number of children in a village increases the per capita school operating cost. Additionally, it is difficult to attract skilled teachers to isolated villages to work at the schools (Bullock 2005). Therefore, students from rural areas have very limited opportunities to receive a local secondary degree.

Current Secondary Schooling Opportunities

The lack of educational opportunities locally forces students who want to pursue further education to leave their villages. In some cases the entire family relocates to an urban center where secondary schools are present. Family relocation can weaken the entire village, because of the loss of contributing members to the village. Relocation can also be stressful on the family because it isolates them from their village culture.

Another option for schooling is for the student to relocate closer to the urban schools. These students who leave their village often stay with extended family or have to attend boarding school. There are a variety of problems associated with sending the student alone to the city. The number one reason for attrition is the cost of schooling. The family cannot pay school fees and therefore the student is forced to return home. Other students have trouble adjusting to life away from the village. The move away from home for school is often the first time the students leave their family and village. The school culture is dominated by a western competitive and individual achievement philosophy (White 2001). The native Fijian students are not pushed by the competitive nature of the school to excel beyond their classmates (White 2001). The students have little motivation, because they do not expect lucrative benefits from education (Boufoy-

Bastick 2002). Many native Fijian students plan to return to the village and inherit the land and live from it. The negative impacts of families and students leaving the village along with the high attrition rate for rural students relocating to urban school demonstrates the need to develop alternative options for rural students hoping to pursue a secondary degree.

Alternative Secondary Schooling Opportunities

Daily Boat Shuttles

One option for the Village to provide secondary school education to the children would be a daily boat shuttle service. The boat could drive the students to Suva each morning where high school attendance is possible. Each evening the students would be picked-up and returned to the Village. This option would allow students to remain an important part of the village life. However, the commute would be time consuming for the students. Also, there are many cost associated with running a boat shuttle service including purchasing funds, gas, maintenance, and boat operator. This option additionally does not address the transitional problems for rural students adapting to the individualistic and competitive school culture.

One room schoolhouse

Another secondary school option for the Village would be to open a community centered one room secondary schoolhouse. This school would have one teacher who is able to teach a whole range of subjects. The teachers would work with village children interested in completing there secondary education. The schoolhouse would allow the community to remain an influential part of children's educational experience. The school would teach the students all the skills and information necessary to pass the standardize test to complete the secondary degree. The school would also work closely with the Village to teach students traditional knowledge and skills. The school would pass on ancestral knowledge and simultaneously give students the skills necessary to succeed in an ever changing world.

Difficulties with the one room schoolhouse would be the large investment for a small number of students. It would require constructing a school building, purchasing computers and modern technology, and the teacher salary. The small number of village children would make the per capita cost quite high. Recruiting skilled teachers to a remote area has also been a problem in Fiji.

Local Boarding School

A third option for providing secondary education would be the creation of a local boarding school for local students and students from surrounding villages. The boarding school option would be more cost effective, because it could house many more students than the small single village schoolhouse. The school would provide basic housing, food, and education for the students. The school would operate Monday through Thursday to allow students to travel home for three day weekends. This would maximize the students' time in the villages. The school would focus on the knowledge and skills needed to pass standardized tests and succeed in earning a secondary degree. Another goal would be to give students cultural classes to teach

traditional knowledge and skills. The school location within the Village would allow for community involvement in educational activities.

The local boarding school could help increase secondary school completion rates for a variety of reasons. First, when students leave their villages to attend an urban school away from their village the transition is very difficult and contributes to students desire to leave school (Prosser 2006). Providing a school close to the villages where students can return home regularly during three day weekends would help the students with transition. The schools focus on traditional knowledge and skills would also allow students to feel connected with village life while at school. It has been shown that a lack of motivation may contribute to native Fijians high attrition rates (Boufoy-Bastick 2002). A local school could address this problem by focusing on skill development that would strengthen the village economically and maintain village life such as resource management and tourism. The close relationship between the school and the villages will help keep the education relevant to village life.

Conclusion

There is a need for secondary school options for students of the Village. The current situation of sending students to urban schools has marginal success. We discussed 3 possible options for alternatives that would allow students schooling: a daily boat shuttle to school, a single village school house, and village boarding school. These options would increase student time in the village and simultaneously increase secondary school completion. Any secondary school success would require the parents and villagers to encourage students to complete secondary schooling. Villagers need to understand that investing in education would produce skilled labor for tourism and resource management, which would help the village. The local school options would give the students the greatest opportunities to complete secondary education and remain involved in village and family life.

Interim Report for the
Yanuca, Fiji 2007 Field Project

Submitted by

Mark A. Calamia, Ph.D.

Introduction

This interim report is a brief summary of the interview activities conducted during the 2007 field season on Yanuca Island, Fiji while under contract with Pacific Blue Foundation (PBF). The data from the interviews conducted in villages in Beqa and Kadavu islands will be presented in the final report to PBF. As part of an ongoing research agenda to help Yanuca village establish a marine protected area and possible ecotourism project, Yanuca Village and Pacific Blue Foundation (PBF) requested Dr. Mark A. Calamia to conduct a five-week preliminary assessment of the socio-cultural dimensions regarding the development and implementation of a locally managed marine area and possible ecotourism venture involving three important cultural sites. A crucial part of this assessment was the documentation of traditional connections, including the trading and exchanges of craft items and people between Yanuca and other islands in the region, especially Kadavu, Serua province of Viti Levu, and Beqa Islands. Particular individuals knowledgeable of the culture history of their villages were identified through local village leaders and elders.

Objectives

The six objectives for the 2007 season of fieldwork in Fiji were to:
1) Document and assess the specific interests the local people of Yanuca have concerning a possible ecotourism venture on Yanuca Island. Specific interests to be addressed are the a) cave containing archaeological remains of concern to the village, b) a protected hill-top original village site, and c) several ancient moka (traditional Fijian fish traps) found along the shores of the island that have lost much of their structure through erosion and disuse;
2) Document the general culture history of trading and/or exchange patterns (material and human) between Yanuca and specific villages in Serua Province (Viti Levu), Kadavu Province, and Beqa Lagoon;
3) Inquire with the local villagers about the culture history of possible local taboo reefs and passages in the Yanuca customary fishing rights area and their implications for adaptive management;
4) Begin to identify possible grant donors interested in funding long-term (3-5 years) research on the culture history and development of ecotourism in Yancua;
5) Identify potential ways the development of an ecotourism venture on Yanuca will be mutually beneficial to the people of Yanuca and PBF;
6) Assist PCDF and PBF staff in carrying out tasks that will be of benefit to their ongoing work while at the same time helping to achieve the objectives listed here.

Methods

Dr. Calamia's methods used in this 2007 season's work involved simple one-on-one open-ended, semi-structured interviews, and possible focus groups. Interviews were recorded but only with the interviewees' permission. Digital photographs were taken of particular people and subjects as appropriate. The information obtained for this assessment is being organized and written in a final report for PBF. Some archival research was conducted as part of this documentation.

With the consent of PBF and the people of Yanuca Island, some of the information from this assessment may be later used in developing paper for presentation at a professional meetings and publication in a peer-reviewed journal. In addition, some of the data will be useful for future grant proposals.

Partnership Consultation

During the anticipated period of documentation and assessment, from July 5th through August 5th 2007, Dr. Calamia served as a field consultant and/or observer to the project. PBF has recently established a working partnership with Partners in Community Development, Fiji (PCDF) to assist Yanuca village in developing a locally managed marine area or MPA and conduct a socioeconomic study of the island and resource base. Dr. Calamia was hired in May of 2006 by PBF to conduct a preliminary environmental marine awareness workshop at Yanuca Island village, which paved the way for the follow-up work that PCDF engaged in earlier this year (2007) in the form of two marine protected area workshops. Dr. Calamia has been in contact on previous occasions with PCDF staff and is very familiar with their overall mission and work in Fiji. As part of this anticipated work on Yanuca and Kadavu, Dr. Calamia has consulted and collaborated with Dr. Austin Bowden-Kerby and other PCDF staff who were engaged in the 2007 workshops on Yanuca Island.

Summary of 2007 Field Session in Yanuca

The interviews conducted for this field session all occurred between July 13th , 2007 and August 4th, 2007, and most involved representatives of Yanuca village. Note: the interviews from Beqa Island and Kadavu Island will be integrated in the final report and are not summarized in this interim report.

Interview with Tui Daga (Chief of Yanuca village) 7.13.07. Chief's name is Panapasa Matia who is 63 years old. He noted that there were historical ties between Yanuca and the following villages: Lalati Village on Beqa Island, Lomanikaya Village on Vatulele Island, Muaivuso Village on Viti Levu (Rewa Province), Yale Village on Kadavu, and Lomanikoro village (Nukutabua Mataqali) with the Roko Tui Dreketi of Rewa province. He then discussed the history of the title of Tui Daga with respect to Yanuca village. Other items he covered included the pottery made at Yanuca and intermarriage of women from Yanuca with men from Lalati, Beqa, and Dagai and Taulalia villages on Kadavu. In terms of trade between Yanuca Island and the surrounding islands, the trade system was no longer active, but during his father's time tapa cloth was traded. Regarding Frigate Passage, he stated there is a submerged ancestral village called Navatailulu. People are not supposed to fish at this site and are expected to show

traditional respect each time they pass through or near the passage. Naivabale is also associated with this area. Naivabale is a large boulder that marks the location of part of this sacred site (on southern end of Yanuca reef) where no rubbish or loud talking is allowed. Although it is a sacred site, it is not tabu (forbidden) for surfing activities, because the community benefits from this activity.

Interview with Emani Sokosoke from Yanuca 7.13.07.

He is originally from Korovisilou in Serua. It was the "vasu" relationship (mother's brother) that allowed him to inherit land, because his mother was from Yanuca. His grandmother on his mother's side was the Tui Daga. Sokosoke generally identified the same inter-village connections as did the Tui Daga. He pointed out that there was the traditional "tauvu" relationship between Yanuca and Lalati, Lomanikoro, Muaivuso, Nakutabua, and Yale villages. He noted that two women from Yanuca had been married to Lalati men . Regarding the sacred reef area he noted that Navatailulu is a submerged ancestral village where the Kalovu, or ancestral gods reside. According to him, there are no restrictions or taboos there today. Emani also spoke of the firewalkers and how the people of the Lutuya mataqali, originally from Navutulevu in Serua, transferred the "mana" for firewalking to Yanuca. When asked about the protection of the marine protected area in Yanuca, Emani said that a decision was made through a community decision following the community MPA workshop presented by Partners in Community Development Fiji (PCDF). He felt that the protected area would be a way to revive the failing resources in the area. He felt that it might be difficult to share the MPA with a neighboring clan .There are issues regarding poachers that come from Beqa Island. The issue of the disputed iqoliqoli boundary was mentioned. He had some opinions regarding the Native Lands and Fisheries Commission view on the boundary. Finally, he discussed the use of the Frigate Passage surfing area and payment structure to the village committee.

Interview with Elenoa Taivalu from Yanuca 7.14.07. She is 77 years old and from Lutuya mataqali of Naceva village on Beqa Island. She said there were ties between Lutuya and Beqa. According to her the tie is based on traditional kinship. There are also marriage ties between the village of Vunisei on Kadavu Island and Yanuca. She was told that one of her husband's grandmother's was married to a man from Vunisei in Naceva, Kadavu. In terms of trade, she told of pleated mats being brought from Kadavu and Beqa and tapa from Vatulele and Naitasiri, near Suva. Yanuca exchanged their village-made pottery for the mats. The Yanuca pottery is not as elongated as that of Nadroga. The soil came from the location known as Daga and all women in the village made the pottery. She heard this story from her husband's grandmother, then aged 85, who was the one person left who knew how to make pottery when Elenoa arrived in the 1950s. According to her, the knowledge has now been forever lost. She did hear of pottery-making in Kadavu, but does not know in which village. She went on to discuss a Chinese trader who owned a boat in the 1940s and traveled between Serua, Vatulele, Beqa, and Kadavu. People would come to the boat to trade items. The Chinese trader bought copra and skills from Yanuca islanders. From the money the Yanuca people received, they would do shopping on the boat. As for the tabu areas there are three: Bola Turaga (a taboo reef), Bola Dau (a taboo reef), and Navatailevu, which is where Frigate Passage is today. The Kalovu (Masilaca) or ancestral god is a shark god and is said to still reside there. Thus, she would always would be respectful in that area when she would glean the reef for shells and not shout or do anything that was disrespectful. She told us

the story of Masilaca. Regarding traditional fishing, the communal fishing method known as Yavirau and the last time it was performed was sometime around 1950. Other nets, including Taraki or push nets, are not used for fishing. Today, however, monofilament nets are used. With respect to social aspects of fishing, reef gleaning is still done along with group and individual fishing, both day and night. Each woman keeps her own individual catch and divides it when it is cooked. Regarding the moka (traditional fish traps) in front of the village, none of them were in use when she arrived.

Interview with Setariki Vulacandra 7.14.07. He is 46 years old and is the shopkeeper of the Yanuca cooperative store and also the skipper of the one of the village boats, the 'Yanuca Flyer'. He is also a fisher and a farmer. His varied jobs and skills illustrate the need to diversify in order to make a living on outer islands. Setariki is also member of the Yanuca village committee and an honorary fish warden (he is one of three on Yanuca). He states that he was selected to be one of the wardens based on what his parents share with him. Setariki identified Kadavu, Vatulele, Serua area of Viti Levu as islands for traditional exchange with Yanuca. He also added that Yanuca also traded with Lomawai village of the province of Nadroga. The Lutuya women of the mataqali Navutulevu in Serua married men on Yanuca of the same mataqali. He did talk about a Vatulelue boat that capsized many years ago because it crossed the tabu reefs at a place called Bola Turaga. He felt that community-based effort for tourism on the island would be best.

Interview with Sireli Kogo 7.14-15.07. Sireli is the turaga ni koro for Yanuca village. He identified the following companies that engage in diving activities in their iqoliqoli (no. 5): Beqa Lagoon Resort, Dive Connection, Aquatrek Beqa, Beqa Adventure Divers, and Waidroka Bay Resort. As for iqoliqoli No. 4, there are only four dive sites that are used by all the dive operators listed here. In terms of surfing, the following operators take their surfers to Frigate Passage: Beqa Lagoon Resort, Lalati Resort (Beqa), Lawaki Resort (Beqa), Waidroka Bay Resort (Serua), Batiluva Resort (Yanuca Island), individual surfers from Pacific Harbor, Yanuca Island Resort (Yanuca Island), Pearl Resort (Pacific Harbor), Uprising Resort (Pacific Harbor). Some of these operators and resorts also offer snorkeling and sea kayaking.

Sireli noted the following dive operation agreements with Yanuca village in 2007(all amounts are in Fiji dollars):

Beqa Lagoon Resort: $160-$200/month, verbal but no written agreement
Dive Connection: $125/month, verbal but no written agreement
Aqua Trek Beqa: $200/month but the agreement ended in 2004. No longer have an agreement with Yanuca and dive only in Beqa and Viti Levu areas.
Beqa Adventure Divers: $100/month, verbal but no written agreement
Waidroka Bay Resort: Paid $15,000 for 10 years. Written agreement signed by the Tui Daga

Surf operation agreements for Frigate Passage:

Beqa Lagoon Resort $160-$200, includes diving and surfing
Lalati Resort from Beqa $4000 for 3 years or $1,300/year, only surfing
Lawaki Resort: No agreement as of today
Waidroka Bay Resort: Written 2004 agreement of $15,000 for 10 years

Individual Surfers: $10/per head
Batiluva (Yanuca): $200/month diving and surfing through verbal agreement only
Yanuca Island Resort: No charge and no agreement
Pearl Resort: No agreement in existence (recently started) $10/per head

Interview with Waisele Masirewa 7-14-07.

Waislele is the manager of Yanuca Island Resort at Wainidubu Beach and is married into the mataqali owners. He noted that most guests are surfers or backpackers and some stay up to a week. He says that Ecotourism is good for the family. Batiluva Beach Resort first built on the Wainidubu site in 1994 and in 2003 moved to adjacent Nukubalavu Beach under a lease developed between 1994-1998. In 2000 and later in 2003, the Nukubalavu lease was stopped, but the resort operators continued to operate the resort between 2003-2007 under some court ruling. Yanuca Island Resort restocked the old Batiluva site at Wainidubu and leased the land properly. The earnings from the resort help to pay their own NLTB monthly lease. The lease is paid to the land owners as well through trust. (This point needs to be checked). According to Waisele he does not see too much difference between ecotourism and conventional tourism in Fiji. With respect to the small MPA in front of the Yanuca Island Resort he notes that there is now more fish and larger ones appearing in the area than prior to the development of the 3 year old MPA. In addition, the area from Caesar's Rock to Davetania passage is controlled by Yanuca village. Iqoliqoli are all under Yanuca village. By 1992 when Waisele arrived, the boundary line had been changed from where it used to be to where it is now. He said that more educated people changed the boundary in order to accommodate a shared iqoliqoli situation. However, he believes that the benefits should not be shared with the Beqa Island village that shares the iqoliqoli. He would like to see more protected areas along the Kavukau reef.

Conclusions

This brief review of some of the major interviews from informants from Yanuca Island identifies the topics and themes to be described and discussed in more detail in the final report. The interviews from Beqa Island and Kadavu Island will be addressed in that report within the context of traditional inter-island exchange and intermarriage. These descriptions will provide a cultural context from which Yanuca Island will be able to provide historical information for new tourists visiting Yanuca and its neighboring islands.

Consultant's Report

July 2008

Domestic Energy Development Options for Yanuca Island, Fiji

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For

The Pacific Blue Foundation

Contents

1 Introduction

1.1 This Report

This report documents the current status of the domestic electricity system of Yanuca Island. Energy and cost saving opportunities for the current energy system are identified, and the potential for alternative solutions is framed. Underlying data was collected by the Pacific Blue Foundation, and during my several days visit to the island in February 2006. Yanuca's poorly designed diesel-generator energy system raised dissatisfaction and confusion among the islanders. High fuel costs provoked a debate about alternative renewable energy-based systems.

1.2 Summary of Findings

Yanuca's diesel generator based power system is not viable going into a future beyond the global peak oil production. Being 600% to large, the current village generator consumes 300% of the fuel a correctly sized generator would use. Partly as a result of this, the village cannot afford to run the generator on a regular schedule. The nearby school operates another generator on a separate mini-grid. The school generator is underutilized, and would be a perfect match for the village's and school's combined energy demand. It is recommended that the current generator be phased out immediately and the school and the village grids be connected.

In the long term, an alternative solution to Diesel needs to be developed. Small and low-cost individual-dwelling solar installations appear to have the greatest potential to reliably supply future energy needs. Individual small wind systems could bring about cost advantages for some households, however, the wind potential needs further study.

It is also recommended there be a strong focus by the community consumers on separating essential energy services from optional energy services, in order to be able to sustainably manage energy demand. A *User Pays* principle should be applied so that those using more appliances and power have to bring in the income to pay for it, thus creating more individual awareness of the actual costs of having "modern goods".

A possible solution is individual solar photovoltaic installations per dwelling. The *User Pays* principle dovetails in with an individual solar units concept, i.e. the more appliances an individual household wants, the more solar panels that household has to buy. If they can afford the appliance but not the extra panels, then they have to reconsider the purchase and their total household income and expenses.

1.3 Pacific Islands

Energy use on Pacific islands poses particular challenges because of the high degree of isolation. Rural electrification schemes using mainly diesel generators have been implemented on many islands under substantial government funding. It was anticipated that electrification would create business opportunities and spur economic development (Matakiviti & Pham, 2003). This way, rural electrification projects were expected to perpetuate themselves. This hardly ever occurred. The Fijian Energy Department itself reports that their Fiji Rural Electrification Policy did not work (Matakiviti & Pham, 2003). The author noted that Pacific Islanders often showed limited

interest in engaging in business activities even when they had the opportunity. Because of the extreme isolation, fuel distribution to the islands has always been disproportionately expensive. This was a contributing factor why Pacific islands were seen as ideal substrate for RE programs. According to the (World-Bank, 1992), Pacific Island governments had high expectation for the development of indigenous energy resources and succumbed to it. In an energy project review, (Fairbairn, 1998) found: "… it is still difficult to find many examples of successful renewable rural electrification projects." According to the (World-Bank, 1992), the most successful projects tended to be small individual solar PV installations. This view is reflected by the author's own observations. During an in-depth survey of energy systems on the Fijian island of Rotuma, even fairly old, very small solar installations were found to be still functional. The systems were small and simple enough that the locals did appear to understand and work with them. For example, most people would change the fatigued system battery every five to ten years themselves. Larger solar systems were often either entirely out-of-order or reported to having caused continuous problems. This is unsurprising, considering the high number of failure prone parts typical for larger solar systems, and the lack of specialized solar electricians.

1.4 A Global Perspective

This report is written in the light of global peak oil and its plethora of consequences for the Fijian economy. Global oil production is most likely to peak within the next ten years (Deffeyes, 2001), or it might already have occurred in 2006[1]. Alternatives to oil do not exist on any scale large enough to offset the shortfall effects of peak oil. Peak oil is expected to trigger economic recessions all around the world. The developing nations, such as Fiji, are likely to be hit the hardest (Hirsch, Bezdek, & Wendling, 2005). This is mainly because energy-intensive manufacturing contributes to a larger portion of their GDP.

[1] 2006 oil production is yet unsurpassed. But it is too early to tell whether this has already been the ultimate peak.

2 Description of Yanuca Island

2.1 Geography and Economy

As part of the Fijian archipelago, Yanuca is located twelve kilometers South of Fiji's main Island of Vitu Levu, at roughly 178˚E, and 18˚N. Figure 2 shows the geographical position of Yanuca with respect to Fiji and the world. A satellite image of the island is shown in Figure 1. The island is approximately two kilometer long and somewhat less than one kilometer wide. Yanuca enjoys a tropical climate, but is drier than average Fiji. The vegetation consists mainly of bush for plantations. Most plantations are, however, no longer in use and crops are now usually purchased on the mainland. Yanuca has a permanent 250 population, all staying in the single one village on the East Coast, in the South of the island (see Figure 2.). Some young people leave the island forever, after completing school. The traditional subsistence lifestyle of Yanuca is compromised by Western influences. Most people on the island earn money and use this to buy pre processed food among other things. Western-style pre-packaged foods are available through two main shops on the island. Economic activities focus on the ocean. There are several boat drivers and many small scale fishermen. Two small surf resorts are located on two secluded beaches in the Southwest of the island, one of which is operated by American investors while the other is run by locals. The surf resorts attracted less than two dozen jobs in the service field. The most lucrative business opportunities on Yanuca arise from the small tourist industry and illegal exploitation of marine resources such as scuba fishing, mining of coral, and the collection of sea cucumbers. Yanuca has a village chief who has inherited this position. However, the chief does not reside on Yanuca; he lives a

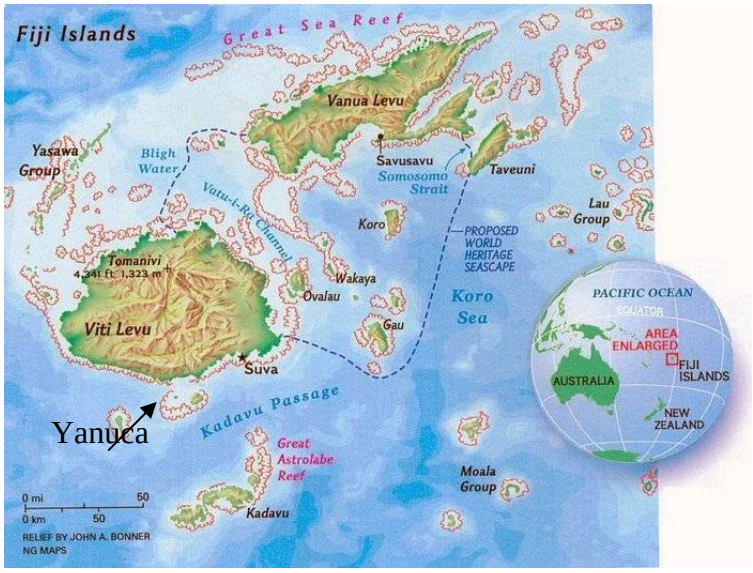

Figure 2: Yanuca's position with reference to Fiji. Map taken from: http://www.fijiprun.org/images/user/photos/content/Fiji_Map_2.JPG.

Figure 1: Yanuca Island.

comfortable lifestyle in the mainland Fiji village of Wainiyabia, directly inshore from the island. Yanuca's traditionally rich marine resources are in rapid decline, and the marine eco system has partly collapsed.

2.2 Climate

Climate data is not available for Yanuca, because there is no weather station. However, the climate is similar to Suva on the main island, probably with somewhat less rainfall and slightly lower temperatures. For reference, basic temperature and rainfall data is given for Suva in Figure 4 **Error! Reference source not found.**and Figure 3.

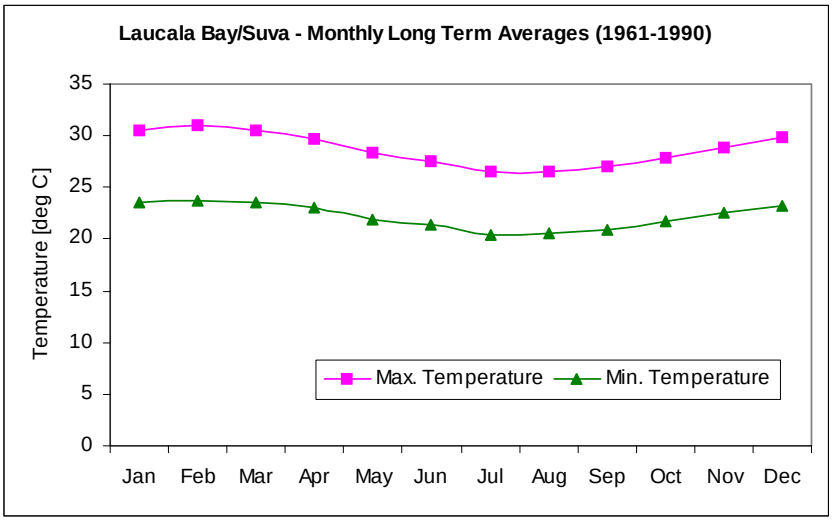

Figure 4: Monthly average temperatures recorded in Suva. The data comes from Fiji, Department of Meteorology.

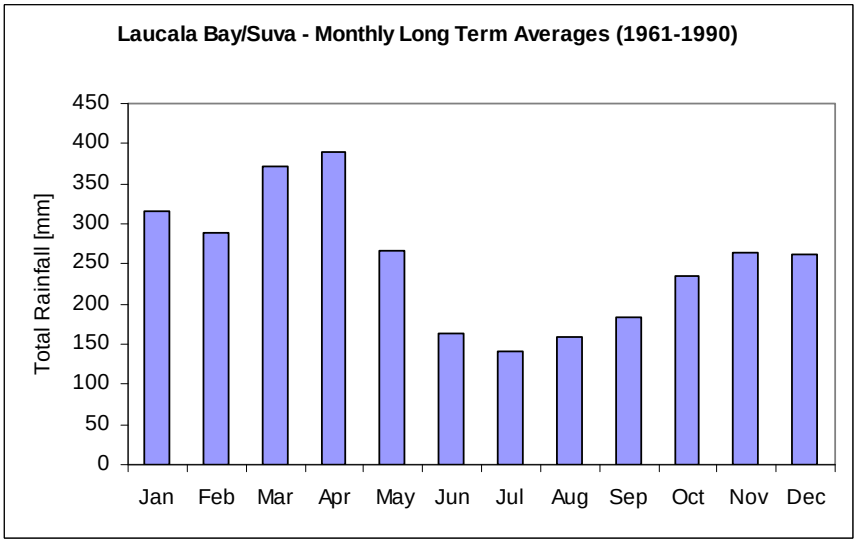

Figure 3: Monthly average rainfall recorded in Suva. The data comes from Fiji, Department of Meteorology.

3 Electric Power System

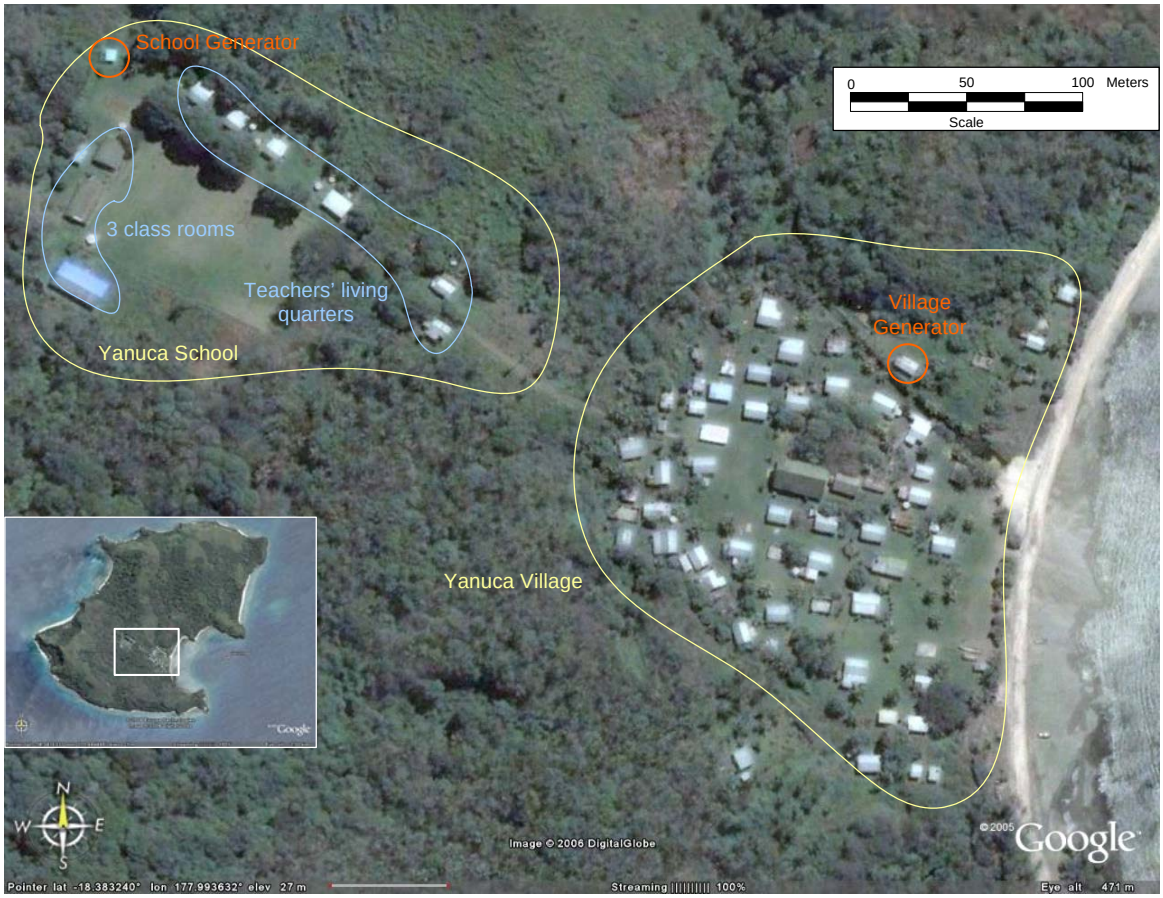

Figure 5: Satellite image of Yanuca village and school.

3.1 General description

Communal electricity was installed on Yanuca only two years ago, in 2004. Before, few people used private electric generators, while most people had no electricity. The communal power system has been put in place under a special agreement with the Federal Electricity Authority (FEA). A second hand Diesel generator (Figure 6) was acquired by the village at low cost (FJ$1000). A mini grid has been installed by FEA free of charge. The generator is operated by Mr. Sireli Kago, a knowledgeable resident and headman of the village. Subject to fuel availability or potential generator problems, the generator is running for two hours in the evening, starting around sunset. Two hours of run time is unusually short by rural Fijian standards. Most generator installations of this type are running for at least 4 hours at night time. Reason for the 2 hours constraint is a lack of sufficient income to pay a higher fuel bill. Sometimes the generator is not run, because some villagers are unable to pay their share of the fuel bill. A second Diesel generator is installed at the school outside of the village grid.

3.2 Diesel Generators

The **village generator** for Yanuca has been chosen with no consideration for the actual system load. The average load on Yanuca is in the order of 4kW, with a peak load of less than 8kW. The 45kW (56kVA) generator is oversized by a factor of six. The implications are two-fold: The generator is operated far below its recommended minimum load, and is therefore likely to fail prematurely. Secondly, the generator's fuel efficiency is poor in part-load operation. The generator has been reported to consume roughly 5 liters of Diesel fuel per hour (Kago 2006, personal communication). This value agrees with simulation results obtained using the given village load and generator size. An appropriate generator for the given load would be 7 to 8kW, SINGLE PHASE[2]. Technically, such a generator could be installed immediately without any modifications to the electricity grid. Fuel savings would approach 70%. Table 1. overviews current generator operating costs, and operating costs of a hypothetical replacement generator of 7kW (8.8kVA). All costs are based on a Diesel fuel price of $1.65 per liter. The replacement generator would provide the same electricity load.

Figure 6: Yanuca Village Generator.

The **school generator** has been installed in 2001 under a Department of Energy (DoE) contract. According to the operator, Mr. Malo, DoE is still the official owner of the generator, and thus also responsible for its maintenance. Under the Fijian rural electrification policy, DoE would actually transfer generator ownership and liabilities to the community THREE YEARS upon installation (DoE-Fiji, 1993). The operator reported that the school generator is run for three hours a day. However, villagers report that the school seldom has fuel to run the generator at all. The school generator has a capacity of 7kW (8.5kVA), which, in fact, would be a perfect match for the village load

If it was running, the school generator would serve four households (teachers' quarters) and three classrooms. Actual

Table 1: Generator Operating Costs.

Generator	Current	7 kW Gen.
Annual O&M Cost	$ 110.00	$ 55.00
Annual Fuel Cost	$ 5,598.00	$ 1,925.00
COE ($/kWh)	$ 1.88	$ 0.65
Gen. hours (hrs/year)	$ 730.00	$ 730.00
Monthly cost per hh	$ 11.33	$ 3.93

[2] Three phase electricity is neither used nor needed on the island. A three phase generator brings about a number of additional management and therefore reliability problems, which a single phase generator does not have.

loads have not been audited, but it is known that the school has three computers (occasional use only) and a few fluorescent tube lights.

For the benefit of both, school and village, it is recommended that the two mini grids of school and village be joined, and the over-seized current village generator be reused as a mooring in the MPA (marine protected area) . Technically, joining the two grids is not a problem. It would require the underground installation of about 200 meters of two-core cable. Since the grid in the village is a three phase system while the school grid is single phase, some minor modifications at the village feeder pillars might be required[3], depending on the way this particular grid is designed. An implication would be that the whole system would become single phase. However, three phase electricity access is neither currently used nor needed anywhere on Yanuca.

It has been proposed that significant energy and cost savings would be achievable by using **deep cycle batteries** in the system. It was proposed that the generator could be operated every other night only, charging a battery bank while it is supplying the village load. Every other night, the generator could thus remain switched off with the village power being supplied by the batteries. This option is technically possible, and would reduce the overall Diesel consumption of the power system by roughly 40%. However, the battery bank option would still require 60% MORE diesel fuel than the 7kW generator option. Plus, the deep-cycle battery solution would not solve the technical issues from operating the generator in an extreme part load situation. The initial investment of purchasing batteries and conversion equipment, if no load increase allowed for, would be in the order of F$10,000. A brand new 7kW generator could be installed for this price. The batteries would require annual maintenance and would need to be replaced after a lifetime of between five and ten years. The greater number of serviceable parts would significantly reduce system reliability. Particularly the inverter component in such a system is generally prone to failure. The use of deep cycle batteries is neither attractive performance-wise nor economically nor technically feasible.

Figure 7: Yanuca school generator with specification plate.

[3] Depending on the wiring of the three phases, phases one, two, and three of the village grid and phase one of the school grid needed to be connected together. The neutral conductors of both grids also needed to be connected.

3.3 Energy services

Arguably the most important energy service provided is electric lighting. The most popular service after lighting may be Television. Figure 8. shows appliance penetration as the fraction of households using the respective appliances. The data is based on a household appliance use survey of 2005, conducted by Mr. Kerry Donovan of the Pacific Blue Foundation. All households are equipped with fluorescent tube lights, usually three 18W luminaries which had been initially supplied upon installation of the generator. Irons are a popular appliance with high power use. The electricity use by appliance group, as shown in Figure 9. is based on estimated appliance use data. This estimate is believed to be a reasonable indicator.

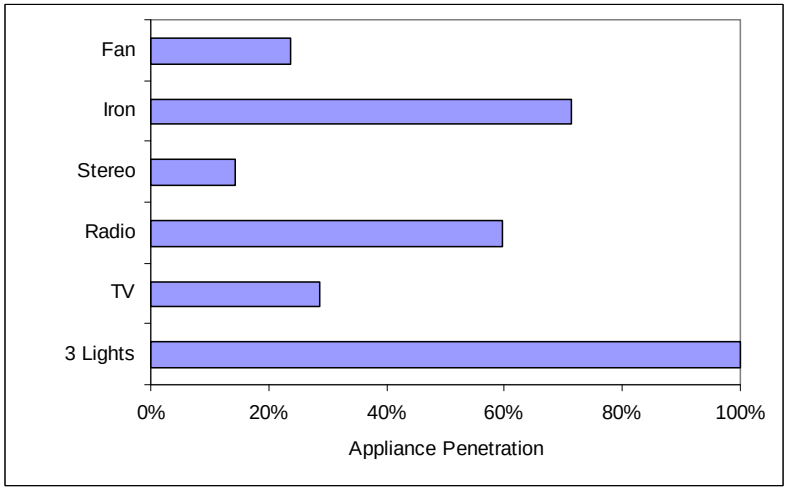

Figure 8: Appliance penetration on Yanuca.

3.4 Future domestic energy service demand

Some people propose that the energy demand on Yanuca will increase with increasing wealth of the people. This point of view is, however, only valid if energy supply can physically keep up with energy demand. And after peak oil, energy supply on a global basis will be less than energy demand. In such a case the energy system would fail.

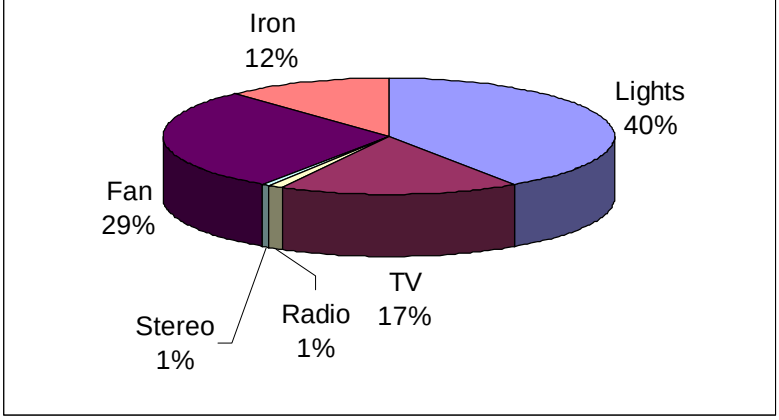

Figure 9: Total electricity use by appliance.

The future energy demand on Yanuca has to be seen in the context of global developments. According to most experts, the world is expected to reach an all-time peak in conventional oil production within the next 10 years, but much more likely within the next 5 years[4]. Although there are some possible alternative fuels available, none will be available at sufficient scale to offset the significant oil supply shortfalls (Hirsch,

[4] The most credible analyses forecast oil production peaking around 2010. As the most conservative forecast of all, Shell Oil Co. predicts peak oil for 2025 (Davis, 2003). However, this forecast is based no biased data (Hirsch, Bezdek, & Wendling, 2005).

Bezdek, & Wendling, 2005). In the more likely event of oil peaking within the next 10 years, there will, most certainly, be economic recessions and possibly collapses of whole economies. Material economic growth will then be no longer an possible. From experiences with previous oil crises of much smaller scale and short durations, it is reasonable to expect oil price increases of at least a factor of three. Considering Fiji's tremendous difficulties to cope with present oil prices, tripling oil prices might cause the dilapidated Fijian economy to derail entirely. Independently of local fuel availability, it is reasonable to expect that there will be a significant decrease in recreational jet travel, incurring a significant decline of the hospitality industry, one of Fiji's mainstays. Future energy demand on Yanuca is thus evaluated considering the imminent difficulties posed by global oil peaking. Thus there is a strong focus on separating essential energy services from optional energy services, in order to be able to sustainably manage energy demand.

Personal observations and discussions during a several days visit to Yanuca indicated that lighting is the most important energy service on Yanuca. The present lighting system is based on efficient light sources (fluorescent tubes), however, generally only the main spaces around a household are illuminated. A more useful service would be the use of more distributed, but smaller lights with longer hours and more flexibility. Radios are an effective and desirable means of communication within Fiji and are seen as fairly desirable. Televisions are appreciated by some people, but are not essential to any day to day activities. Stereos fall into the same category. Both are, herein, treated as optional. Electric irons are a convenient means of ironing clothes. However, ironing can be effectively carried out with abundantly available charcoal irons using the abundantly available charcoal. Therefore electric irons can be considered an optional electricity service in the future. Electric fans are useful in summer. However, the village is principally exposed to the prevailing South East trades. The need for fans can probably be largely eliminated by appropriate passive ventilation management in houses.

4 Renewable Energy potential

The principal three renewable energy resources on Yanuca are biomass, solar irradiation, and wind power. Hydro power is not possible because there is no surface water. Wave power is available past the reef, several miles off-shore, but there is no technology to harness this energy. The tidal power resource is small because of small tidal variation. Ocean currents are probably relatively small, and there is no commercial technology to harness this energy.

4.1 Biomass

Biomass in the form of dead wood has been traditionally, and still is used as a cooking fuel. Coconut oil has probably been traditionally used for lighting, although this is not clear. The biomass mass potential on Yanuca has not been investigated, but relatively sparse vegetation suggests that there is not much to waste. Coconut growth on the island appears to be small and there is no indication that the coconut resource could provide any substantial contribution to generator or outboard fuel use. The sea is Yanuca's largest resource, and algae could theoretically be farmed for fuel production. However, suitable commercial technologies for algae farming and processing are yet to be developed. The potential risk to the marine ecosystem would also need to be assessed. Biomass is not considered as an option for electricity generation on Yanuca for the near future.

4.2 Solar

No insolation data has been recorded on Yanuca. For preliminary feasibility, insolation data from Suva can be used with some confidence. Monthly average solar radiation in Suva has been recorded by the Fiji Department of Meteorology over several years. Mean values and standard deviation for irradiation on the horizontal surface are shown in Figure 10.

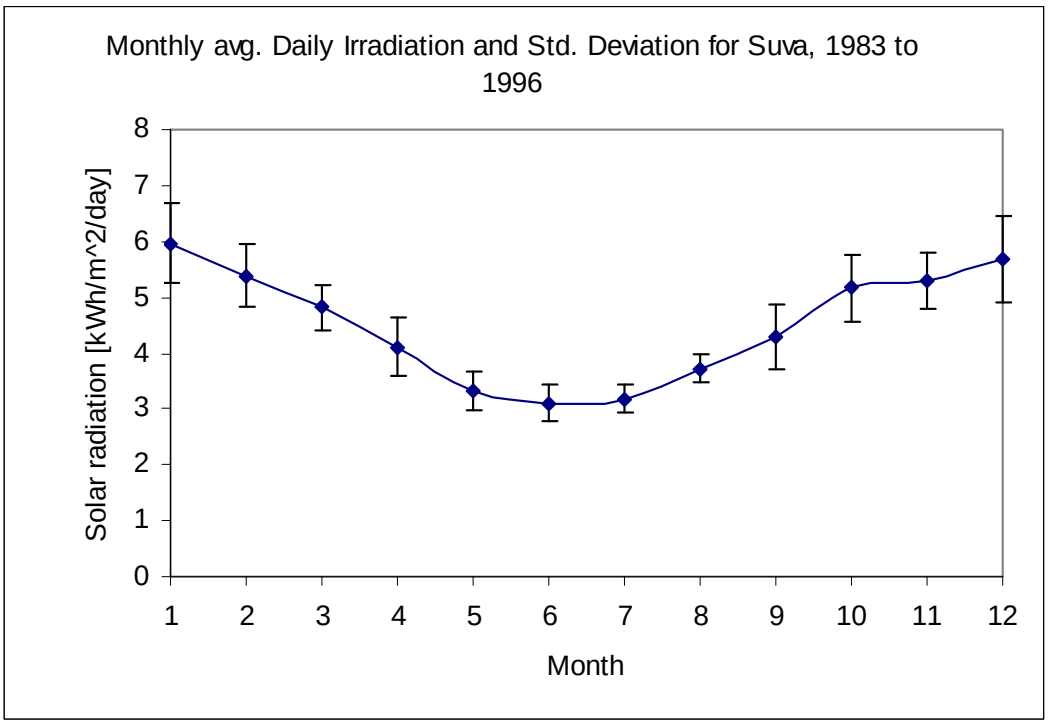

Figure 10: Suva solar irradiation data.

The daily amount of solar energy varies considerably throughout the course of the year. The seasonal variation can be offset by mounting solar panels at a fixed angle of 28degrees (TBR) to the horizontal. According to the Suva data at hand, the solar resource can be considered good and reliable[5]. In this study, the Suva irradiation data by the Department of Meteorology is used for modeling the performance of solar photovoltaic panels. A concept for a solar PV electricity system is provided in section 5. It is recommended to install a trial system first and record energy flows in order to confirm or adjust the modeling results.

4.3 Wind

The wind power potential on Yanuca is fairly hard to judge, at the lack of local data. Wind data are available for different places in Fiji, the closest being Suva. Other wind data, such as for Sigatoka, exist but are kept confidential by prospecting wind farm developers. Wind data from Suva are here used as an indication for wind power availability in the area. These data are meaningful for understanding the regionally typical wind variations over time; the actual wind

[5] The measured annual solar energy for Suva amounts to roughly 1600kWh/m^2/year; for comparison, the value for desert areas in Nevada is 2100kWh/m^2/day, and roughly 800kWh/m^2/day (TBR) for Cologne in Germany.

speeds are not representative for the region, because of the poor location of the anemometer mast in Suva. Figure 11. shows the seasonal variation in wind speeds; there is no recognizable trend.

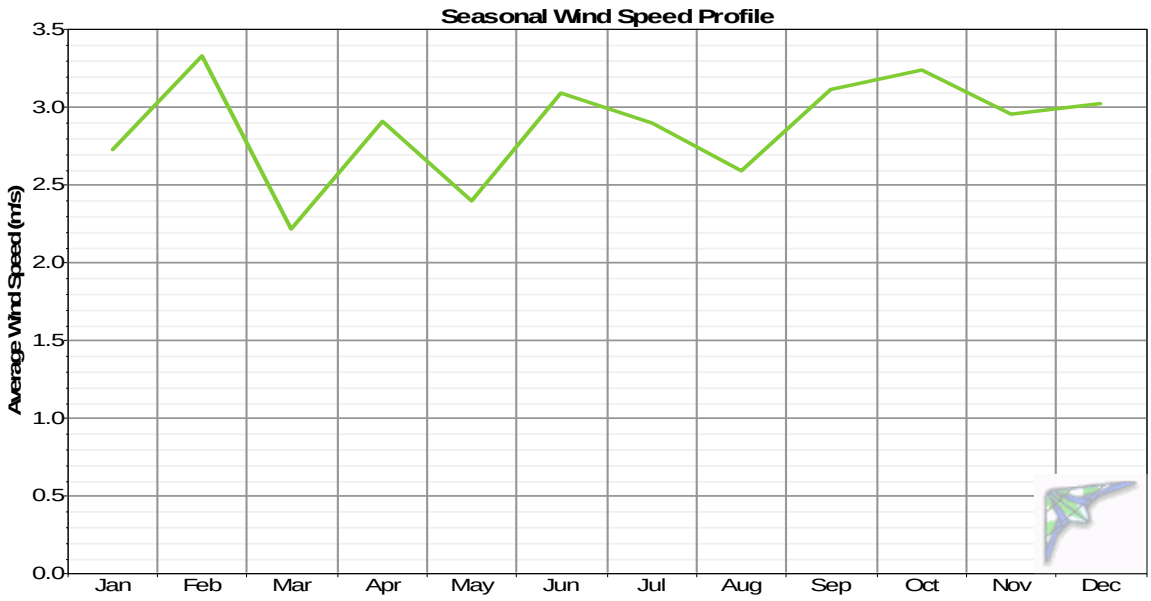

Figure 11: Seasonal wind speed variation (2005 only); based on data from Nabua, Suva. Raw data provided by SOPAC.

The wind frequency by direction is shown in Figure 12. As to be expected for Fiji's geographical position, the main portion of winds can be attributed to the South-East trades. The diurnal variation is shown in Figure 13. In average, high wind speeds occur during the day and peak from approximately 1 through 3pm. Power demand usually peaks in the evening hours. Thus, wind availability does not match power demand very well.

An assessment of wind power feasibility will require additional data. At this stage it is possible to say that the wind resource can be expected to be marginally feasible, depending on the particular system design. It is recommended to pursue wind power feasibility further, and to record wind data at sites in and around the village. In general, the village is exposed to the South-East trades, which is the most relevant portion of the wind spectrum for power generation in the wider region.

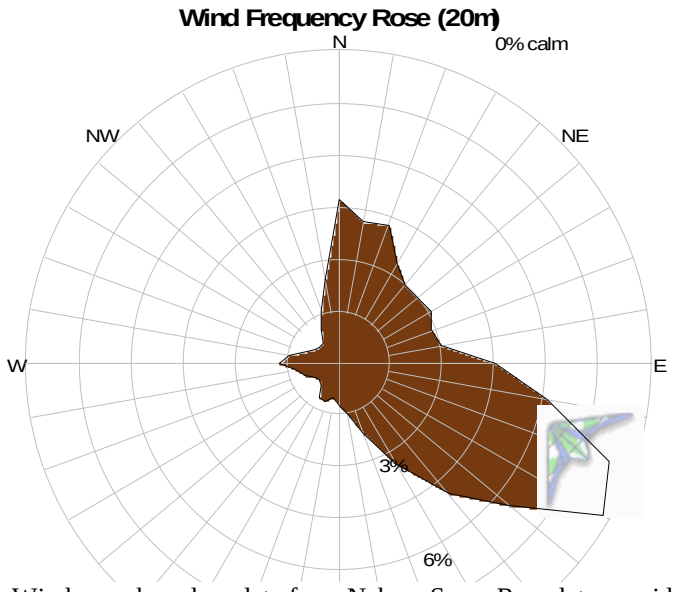

Figure 12: Wind rose; based on data from Nabua, Suva. Raw data provided by SOPAC.

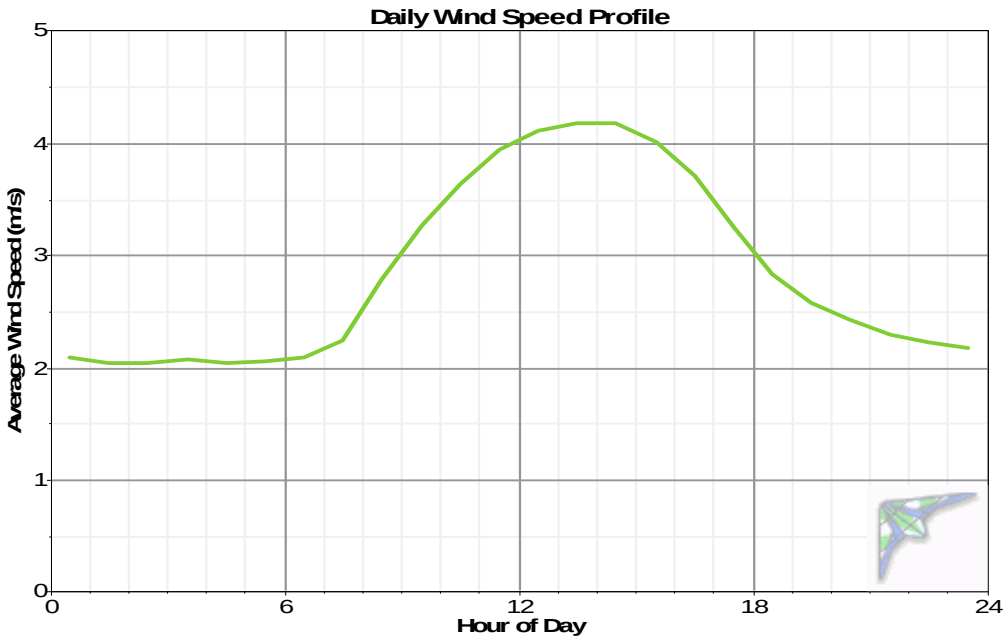

Figure 13: Daily wind speed profile; based on data from Nabua, Suva. Raw data provided by SOPAC.

5 Alternative Energy System Concepts

Under the expectation of rising fuel prices and erratic fossil fuel availability in the medium term future, a low energy concept with three demand levels has been developed to suit the needs of the people of Yanuca. This concept is based on small solar PV, which has been identified as the most reliable type renewable energy system in the Pacific Islands. It is assumed that reliable lighting makes the biggest difference in everyday life on the island. Ironing cloth has been a widespread use of electricity, but this is energy intensive, and does not appear to have any significant advantages over ironing with abundantly available charcoal irons.

5.1 Energy system concepts

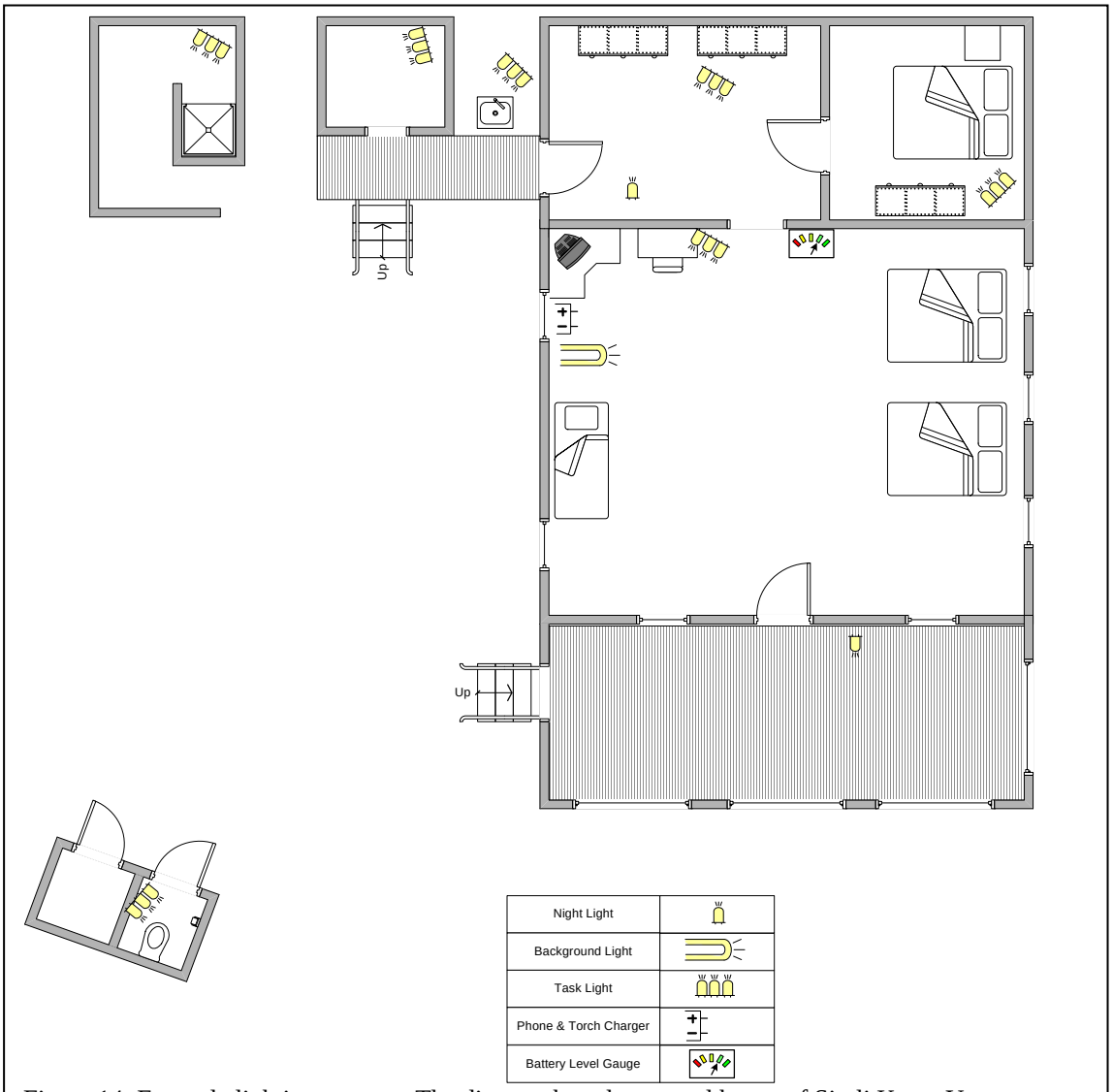

Figure 14: Example lighting concept. The diagram based on actual house of Sireli Kago, Yanuca Village.

Table 2: Energy System Concepts.

	Qty			Average daily energy demand		
	Lev 1	*Lev 2*	*Lev 3*	*Lev 1*	*Lev 2*	*Lev 3*
Night Light	1	1	1	1 Wh	1 Wh	1 Wh
Task Light	3	4	6	3 Wh	4 Wh	5 Wh
Background Light	0	1	2		24 Wh	48 Wh
Phone & Torch Chargers	0	1	1		5 Wh	5 Wh
Battery Gauge	1	1	1			
TV	0	0	1			180 Wh
Radio	0	1	1		24 Wh	24 Wh

People's energy requirements and willingness for financial sacrifices for energy vary. The following options are meant to be illustrative for system requirements and costs for three levels of power use. The actual systems can be configured to anyone's liking. The three levels of systems configurations are listed in Table 2. The table shows quantities of each appliance used in a household and an approximate value for the respective daily energy input requirements. The system concept is illustrated by means of a building plan of a real house on Yanuca, in Figure 14. One essential part of all system concepts proposed is the battery level monitor. This is not included in many contemporary solar installations, but is as essential and useful as a fuel level indicator in a car. The energy supply is modeled as individual solar photovoltaic systems with batteries. A central system is not economical to maintain for the small energy levels at hand, and even less so in terms of system reliability. Individual wind power supplies are not feasible for levels one and two. For level three, a small (yacht-size) wind generator could be more attractive than solar photovoltaic, but this depends on the wind resource. If wind speeds are as low as those recorded in Suva (see Figure 11.), the wind option would not be cheaper. If wind speeds at village level are at least 50% higher, a hybrid wind-solar system would be somewhat cheaper. However, limitations are given by the erratic availability of wind, with calm periods that can be several days at a time. In the best case, cost reductions through the replacement of individual solar systems by wind-solar hybrid systems are less than 50%. It is recommended that wind power availability is evaluated by means of setting up a pilot plant, and recording power production for at least one year. Wind options are not listed in this report.

Table 3: System cost estimates.

	Lev 1	*Lev 2*	*Lev 3*
Battery size	One quarter of smallest car battery	Small car battery	Small truck battery
Solar panel size	0.5 sheets A4 paper	7 sheets A4 paper	1m x 1.5m
Cost	$ 250.00	$ 1,315.00	$ 4,430.00

System sizing requirements and costs for each level are summarized in Table 3. Here included are costs for all lighting appliances and the complete energy systems. Costs are best guesses, based on incomplete pricing information from Fijian suppliers, and should be considered indicative. Costs do not include labor for installation of the systems. It is recommended to train two locals to install and maintain small solar systems, and to stock spare parts.

The best ratio of service to price is clearly given by the lowest energy level. As apparent from Table 2 it is mainly the addition of fluorescent background lighting increases the cost for level two significantly. Another cost hike is caused by the addition of television in level three. The qualitative relationship between cost and useful service is shown in Figure 15. An additional factor to consider is that larger systems are more costly to maintain, and altogether, have a higher risk to system failure. All essential electricity services are already included in a level one size system (cell phone, torch battery chargers, and a very small radio could be included in a level 1 system as well). A level one system should be considered the most robust, most reliable, and most cost effective electricity service solution. Level two and three system may be considered appropriate as fully self-funded (user pays) options for people who demand the respective services.

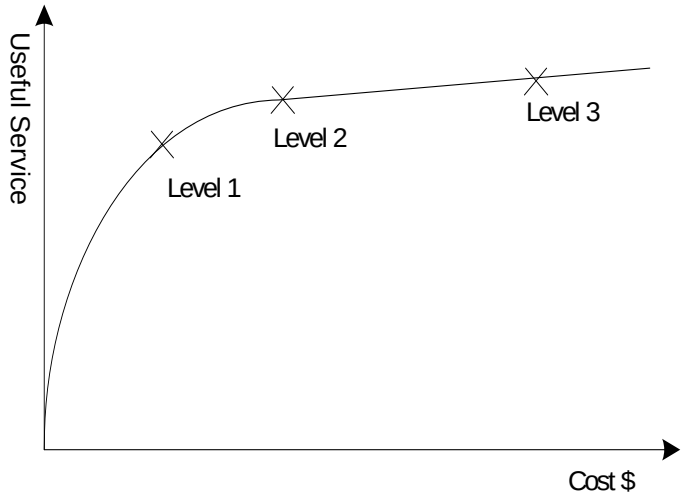

Figure 15: Qualitative representation of cost vs. useful service.

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APPENDIX A

PCDF REPORTS

PCDF LETTERHEAD

Dr. Greg Mitchell
Pacific Blue Foundation
P. O. Box 2014
La Jolla, California

Re : Pacific Blue Foundation
Letter of Acknowledgement

Dear Dr. Mitchell:

We are grateful for the support given by Pacific Blue Foundation's Coordinator, Kerry Donovan, in sharing the cost of food and transportation, while our representatives were conducting workshops on Yanuca Island. Once again, thank you very much.

Sincerely,

Partners in Community Development of Fiji

REPORT

SERUA DISTRICT MARINE AWARENESS, PARTICIPATORY LEARNING AND ACTION WORKSHOPS AND SOCIO-ECONOMIC STUDY
MARCH 5th – 23th , 2007

"CAKAU BULABULA" – HEALTHY REEF EED PROJECT

NRM – PCDF
SUVA
FIJI

OCTOBER - 2007

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ACKNOWLEDGEMENT

Our appreciation and deep thanks go out to the people of Serua for the success of the workshop and the support rendered by the 'vanuas' people and chiefs. We specifically thanked the high Chief, Ratu Aseri Latianara the Vunivalu, Tui Serua for his support. Without their presence and support the workshop could not have materialize.

We would like to acknowledge the support and assistance by the Assistant Roko Serua, Ratu Inoke Sauturaga, District Representative, Ratu Aseri Latianara and Fisheries Officer, Laisenia Balenacagi for their contribution to the workshop. We specifically thanked Mr Delai and Saimoni for their part as community representatives of PCDF, MPA sites of Moturiki District. And not forgetting the Turaga ni Koro's of Yanuca, Serua and Vunaniu for their support in the accommodation and meals during the PLA workshop.

We extend our appreciation and gratitude to the Head Teachers of Ratu Latianara Memorial Primary School and Yanuca Village Primary School. And not forgetting the Principal of Ratu Latianara College for their support and acceptance in allowing our group to participate in the awareness program for the schools. We enjoyed your company and we intend to continue working with you in your dream to make our children be conscious of their resources.

We specifically thanked each participant from Yanuca, Serua, Navutulevu, Vunaniu, Culanuku and Naboutini for taking their time and be part of the PLA workshop. We hope that what you have gained and contribute so far will be a stepping stone to more exciting activities that will be implemented in your communities, for the betterment of your resources in future.

We also acknowledge PCDF support staff, Ms. Fulori Nainoca (Coordinator), Ms. Mereoni Mataika and Dr. Austin Kerby for their contribution to the success of the workshop.

We also acknowledged EED for financially supporting this project and the Pacific Blue Foundation for their support in-kind, and joint fund contribution on the workshop at Yanuca.

EXECUTIVE SUMMARY

On March 5th to the 23rd 2007 Partners in Community Development of Fiji (PCDF) with other stakeholders comprised of Assistant Roko Serua, Ratu Inoke Sauturaga of the Serua Provincial Office and Fisheries Officer, Mr. Laisenia Balenacagi of the Fisheries Department in Serua, conducted a Marine Awareness and Participatory Learning and Action (PLA) program in the Serua District of the Serua Province. A socio-economic survey for the seven villages in the district was also conducted.

The awareness program was conducted in each village and all primary/secondary schools within the District. The first week of the program began on day one upon our arrival, with the normal traditional request to the "vanua" with the presence of the chief, and informing them of the purpose of the visit and requesting their support on the program. This was followed by our introduction where all our team members are to take the time in describing themselves and their roles on this program. This was the normal introductory phase in all seven villages during the first week before returning to Yanuca to conduct the first PLA workshop on the second week. The second PLA was later staged at Serua Island for two villages of Serua and Navutulevu located on Viti Levu. The third PLA workshop was later staged at Vunaniu Village for Culanuku, Vunaniu and Naboutini villages.

As a result of this work the number of people that attended the week one awareness presentation in Serua, Korovisilou, Vunaniu and Namaqumaqua were 83, 34, 67, and 46 respectively. The primary and secondary school attendance was 305. In Culanuku the attendance was 89 and Navutulevu was 98. The first PLA workshop was attended by 37 representatives of Yanuca Village. The second PLA was attended by 19 participants for Serua and Navutulevu during the workshop at Serua Island. The Third PLA at Vunaniu was attended by 25 participants of Vunaniu, Culanuku and Naboutini villages. The total certified PLA workshop attendees for the six villages were 81.

The main objective for the PLA workshop was met when all these villages were able to draw up their individual Marine Management Action Plan. Overall, each village came up with the initiative to set up Marine Protected Areas in their Customary Fishing Right Areas (CFRA) "*qoliqoli*". It has highlighted the fact that these communities are conscious of the importance of marine resources to them and their next generation. The management plan drawn as a result of the workshop is now a working document for these villages to develop, manage and conserve their marine resources for years to come.

The socio-economic survey that was conducted on seven villages highlighted that fishing is mostly for subsistence purpose, and commercially exploited at a very small scale. Tourism and Farming also contribute significantly to their overall income. Some villages like Navutulevu and Namaqumaqua concentrate on tourism as their primary income source, whilst the rest of the villages also have fishing, farming and other activities as their means on a very small scale.

The average incomes collectively for these villages are within the range of $100 - $300 per month. The villages with high income level are those that are engaged in commercial fishing, tourism, handicrafts and other activities, which implies that their income level is higher then the other

villages. This figure is expected to improve in future because of the new development in the district on tourism and the forestry industries.

When we compare the household income and expenditure level, it is very encouraging that their expenses are less then their income. That is, their average expenses ranges from $50 to $100 per month. Bulk of their expenses is spent on food, followed by school fees then church levies. The village of Serua shows significant expenses on education, whilst Yanuca's expense on fuel is also significant. Overall the people of Serua have a good income level to cater for their needs however, the current level of inflation as a result of the political situation in Fiji will increase their spending rate for the next 3 to 5 years.

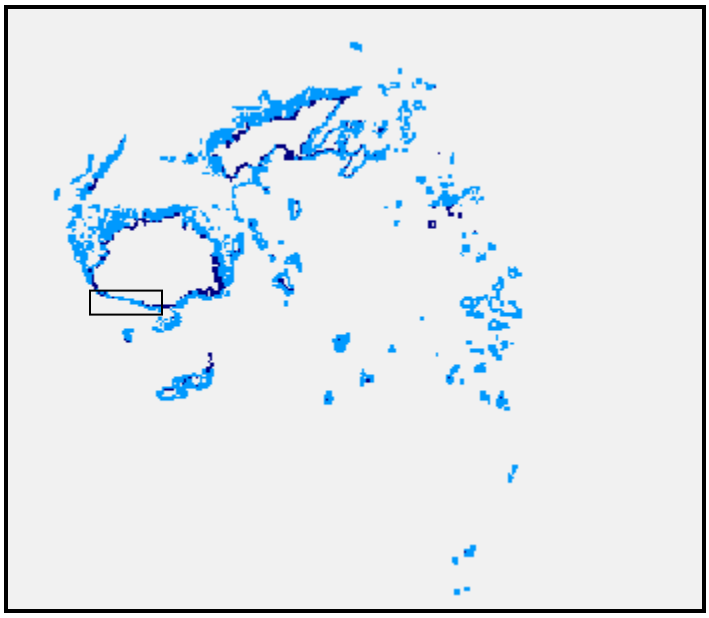
According to the management of their fishery resources, there is an outright overfishing in their qoliqoli areas. This is substantiated by the amount of time spent in fishing with an average of 3.5 hours per fishing trip. The amounts of fish food that are caught during each fishing trip have decreased drastically for the last 5 – 10 years. Since most of the fishing is done by women for subsistence purposes, it is imperative that from this survey that woman should be included as stakeholders in making decision for conservation strategies on the fishery resources.

Other alternative income generating activities to offset the setting up of MPA should be identified with the help of the women in order to cater for the subsistence needs of these communities.

The problem of poaching in MPA areas is an issue whereby the district, provincial and government authorities should addressed in order to support the setting up of MPA's as well as assisting the communities in policing.

As a result of this first phase, we can conclude that Serua District are well informed of the conservation concept for their resources, and they are determined to undertake necessary measures to address issues that they identified that will enhance their environment, and also to bring about long-term sustainability as far as economic success is concerned.

Figure 1: Map of Fiji showing the Location of Serua District



1.0 BACKGROUND

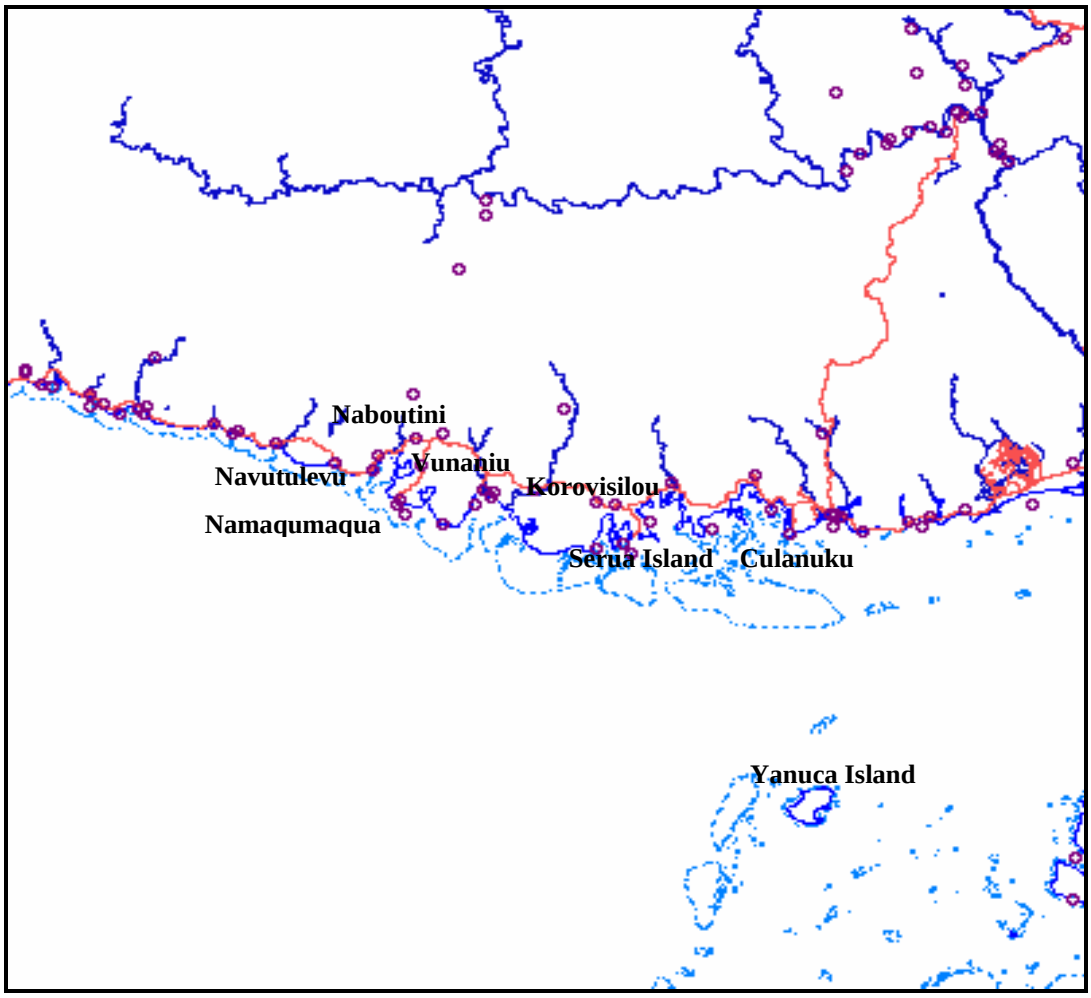
A formal request for PCDF's assistance in Serua came from the Provincial Office and Paramount Chief. Serua District is located midway between the wealthy tourism area of the Coral Coast and the diverse commercial activities of Suva Capital. It is made up of 9 villages, 7 on the main island of Viti Levu and two on small offshore islands (Serua and Yanuca). Serua District is mountainous, steep and very wet, with a rainfall of some 4000 mm per year. The district is not conducive to a high level commercial agriculture. Extensive coral reefs and lagoons are present in the district, which includes over half of Yanuca-Beqa barrier reef system. Most of the communities rely heavily on subsistence farming and fishing to meet the daily needs. The seven villages on the main island sell surplus produce, fish and coconuts to travelers on the main road, the Queens Highway as the primary means of cash income. The villages of Yanuca and Serua rely heavily on aquarium trade for their livelihood, with most of the coral collections residing on Yanuca Island.

In past years, Fisheries Department established successful seaweed farming in Serua District under external funding, but this project ultimately failed due to lack of local markets in Fiji for the dried seaweeds. However, in the past year the economic reality has changed with local companies firmly established that are actively buying the seaweeds from growers. PCDF staff have also in recent years became trained in the use of seaweeds as food and medicine, as well as using potassium salts that are a by-product of the drying process as fertilizer, increasing local food production, particularly bananas and root crops. The Provincial Fisheries Officer is fully supportive of PCDF's vision for sustainable livelihoods and offered to work with PCDF and the communities to implement the project.

This report is the result of the first Awareness and Participatory Learning & Action (PLA) workshop that was conducted in the district of Serua from March the 5th to the 23th 2007. The report will be divided into three parts. The first part contains the awareness programme, followed by the PLA

section and lastly the socio-economic survey that was conducted for the villages.

Figure 2: Portion Map of Viti Levu Showing the Location of Villages in the Serua District



2.0 AWARENESS PROGRAM

2.1 Aim

To raise awareness and increase knowledge of communities of Serua District (*Tikina*) on the Marine Environment and introduce management concepts in the effort to conserve and protect their valuable natural resources within their "*i Qoliqoli*".

2.2 Objectives:

- To inform the villages of the Serua Provincial involvement in the Project.
- To inform the villages of the Fisheries Department's involvement in the Project.
- To inform the villages of the Moturiki Initiative Conservation Project by a Moturiki community representative.
- To introduce PCDF and the project for Serua District.
- To conduct Marine Resources Management awareness for the eight villages in the Serua District.
- To conduct Marine Resources Management Awareness for schools in the Serua District.

2.3 Introduction

This project will address the issues of marine resources degradation, destructive fishing practices, coral harvesting and the lack of sustainable income generating options in Fiji, with a focus on the coastal communities of Serua district. The program will assist communities in developing and implementing resource management and recovery plans, while working to convert destructive marine trades into sustainable industries. Measurable indicators of a reduction in poverty will be an increase in fish, shellfish and edible seaweeds, available for marketing and incorporated into the local diet. Sustainable income generating livelihoods will include sustainable sea farming of corals for the aquarium trade and seaweeds for a rapidly expanding export industry to meet existing market demands in Fiji.

"Healthy Reefs for Healthy Communities" project is not a program in isolation. It is a community response to a two important development agreements. Fiji is committed to: The Pacific Plan and the United Nations Millennium Development Goal (MDG). The Pacific Plan was born in 2004, out of a vision by our Pacific leaders to "strengthen support for current programmes, develop new initiatives and advocate for the needs of Small Island States, particularly given their limited capacity and fragile, vulnerable environment including climate change…"

The tourism industry in the District of Serua has increased through the years and a portion of communities are also dependent on it for their economic survival, thus the need for better management practices in order to secure its future within the district is warranted.

Awareness is having knowledge of a situation or fact. In community situation it is a simple method of education used to raise knowledge on a particular situation or fact that has affected, or affects, or will affect the daily livelihood of the community. For this project, Marine Resources Management Awareness was conducted in all villages in the Serua District so that they can understand the impacts of tourism development and other unsustainable development. Also included in this program was the need to conserve and properly manage their marine resources in order to have sustainable fisheries and healthier reefs within the District.

The Marine Resources Management Awareness program for the Serua District includes seven villages, 2 primary schools and 1 secondary school. It was facilitated by the PCDF natural resource management staff, a Serua Fisheries officer, assistant Roko of the Serua Provincial Office and a community representative from Moturiki in Lomai Viti. The target audiences were people in the community that was made up of children, teens, youth and adult. It was conducted in all villages and schools within the district.

The villages that were involved in this awareness program are Serua, Korovisilou, Vunaniu, Naboutini, Namaqumaqua, Navutulevu, Culanuku and Yanuca villages. The school awareness was conducted in two primary and one secondary schools; Ratu Latianara Primary School, Yanuca Primary School (at Yanuca Island) and Ratu Latianara College. The methods used for the Serua District Marine Resources Management Awareness were in the form of presentations, handing out of information and posters presentation.

One important and effective tool used in this awareness program was presentations that portray the basic principles in marine conservation and management. The impact of poster presentation to the communities understanding was very encouraging. These posters were translated from English into Fijian language and emphasized the importance of conservation and marine management to the coastal communities that rely primarily on marine resources.

2.4 Method

The awareness program set up was the same for every village in Figure 2. It started with a prayer and then followed by Assistant Roko of the Serua Provincial Office contribution on their role as advisor to the community. The Fisheries Officer in charge of Serua than delivered his address on Fisheries Management. After the Fisheries presentation, community representative from Moturiki District share their experiences on what had been happening on their island for the last five years. He then specifically shared their work on Marine Protected Area as a restocking area in their fishing zones and that all stakeholders benefited from this.

After the Moturiki community representation, PCDF presented and then explained the Fijian translated Marine Resources Management Posters. The posters were put up on the wall and were divided in to three sets. The audiences were also divided into three groups and they moved from one set of posters to another after 10 – 15 minutes presentation.

After the poster presentation then a prayer was delivered to close the session. The communities were encouraged to ask as many questions as they wish during the village presentation.

2.5 Village Program

- Protocol – the sevusevu
- Introduction
- Provincial Presentation
- Fisheries Department Presentation
- Moturiki community rep. presentation
- PCDF presentation
- Posters presentation
- Videos

2.6 Schools Program

- Introduction
- Coral Ecology
- Poster and Presentation
- Vote of thanks

2.7 Outline of Awareness Session

The attendance during the awareness workshops was good because it was conducted during the evenings in community halls or outside the village headman's compound or house. It was conducted during the evening in order to have maximum representative, because most villagers go out to their farms, fishing or work at the hotel during the day. The awareness workshop was also to prepare the village representatives for the PLA workshop.

Serua (5/03/2007)
The awareness program was conducted on Monday evening at the Serua community hall with good attendance. There were more men then women, and also accompanied by youths and children.

Figure 3: The island of Serua, Middle (*Rt Inoke Sauturaga*) the Assistant Roko Serua, (*Taione Delai*) Communty Rep and Fisheries officer (*Laisenia Balenaivalu*) and the third, participants at the Serua village Hall. ,

Figure 4: Giant clam (*left*) in Serua Island MPA site and a snorkler (*right*) with the bed of giant clam

Naboutini (6/03/2007)

The awareness program was conducted during mid morning on Tuesday at the Naboutini community hall during the District Meeting. This meeting was attended by Village Representatives, Provincial Administrators and Government Officers responsible for the District.

Figure 5: The District Rep (*left*) and Iliapi Tuwai (*right*) explaining the project to attendees during the District meeting at Naboutini.

Korovisilou (6/03/07)

The Korovisilou program was attended by 30 villagers at the Village Hall at night. They comprised of men, women and young people.

Figure 6: Women of Korovisilou attending awareness workshop *left* and *right* Fisheries Officer Laisenia at the community Hall

Vunaniu Awareness (07/03/07)

The program at Vunaniu was also conducted at night with attendance of 40 men, women and young people.

Figure 7: Etika presenting to men at Vunaniu (*left*) and Iliapi (*right*) presenting at Vunaniu Village Hall

Namaqumaqua Awareness (08/03/07)

The program at Namaqumaqua started at 7.00 pm at night when all villagers were able to attend with capacity of over 55 comprised of men, women and young people.

Figure 8: Taione Delai presenting posters (*left*) and young people (*right*) listens to the awareness presentations at Namaqumaqua Village hall.

Culanuku Village (12/03/07)

The program at Culanuku was conducted at night in the village hall with full attendance of men, women and young people with a total of 60.

Figure 9: Sitiveni Naileqe (*left*) explains poster on Protecting Fish from Over-fishing to a group of youth. Etika Sing explains the Destructive Fishing Method poster to a group of men at Culanuku(*right*).

Navutulevu Village (13/03/07)

The awareness program was conducted in the evening at the Navutulevu community hall with good attendance. The number of men and women was fairly distributed with young people of 56.

Figure 10: The community of Navutulevu village during the awareness program as Etika presents (*left*) .Taione Delai explains the life cycle of coral poster to a group of men at Navutulevu village.


Figure 11: Women of Navutulevu came in numbers during the awareness (*left*) and Provincial Representative (Ratu Latianara) (*right*) introduces the awareness program to the Navutulevu villagers.

<u>Awareness for the Primary and Secondary Schools in Serua District.</u>

In order to conduct the awareness for the primary schools we had to seek permission at first from the Education Officer (Eastern) then the head teacher. Fortunately the head teacher allowed us to conduct awareness to the school, because the school year has just begun and a lot of work for the students with their schedule was needed.

Ratu Latianara Memorial Primary School (6/03/2007)

There was full attendance from the school with all their teachers during the lunch hour break. The total school rolls of 350 students from class 1 to 8 with 15 teachers.


Figure 12: Sitiveni Naileqe presenting to students, and Head Teacher addressing students before the awareness

Yanuca Primary School (14/03/07)
The Awareness at Yanuca Primary was attended by the whole school of 45 from classes 1 to 8 with 4 school teachers.


Figure 13: Students at Yanuca Primary listening to awareness (*left*) and Sitiveni presenting posters (*right*)

Ratu Latianara College (6/03/2007)
The awareness program was conducted in the afternoon at the College Hall with full attendance of Form 5, 6 and 7 students of over 165. All teachers were also present during the presentation
.


Figure 14: Students listen attentively at the College (*left*) and Etika (*right*) present posters to students.

2.8 Overview of Presentation

Serua Provincial Presentation
Ratu Inoke Sauturaga (assistant Roko) represented the Serua Provincial Office in informing the community of their full support on this project as it is part of achieving the Serua Provincial Administration Strategic Plan to which Serua District comes under. He also said how fortunate Serua district in being chosen from the 4 district in Serua province for this purpose. He further explained to the communities the Provincial office's role part in ensuring that the communities are not taken advantaged off. In other words they had given the support for any organization for such management

and development to support committees in the Province of Serua, and therefore the PCDF impact we had approval of the Serua Provincial Office.

Fisheries Presentation
Laisenia Baleinacagi (fisheries officer) from the Navua Fisheries Department presented on the mission and vision, of the Fisheries Department in order to have a sustainable fisheries management for the western division and Fiji as a whole. The fisheries department strategic plans support fisheries in the country in general and deal mostly from the top with limited funding. NGO's like PCDF assist Fisheries Department of the plans by working with local communities from on marine resources, conservation and management. Refer to Appendix.

Moturiki community representative Presentation
Taione Delai (Member of the Moturiki Environmental Committee) from the District of Moturiki shared their experience and lesson learned with the Serua District communities how Moturiki District was chosen from the 12 Districts in the Lomaiviti Province to be part of this program with PCDF.

He presented his talk on the Daku Conservation Initiative Project and summaries as follow.

- Although the beginning was hard because of lack of support from most villagers, when the MPA was 6 months old, people began to see the changes in the fishery resources;
- Now after 3 years, the whole village has come together to show their support and appreciation of the gain they have so far; that is they were able to pay fees for their children, levies to the church and other village obligations.

Partners in Community Development Fiji (PCDF) Presentation
Iliapi Tuwai (PCDF: NRM- Marine Scientist) presented on:
Introduction of PCDF and as an affiliate of Foundation of the South Pacific International (FSPI) and the Cakau Bulabula Project. He presented on the work undertaken by NRM at various sites in Fiji beginning at Cuvu, Malolo, Nacula, Yasawa, Nairai, Batiki, Moturiki, Vuna (Taveuni), Vuya (Bua). He emphasized the need to involve the villagers (communities) with PCDF and other major stakeholders like Fisheries and the Provincial office to make this programme a success to the community.

Posters Presentation
Etika Sing, Sitiveni Naileqe and Taione Delai (PCDF and Community member) presented the 12 different marine resource management and conservation posters in 3 groups each with 4 different posters. One of the effective methods used in teaching and learning in the form of awareness is the use of posters that helps to portrays or describe the basic principles of marine conservation and management. It also illustrates some of the important marine species and their function in maintaining its ecosystem.

The posters were on the following topics:

- The different impacts of healthy fisheries resources and over fishing
- Coral reproduction
- Corals are important fish houses
- Sea cucumbers are important cleaners of sandy environments

Addressing improper development management of human interaction

- Destructive fishing methods.
- The protection of fish from over fishing.
- Activities on land affect the sea.
- Establishment of MPA's and its benefits.
- The grouping of invertebrates in MPA's to favor reproduction thus many babies are produced.
- The constant supply of marine organism babies from healthy MPA's to other reefs.

Natural interaction

- Crown of thorns starfish kills corals and the need to conserve crown of thorns starfish predators to control the population growth of crown of thorns starfish.

2.9 Discussion: Lessons Learnt

Villages

1. Presenting awareness at night is an added advantage where community members were able to stay long hours after a days work to listen with maximum attendance.

2. The present of the village headman and on his role has advisor to situation or issues that are happening in the village is very useful indeed.

3. Presentation by Government officials was very encouraging because people in all local villages were able to receive advice and information first hand instead of listening to village representatives that usually attend district or provincial meetings four to six times per year.

4. Awareness was presented in local dialect and language and locals were able to understand very clearly all information that were presented.

Schools

1. Schools that were visited during the awareness program welcome and enjoyed all presentations made and invited the team to visit more often to further present other environmental issues later in the year.
2. The need to provide some curriculum on subject that address conservation of coastal areas, and to target classes that are taking science as their major.

2.10 Recommendations

1. The awareness program to be conducted to accommodate all age groups in the community with both gender, to avoid mis-information on the purpose of the project to be initiated for the village or district concern at appropriate time for maximum attendance;

2. That representative from Environment, Lands and where appropriate from other Government Department to participate in future awareness but this will depend on budget;
3. The use of community representative from PCDF sites should be encouraged with new stories in the form of pictures though DVDs would be an advantage;
4. The use of handouts and pamphlets in awareness is an important component especially for schools;
5. The presentation of awareness could also be more effective if its conducted as a showcase where all facilitators have their individual area in the hall or ground, set up as booths, and for the communities to go around in groups during the program proper.
6. From the feedback, majority of the villagers suggested this type of program can be enhanced if more visit is made with other representatives from other ministries and departments concerned in natural resources.

3.0 PARTICIPATORY, LEARNING AND ACTION WORKSHOP

3.1 Purpose of the PLA Workshop

The purpose of the workshop is to inform/advice the stakeholders of their roles as steward of the resources (terrestrial and water) that they owned and interact with, and to develop their marine resource Management Plan using the Participatory, Learning and Action method (PLA).

3.2 Workshop Objectives

1. To raise stakeholders awareness and empower them on their role as stewards of their resources;
2. To raise stakeholders awareness on PCDF and its partner's commitment to support initiatives and opportunities that will eventuate for establishment of plan or strategies to restore/develop- marine/coastal resources in sustainable manner;
3. To identify issues and opportunities for development initiatives where stakeholders could utilize for their benefits;
4. To assess status of current marine resources and develop initiatives where stakeholders participate in formulation of a Management Plan;
5. To agree and develop a Management Plan for the villages in the Tikina for establishment of Marine Protected Areas.

3.3 Methods of Presentation

The PLA workshop was conducted for six days at three locations after the awareness presentation that was earlier delivered to the eight villages. For the first week, the first PLA was conducted for two days at Yanuca Village, which was attended by 37 participants representing the village of Yanuca. The second PLA workshop was conducted at Serua Village for Serua and Navutulevu villages with 19 attendees, and the third one at Vunaniu which was attended by 25 participants representing three villages of Vunaniu, Culanuku and Naboutini.

We choose the best tools to use for the PLA and as described on the attached program, and the tools used were primarily to extract information on their marine and land resources. This information's were then constructed with their group representative in building up individual Marine Management Action Plan for each village.

1. After the preliminary greetings and welcome, all participants and facilitators took time in the introduction session. This was done with the pairing exercise where each individual was asked on his/her name, age, village, marital status and lastly on their expectation from the workshop. This lasted for about 15 minutes. Then the ground rule was made with the input of all participants. This was followed by the election of a Head Boy Assistant to oversee the workshop technicalities. That is, all has to abide and follow the workshop regulation agreed upon, and those that broke it would be punished accordingly.
2. The first topic that was shared and discussed as an exercise on the term "Management Planning". What is Management Planning from their perspective? The method is illustrated in Appendix 3.
3. This was followed by the Resource Mapping exercise where each village group were divided to map their fisheries and marine resources, and as well as their land based resources (see appendix 3)
4. The historical analysis exercise where each village group were to record happenings or historical information collated for the last 40 years. Major events like cyclone, earthquakes, tsunami etc, were recorded on five – ten years duration (see appendix 3).
5. A break was made from doing the above exercises when a lecture on Marine Ecology was delivered to the participants. This lecture encompasses the life of corals, how they are formed and the impact of environment on their life cycle.
6. The seasonal calendar exercise followed where each village were to draw the occurrence of marine resources according to the months of the year (see appendix 3), was conducted for about 30 minutes.
7. On the second day, there was a recap exercise for participants to recall what they had learned of yesterday, and later had to submit issues and questions that they had, which was a good exercise to acknowledge that they had understand what had transpired on the first day.
8. The pie chart exercise where all villages had to come up and quantify the various type of fishing methods used in their fishing areas (appendix 3) was listed.
9. This was followed by the root-cause analysis where each village were to discuss the problems they had using the life and death of a tree as illustration (appendix 3). Since they were specifically looking at their marine resources, they then came up with the cause of the problem and at the same time listing the solutions.
10. The vision map exercise was made by each village group, on what they foresee as the outcome of a resources that is perfectly managed with variety of fishes and non-fishes that dwells in them (appendix 3) for the future.
11. Then to bring to a close, the groups were led to construct their individual Management Action Plan for each village (Appendix 3) and submit their plan as an outcome from this workshop.

3.4 Result of PLA

The final result of the PLA process was the construction of each village's "qoliqoli" Marine Management Action Plan illustrated in Appendix 4. The Plan is made up of strategies that the communities with other stakeholder's put together, in trying to restore the coastal fishing areas surrounding their Customary Fishing Right Areas (CFRA). The main problem that they observed is that their fishing grounds has been depleted as a result of over-fishing together with uses of illegal fishing method. They came to a conclusion that the setting up of Marine Protected Areas (MPA) in important fishing areas would help in the restoration process in time to come.

Also shown in Appendix 5 are the exercise results of the PLA for Yanuca, Serua and Vunaniu (Group exercises that were presented showing all activities that was undertaken during the workshop).

Figure 15: PLA group work (*left*) at Yanuca and PLA participants with facilitators (*right*)

Figure 16: Presentation of pie chart (*left*) by a lady participant and group photo of participants and facilitators (*right*) during the Serua PLA workshop

Figure 17: Culanuku group work (*right*) and presentation by their leader (*left*) of Resource Map during Vunaniu PLA workshop

3.5 Discussion and Recommendations

The PLA workshop was a success for the Serua District. Six villages in the District were able to come up with their village Management Action Plan for their Customary Fishing Right Areas. In these documents they had identified that their CFRA is over-fished and there is an immediate need to rehabilitate it. The rehabilitation process has been agreed upon by all participants that the way forward is to have Marine Protected Areas in their CFRA ground. Other activities are also included in this document that will support the idea of bringing back the life lost in their CFRA. The activities like re-stocking of depleted non-fish organisms like giant clams, triton shellfish, coral replanting and others will be implemented as the project progress. The training of fish-warden and biological survey are activities that will support this initiative.

It was also highlighted, for this initiative to benefit the tourism industry in future it needs a combine working relationship between the resource and resort owners. The chief will advise the Resort owners on behalf of his people of this initiative, and the setting up of MPA's surrounding the resort to be made with consultation between all stakeholders. It is important for the Resort owners to work in collaboration with the chief and his people on managing MPA's around the resort. This will avoid conflict of interest that may arise in future when new owners or management takes over.

All villages in the *tikina* came up with the idea of setting up MPA's for a certain period. This mandate will be discussed with the "*vanua*" which comprised of the people and their chief. This will be confirmed during the next phase when the biological survey and fish warden training takes place. The "*vanua*" of Serua Village had already given their term of ten years however, PCDF will advice them later during the next visit. Other areas came up with the period of five-to seven years as their term for MPA site surrounding the foreshore of the village.

4.0 SOCIO-ECONOMIC SURVEY

4.1 Purpose of the Survey

The survey was conducted in order to understand the social needs of the community and as well as to come up with the formula whether these needs are being met economically. In a community, the person is the primary resource that will determine the outcome of any management strategy that will govern any other resources that surrounds them. It is the person that will be using all these resources for his survival. Therefore it is important to know this information and seek best alternative solutions in addressing their needs. For this purpose, the survey was conducted in households for the seven villages of the district.

4.2 Objectives

To understand the social needs of the villages of the tikina;
To measure the economic status of villages in the tikina;
To be informed of the current socio-economic status of these villages;
To understand the impacts of these economic status on their marine resources;
To come up with the most appropriate and resource friendly alternatives that will address this status.

4.3 Methods

A questionnaire survey form (Appendix 13) was used to collate information from households in villages that was visited during the awareness program. We took samples from a wide range of households, ranging from small to big families, young, middle and old family age groupings.

The data were entered in excel spreadsheet and analyzed using basic statistic.

4.4 Results

4.4.1 Respondent Information

A total of 91 households were interviewed from the seven villages, comprised of 71 males and 20 females. As illustrated in Table 1 over 50% of the respondents were between the ages of 24 to 55. The one-sided skew of young age respondent compared to insignificant representative from ages over 70, suggest that Serua District has a very young society. Another significant point to be made is that more male took part in the survey, suggesting that this is a male dominant society.

The sampling sizes (n) for each village are not the same, which will affect the analysis of the data.

TABLE 1; RESPONDENT ANALYSIS FOR SOCIO-ECONOMIC STUDY

AGE	SEX	SER	KOR	CUL	NAM	VUN	NAV	YAN	TOT
24-44	**M**	3	2	4	9	4	4	4	***30***
	F	1	0	3	1	0	1	0	***6***
45-55	**M**	3	3	2	1	2	6	4	***21***
	F	1	2	1	0	3	3	2	***12***
56-66	**M**	3	3	1	2	3	2	3	***17***

	F	1	0	0	0	1	0	0	***2***
67-77	**M**	1	0	0	0	2	0	0	***3***
	F	0	0	0	0	0	0	0	***0***
n		***13***	***11***	***11***	***13***	***14***	***16***	***13***	***91***

Total	***M***	**71**
	F	**20**

4.4.2 Household Information

Table 2 shows that majority of the people leaving in Serua are less then 50 years old. There are a lot of children compared to adults. For children less then 12 years old, both genders are equally distributed. There are more teenage boys then girls, almost half the number of males (between 13-23). Above that age, both genders are more or less equally represented. Overall the total numbers of males from females for the 91 households were 184 and 158 consecutively.

Figure 18 and Table 2 also shows that there is a significant trend whereby the population concentrated in the age group less then 45 years for the seven villages. That is, the children's population outnumbers the adult in these villages. The population of adults over the age of 67 is insignificant for these villages. Apart from Serua, Namaqumaqua, Vunaniu and Yanuca, the adult population over the age of 67 is nil. The distribution of gender for these villages is well catered for in regards to the number showed from this survey.

The graph in Figure 18 also shows the significant gradual trend that the population decreases after the age of 45 for the District.

Table 2: Household Age Groupings

VIILLAGE	n	Gender	<12	13 - 23	24 - 44	45 - 55	56 - 66	67 - 77	>77
SER	***13***	M	10	8	12	3	3	0	0
		F	6	7	7	5	3	2	0
KOR	***11***	M	3	8	5	5	4	0	0
		F	3	5	4	6	2	0	0
CUL	***11***	M	5	14	8	3	0	0	0
		F	3	8	8	3	1	0	0
NAM	***13***	M	9	9	9	1	2	1	0
		F	9	6	8	2	1	1	0
VUN	***14***	M	7	9	7	3	5	1	0
		F	8	4	9	4	3	0	0
NAV	***16***	M	7	11	8	9	2	0	0
		F	5	12	8	6	2	0	0
YAN	***13***	M	7	9	5	6	3	1	0
		F	16	1	9	4	0	0	0
total		M	41	59	49	24	16	2	0
		F	34	42	44	26	12	3	0
G.total	***91***		***75***	***101***	***93***	***50***	***28***	***5***	***0***

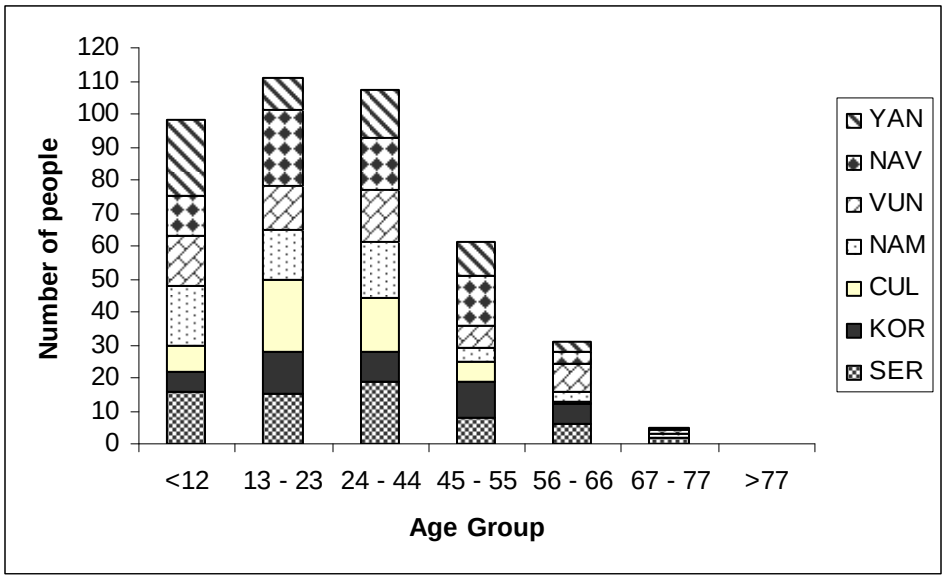


Figure 18: Average Age Groups for SAMPLED Households in Serua District

4.4.3 Fishing Activities

Figure 19 shows that there are more subsistence fishers for the District when compared to commercial operators. The two villages of Culanuku and Vunaniu have significant number of fishermen that are operating commercially. Serua, Korovisilou, Namaqumaqua and Yanuca significantly shows that they fish only for food rather then commercial purposes. Although there are semi-commercial operation in these villages, but it is conducted at insignificant level.

Overall, subsistence fishing outnumbers the commercial and semi-commercial operators. This signifies that the people of Serua are predominantly relying on fish for subsistence uses rather then commercial purposes.

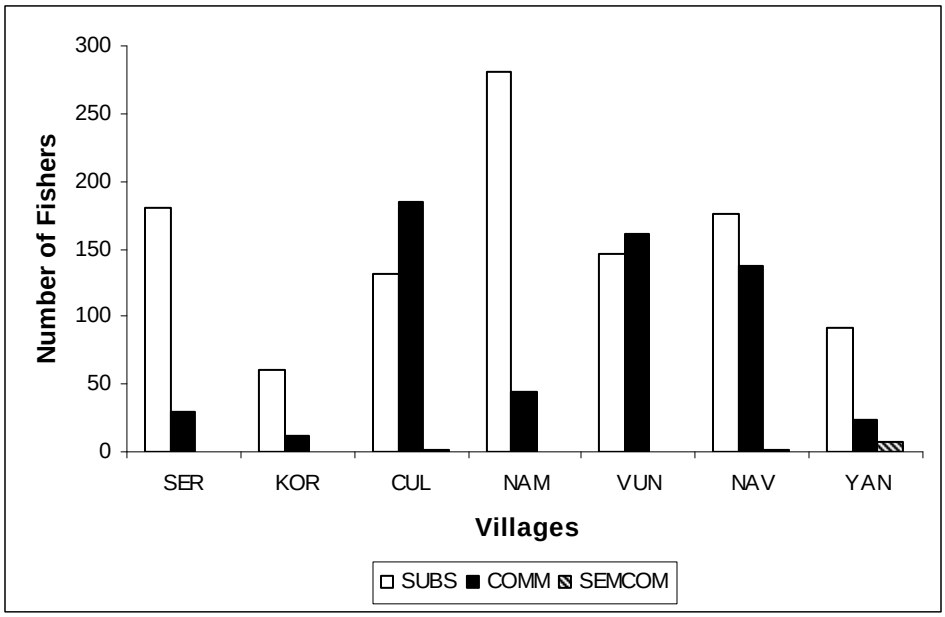


Figure 19: Type of Fishing Activities for Sampled Households in Serua District

4.4.4 Income and Expenditures for the Villages (Appendix 11)

4.4.4.1 Income

Figure 20 shows that fishing is the main income generating activity followed by hotel/tourism, then agriculture, other activities and handicrafts. This is true for Yanuca and generally for other villages. The wide range of income per household for these three villages ranges from $100 to $300 per month. The village of Navutulevu has the highest income compared to other villages per month. We can assume from this data that villages like Culanuku and Vunaniu are predominantly fishing for commercial purposes.

Navutulevu show that tourism is predominantly their main income generating activity followed by fishing and agriculture.

This graph also shows that Namaqumaqua shows a well distributed income generating activities for the district.

It is also significant to suggest that all these villages are now engaged in tourism industry. That is, Namaqumaqua and Navutulevu shows significant trend in handicrafts, and almost all remaining five villages have included tourism as one of their main income source.

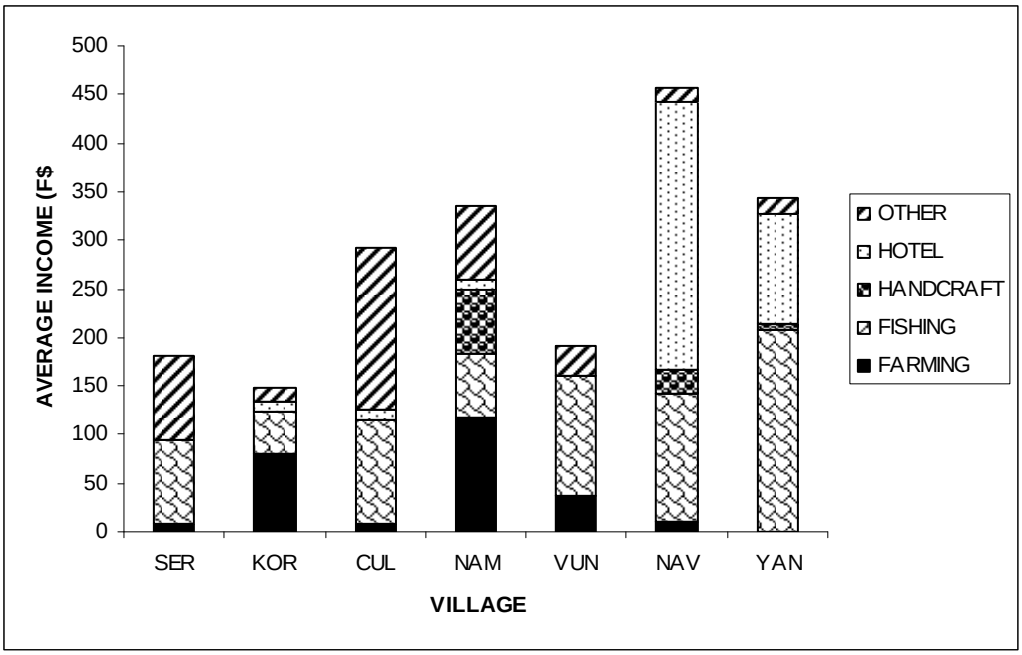


Figure 20: Monthly Average Income generating Activities for Serua District

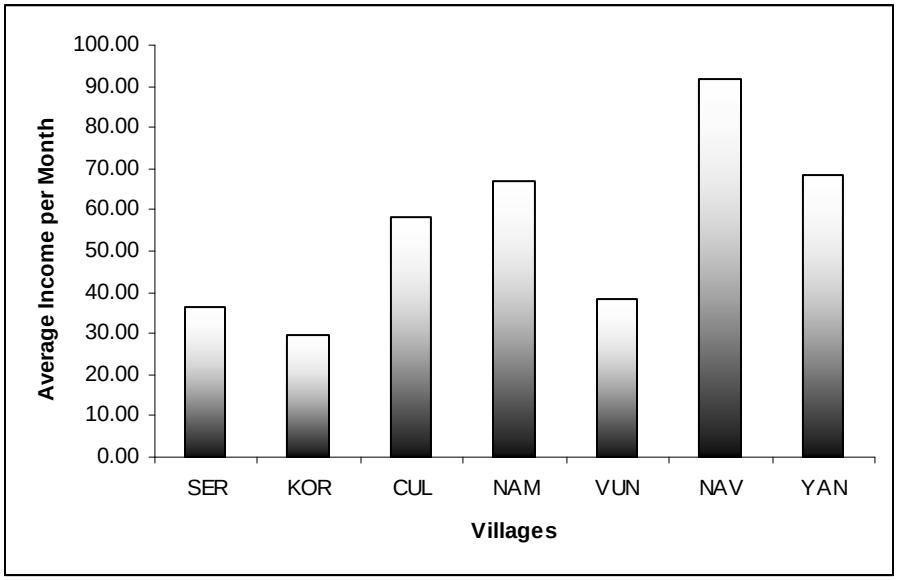


Figure 21: Monthly Average Household Income for Villages in Serua District

Figure 21 illustrate the monthly average income for each household in villages of this district. The monthly average income ranges from $30 to $90 for one household per month. Navutulevu have high income rate followed by Yanuca, Namaqumaqua and Culanuku. This could be the result that majority of household in Navutulevu are engaged in fishing and the hotel industry. All villages are engaged in fishing as source of income on small scale.

4.4.4.2 Expenditures

Figure 22 shows items that constitute household expenses for the villages in the district. The greatest expenses as expected are on food items, followed by school fees, village obligation and church activities. The remaining expenses on clothes, fares, hire purchase and cigarettes/kava are also significant in the household expenses. The average food expenses for these villages are $20 - 100 per month.

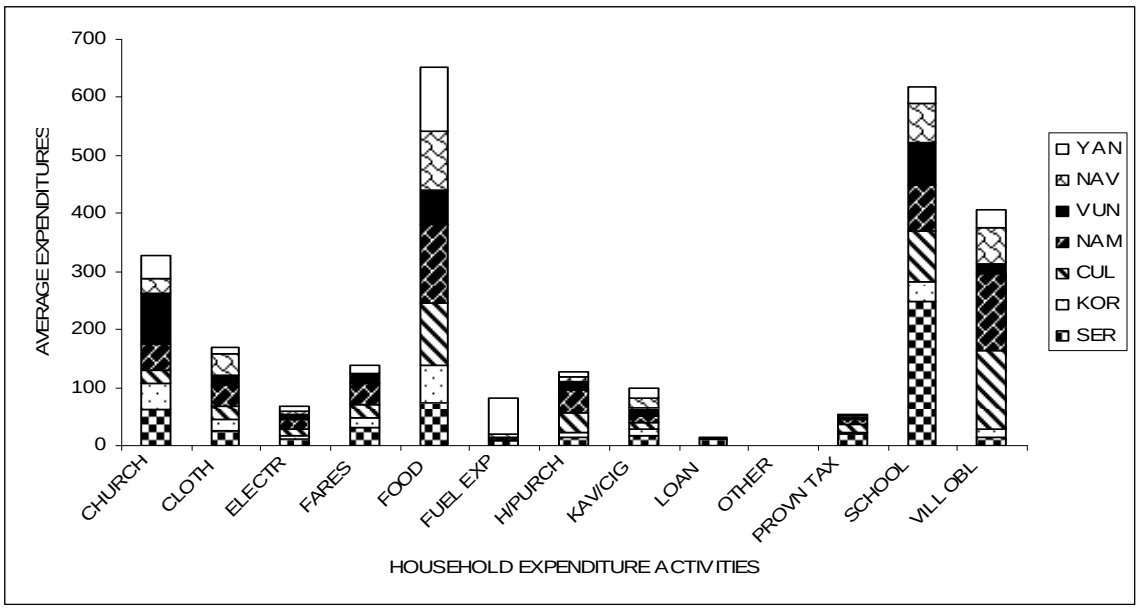


Figure 22: Monthly Average Expenditures per Household per Activities for Serua District

Serua shows that they invest a lot in education when compared to food and other expenses. Yanuca's expense on fuel is higher which is significant because they are engaged in fishing and as well as transportation to the main land, when compared to other villages that are situated on the main land.

Since most expense is driven to food requirement, it signifies that these communities are purchasing food at local shops and from markets/shops in town. Which in turn confirm that the people in Serua are gaining good-average income to cater for their immediate needs. That is, an average household in Serua is expected to spend at least F$100 per month on food expenses.

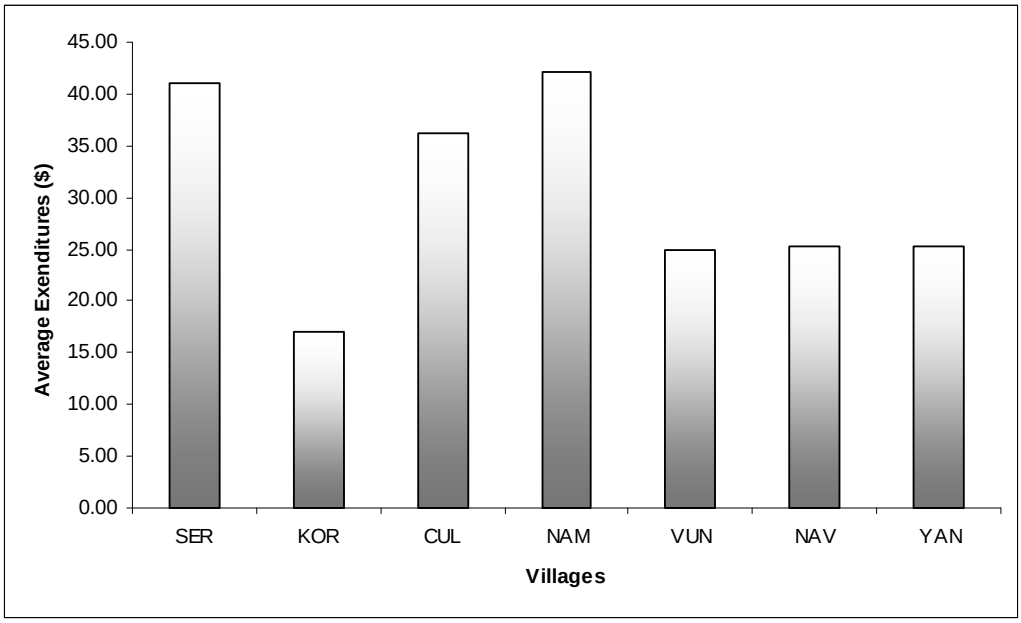


Figure 23: Monthly Average Household Expenditures for Villages of Serua District

The average household expenses as shown in Figure 23 reflects that these villages spending limit is below their income rate except for Serua, which is encouraging when observing the expensive lifestyle currently experienced in Fiji. This margin is further illustrated in Figure 24, where there is distinct difference between income and expenses.

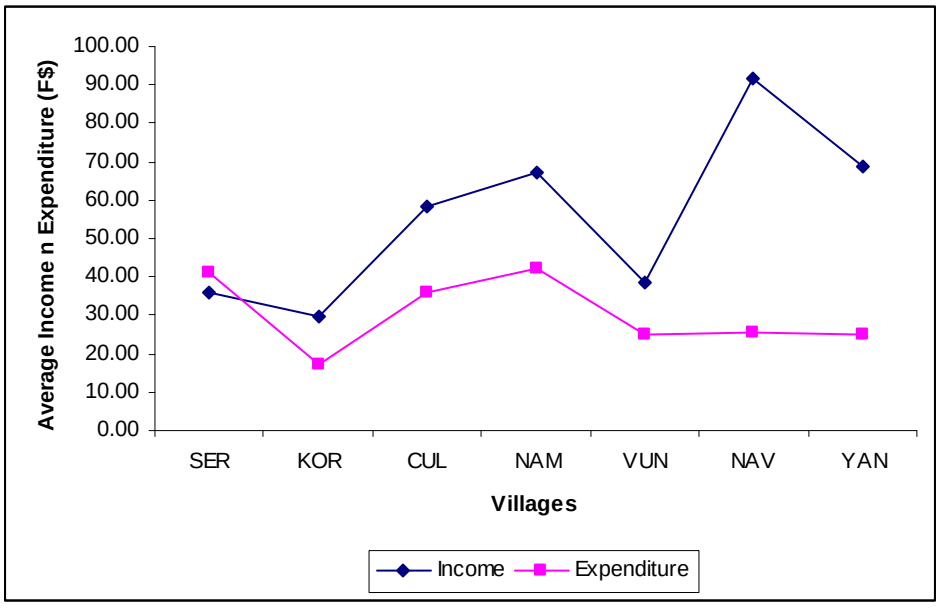


Figure 24: Average Monthly Household Income and Expenditures for Villages in Serua

4.4.5 Fisheries Resources and Management Strategies

The list of fishes shown in Appendix 8 illustrates major food fishes that are targeted during their fishing activities. It seems uniform to these villages which implies that these fish families are expected to be low in abundance or maybe extinct in some areas around Serua. One can also expect that these group of fishes to be sold regularly by commercial fishermen in this area.

The catch rate is decreasing according to the catch estimate on the time before and after estimate for food fishes reported in this survey (Appendix 9). The fishing effort recorded for the district with an average of 3.5 hours per fishing trip (figure 25). The fishing hours is increasing which implies that targeted food fishes are decreasing in abundance. As expected, over fishing which is supported by the use of illegal methods such as duva or derris with night diving, that is prevalent in this area could attribute to this problem. The people of Serua are supportive of the strategy to set up MPA in order to initiate the revival of their fishing areas. Suggestions that they submitted in the survey showed that majority of the people in this district are very much in line with the conservation mandate for their marine resource. This is a positive outlook which they think will benefit them in the long-term.

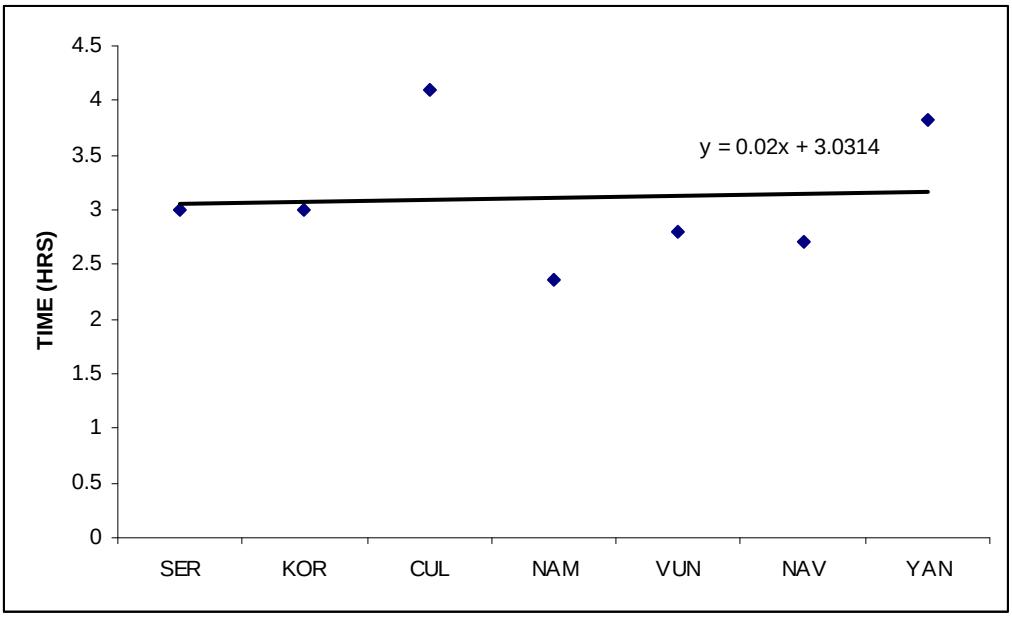


Figure 25: Average Fishing Effort (Hours) for Villages of Serua District

Listed on Appendix 10 are some management options that can be considered for the District as it proceed with the proposed Management Plan outcome from the workshop.

4.5 Discussion

4.5.1 Household Information

From the 91 household interviewed within the seven villages of Serua District over 50% of the population are in the age group 24-55 years old. The insignificant number of people over 65 years old shows that this district is populated by young people. That is, it is dominantly populated by young people of the age group 13 – 23 years old, followed by 24-44 then by children less then 12 years old. Both genders are well represented for all age groups however, this society is male

dominated represented by significant response of male counterpart's in answering questions from this interview process.

Similar to other district in Fiji where male is dominant "*Patriarchal*" it might take a bit of time to change the trend where women can be part and partial of decision making process for issues that relate to household. From the survey its shows that majority of subsistence activities are conducted by women. That is, they spend more time in the sea when compared to their male counterpart. Knowing that they are the key contributor of the daily usage of sea resources, it is important they are considered to the decision making process in the conservation and development of their coastal resources. That is, marine conservation strategy that maybe implemented should also address alternative resource for the family's daily needs.

Overall Serua District relies on fishing for subsistence purposes rather then commercial. Although some villages like Culanuku and Vunaniu have significant number of semi-commercial operators, the survey shows significant usage of fishery resources for home consumption from all villages. Almost all areas are completely over fished and experienced low catch rate. These areas can only improved its capacity if illegal fishing technique such as derris (*duva*) and night diving are prohibited. It is important from this finding that some drastic measures are to be implemented by district, provincial and government in addressing these issues.

The introduction of management measure for fishing areas (MPA) has to take into consideration alternative ways to cater for their subsistence needs. Tourism is one source where locals are employed for their daily needs. In other areas farming of corals, seaweeds, giant clams and farming on land are best alternative for the district. These alternatives will help in the transition on setting up MPA's.

The introduction of Marine Protected Areas (MPA) can drastically affect their income level if land is scarce. However, this concept has to be understood by the communities to avoid conflict of interest that can lead to abuse at a later stage when desperation takes over on situation where needs are not met in the household. As a result of this survey, there is a maximum consensus from the community of the need to conserve their resources in order to avoid over-fishing and support the recovery of the resources for subsistence use and also for the tourism industry.

4.5.2 Income and Expenditures

The income generated by these communities on fishing and tourism is currently sustainable when compared to the amount of spending. It is encouraging to note that majority of these villages that are in the age group less then 50 years old are engaged in the affairs of their household and the community "*vanua*". That is, they are earning income that is directly benefiting the community and at the same time participating in the overall advice and decision making process in the community on their resources utilization and management.

The fishing areas that surround these communities will be divided into open areas and closed MPA sites that will benefit them in the long-run as they continue fishing. They support this concept, knowing that fishing activities will still continue as usual and at the same time, conserving as a re-stocking measure to their target areas. Therefore their income from fishing won't be affected at all.

At the same time tourism is blooming in this district at a rate that the concept of MPA comes at a very crucial time. The income that they will earn from it will surpass that of fishing if their marine resource is in good shape. That is what tourist is all about, snorkeling and diving in clear and crystal water with live corals and fishes.

The amount of expenditure for the communities is very moderate as shown by the data collected. It seems that the income level enjoyed by these communities compared to the expenditure level is good and can be sustained on long term if the current level of expenses is maintained. On the other hand, it can be an advantaged to these communities where they can turn to have more savings from their balance of expenses.

At the current rate and together with new openings from the tourist industry, a forecast with an increase in their income level for these communities in the near future. It is therefore envisage that during the next 5 – 10 years time, one can expect a completely different scenario, where the communities will either double or triple their income level.

4.5.3 Fisheries Resources and Management

The level of fishing in Serua is very intensive because both commercial and semi-commercial operators are utilizing the resources, apart from the daily subsistence users. Almost all villages are engaged in fishing for subsistence purposes only. Current records show that fishermen are licensed every year however; the daily occurrence of poachers around the fishing grounds at night is one issue that had been highlighted by all villages in the district. But contrary to this, the people of Serua in general are seriously considering the practice of conducting responsible fishing in order to safeguard their resources for the future generation. They are very much aware of the impact of using illegal fishing methods to the fishery and the environment, and admitted that they were to be blamed for the mistake of allowing these activities within the fishing ground. They also have experienced drastic decrease in their fishery resources for the past ten years and have submitted their opinion supporting the initiative of conservation in the fishing areas, as a rehabilitation strategy.

From the outset, all respondent have unanimously agreed to the concept of setting up of MPA or Marine Protected Areas around their fishing areas or "*qoliqoli*". This has set up the foundation on PCDF's support to the community in achieving their dream of conservation to the marine environment in which they are entirely depended upon for their livelihood.

In conclusion, this baseline study will help the project in maneuvering the current marine resource management focus to a more adaptable one, where the community will in the end obtain the maximum benefit from their participation together with other stakeholders that are also concerned on this initiative.

SERUA DISTRICT FISH WARDEN TRAINING AND BIOLOGICAL SURVEY IN YANUCA MPA
APRIL 21st – 24th, 2007

"CAKAU BULABULA" – HEALTHY REEF EED PROJECT

NRM – PCDF
SUVA
FIJI

OCTOBER - 2007

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Acknowledgement

This work could not have been materialized without the following people who had the vision and took the initiative to look after the future of the community and its resources. The high chief of Serua, Ratu Aseri Latianara "*na Turaga na Vunivalu of Serua*" and the Assistant Roko Tui Serua (Ratu Inoke Sauturaga) for their part in seeking assistance from PCDF to work in Serua.

We also acknowledge the support rendered by the Chief of Yanuca – "*Tui Daga*" and his Village headman – Sireli Kago. We thanked the women of the village who took time to prepare food and accommodation during the training workshop. Not forgetting the participants (12 fish warden) who were very eager to learn and energetic in conducting the field work, even though the weather was not conducive to the task.

We would also mention the support that was made by Pacific Blue Foundation Coordinator, Kerry in food and transportation share costing, thank you very much. We acknowledge the services of Ratu Nemani Cavuilati (Fisheries Officer) and his Assistant Mr Watisoni Uluiviti, Eastern Division for conducting training for the Fish Warden and Officer in Charge of the Eastern Division (Mr. Ram Lakhan) for his support.

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And lastly but not the least we also acknowledge Evangelischer Entwicklungsdienst (EED) for funding this project.

Executive Summary

On April 21st to the 24th of this year 2007, PCDF together with Fisheries Department conducted Fish Warden and Biological Training workshop on Yanuca Island. As a result of this training workshop, twelve (12) fish warden are now certified to carry out the duty of surveillance officer in their Customary Fishing Right Areas or "*qoliqoli*". These 12 men were also trained in biological survey techniques that will be used in monitoring of their Marine Protected Areas for the next five to ten years.

A baseline survey was conducted around the island where the proposed Marine Protected Area (MPA) and unclosed area was sampled using simple Line and Belt Transect method. Fish, Invertebrates counts and Coral cover were sampled accordingly using trainees during their practical session around the island. A total of 8 transect was made, in which 4 transect was allocated each to MPA and Non MPA areas. Each transect was measured with a measuring meter tape of 50 meters. Fish and Invertebrates was counted using visual census whilst the coral cover was estimated using the quadrant measuring 100 percentage coverage.

The result of the survey showed that the most dominant fish was the parrot fish (*Scarids spp*) followed by wrasses (*Cheilinus spp*.). The other major food species identified to be sampled like Rock Cod, Coral Trout, Sweet Lips, Unicorn fish and Emperors were not observed during the survey. These are targeted fishes for market and food consumption which implies that fishing in this area is very intensive. Information gathered from the locals that night fishing is prevalent in this area and is a major problem to the authorities according to the Fisheries Officer in charge of Serua.

The invertebrates count was not significant according to the data that was collected because the number was more or less the same for both MPA and Non MPA sites. This was expected because the area is accessible to locals from land where one can swim in less then 5 minutes and prone to intensive gleaning or even fishing. However, the number of these invertebrates is expected to increase during the next 6-12 months and will be a significant indicator to the success of this initiative.

The coral cover according to the sampling showed that live corals in both MPA and Non MPA sites is between 15 to 50%. The site has been utilized for live coral trade for the last 10 years, but this observation showed that living coral is in good shape and should improve their coverage during the next six to twelve months. Coral cover will be a significant identification mark to show the improvement in the restoration of MPA site at Yanuca. Overall the coral cover surrounding the edge of Yanuca Island is more or less in good condition and will improve as the MPA terms increases.

INTRODUCTION

The concept of management and monitoring of resources is important for coastal areas in Fiji. One of the tools that is currently established in Fiji is to allow the resource owners to also participate in adaptive management by volunteering their service as Fish Warden, in order to support the Government arm of Fisheries Department. It has been the practice in areas around Fiji where Marine Protected Areas are established that the Fisheries Department trained the local fish warden and certify them accordingly as required under the Fisheries Act. This was conducted at Yanuca Village for twelve men that were chosen by village elders who were capable to take the role of Fishery Policemen.

This was also followed by training these Fish Warden to monitor their resources with simple biological survey methods with practical exercise conducted in their MPA and Open Areas. These two activities which were shared by Fisheries Department and other NGO's are now being undertaken by local fish wardens and trained young people in communities around Fiji.

The impact of this training and empowerment process will enhance the level of commitment the local people will have on their role as the major stakeholder of their *'qoliqoli'*. It will also strengthen their sense of ownership on the work they are conducting, and support the adaptive management concept which will be sustainable in the long run. They will understand the importance of fisheries resources in terms of food supply, 'money in their pocket', and more importantly their relationship with their environment which is "God given" accompanied by their role as 'steward'.

The survey work with the result that will be obtained, will inform them of the impact of the Marine Protected Area concept on short and long-term basis. It will also show upon observation whether the resources is improving and motivate them to advise their people on the progress of their work. The biological survey training and exercise was conducted in the village before undertaking the survey proper in the MPA and Non MPA areas.

Background

Yanuca Island is populated by villagers living in the village of Yanuca with a population of 241 people, comprised of 125 male and 116 female. The village has a church, a primary school and currently using an old church building as a community hall. Upon observation, all household totaling 34 have a water tank with carrying capacity of 1000 liters and more. They are currently using rain water for cooking and drinking. For bathing they are using a small pools and wells. These wells have the mixture of captured surface water and groundwater.

The chief of Yanuca lives at Wainiyabia Village on the main island of Viti Levu. He attends to his duties on the island when he is needed, or the village elders seeks his advise and blessing when ever they have issues to be taken care of for the village.

The people of Yanuca rely heavily on Fisheries resources for their protein supply, and plant root crops, fruits and vegetables as sources of carbohydrates and starch compliments food products. They also sell their fishery products as a source of income to compliment their needs in obtaining clothing, school fees for the children, village obligations, church activities and other needs. These needs have led this village to understand the importance of managing their fishery resources in a sustainable manner, in order for them to be able to utilize their resources continuously for years to come without any problem.

The concept of setting up of Marine Protected Area was established with support from Provincial Office, Fisheries Department and PCDF during the Awareness and PLA workshop. After the establishment of MPA, the need to look after it was highlighted which resulted in the training of Fish Warden was conducted accordingly. In conjunction to the fish warden training, these men were also trained in conducting survey in the MPA site to determine the resource abundance in relation to the open site. Fisheries Department and PCDF conducted these training at Yanuca Village on April the 21st to the 24th. The initial target was 10 Fish Warden but it increased to 12 according to their need.

This paper describes the result of the training of the Fish Warden as well the baseline survey of the Marine Protected Area surrounding the island of Yanuca. It also describes some observation made on the work undertaken with some recommendation that can be useful to future development in Yanuca.

1.0 FISH WARDEN TRAINING

Fish Warden Training

The Fisheries Officer began his sessions by explaining the role of the Fisheries Department and their work at the community and national level. The following outlines the sessions that were discussed:

i) Traditional Fishing Ground Boundary

The participants were asked on their knowledge of the boundary of their fishing grounds. Most participants had a negative response and were not clear on the actual boundary lines. The Fisheries Officer also explained the importance of their fishing boundary which started from the shore ends (high tide mark on shore) and ended at the reef edge.

ii) Fishing License

The Fisheries Officer explained to the participants the importance of having a fishing license. Under the Fisheries Act, all fishermen selling their catch are equipped with a boat and fishing gears must have a fishing license. The fishing license is non-transferable which meant that the person who holds a license must always be present in the boat when going out for fishing. The license, which expires on 31st of December of every year, guarantees the fisherman the right to fish within the '*qoliqoli'* (traditional fishing grounds) to which the chief has given their approval.

To create flexibility in the Programme, the Fisheries set up a mock exercise on where the trainees were to perform the role of poachers and fish warden. This exercise was organized with the involvement of both participants and facilitators at the village beachfront using their boat and engine.

iii) Development Assistance

The Fisheries Officer explained that there were various development assistance schemes available to help the communities in whatever project, for example purchasing a boat and fishing gear. He also explained that there were certain conditions attached with these schemes, for example those interested should obtain licenses.

iv) Prohibited Fishing Methods and Species

The Fisheries explained that some fishing methods were prohibited under the Fisheries Act that includes the use of compressor or use of scuba gear to catch fish, and the use of natural plant derris (*duva*). He emphasized that the use of scuba tanks should only be used for research and rescue in deep water and not to catch fish. In addition, he also explained that there were some marine species that are protected under the International Law and also under the Fisheries Act, for example the Triton's Trumpet snail, Maori Humphead Wrasse and green turtles.

v) Government Assistance

He re-iterated that the Government when establishing this program was really asking the people to help them in managing the resources because they lack manpower and equipment. It is therefore necessary for each village to come up with their own strategies in equipping themselves in obtaining boats and engines, as well as fuel during their operation. They could only help in as far as prosecution is concerned and also sometimes using their patrol boat to combat the night divers and illegal fisherman.

Certified Fish Warden

Twelve men were certified as Fish Warden after the training exercise and will later receive their cards when it they are endorsed by the Minister for Fisheries. The names of this Fish Warden are shown in Appendix 1.

Lesson Learnt

The following are some the lesson learnt from this training exercise:

- The training should be conducted for at least 3 days which is the normal term for all fish warden, but this training was intensive according to the funding limitation;
- The use of practical aspect of the training is important as far as 'hands on' is concerned because they felt they will understand more compared to the lecture;
- It is easy to bring such training into the community because they felt, they relate so well to their natural surrounding and cheaper to conduct as far as finance is concerned;

2,0 BIOLOGICAL SURVEY

2.1 Introduction

The training of locals to undertake survey of their MPA and Non MPA areas was made to allow them to take ownership of the initiative (project) and as an empowerment tool. It will also help them to be more involved in creating awareness in the community, with information that will be gathered as they participate in the survey. Having a lot of knowledge on their resources, will also make them more powerful in addressing management and development issues that they will encounter in future.

These were the primary motives in developing simple survey techniques that locals who can write and read, will be able to understand and perform when ever they can undertake the survey. PCDF played the role of facilitator in training 12 men to be involved in this work.

2.2 Background

The setting up of the work conducted on resource management at Yanuca requires stock estimates that will support any sort of measures taken in order to complement strategies taken to sustain the resources on a long-term basis. This is true for the marine aspect of the resources where data are collected and analyse to inform the stakeholders of the resource status and help in identifying actions that will address restoration of the resources. We therefore set up a simple biological training technique in collecting data described in the method section.

The participants were earlier introduced to the importance of obtaining good information that will answer questions that may arise from their communities and other major stakeholders. With this in mind, they were made to construct a map of the island locating the MPA site and all information about the resources one would expect to find in the area. From the resources that they had identified they were instructed to list them down and prioritizing them according to their importance as food and economic sources. They were listing the resources as Fishes and Invertebrates, which in the end would be used as indicators during the survey. The fishes and invertebrates identified are shown in Appendix 4.

The trainees were later given an exercise of drawing up their Action Plan on the Survey and Activities to be undertaken for their island as shown in Appendix 5.

2.3 Method

Using the method described by *English etal (1997)*, we managed to conduct a total of 8 belt transect survey of 100 meters. Four (4) of these transect was conducted in MPA and four in the Non MPA sites around the island. Two teams of surveyors comprised of six (6) trainees and two instructors conducted the survey in two separate boats. Materials that were used were measuring tapes (50 meters), slates, underwater papers, quadrat (100 squares) pencils, mask, snorkels and fins.

At the beginning of the survey, one team member swam and laid the tape at the bottom and swims away. After 2-3 minutes when the fish are settled, the second team member started counting fish starting from 0 and every 5 meter intervals stopping and counting looking right and left of the tape with a distance of 2.5 meters square. This will later followed by the third team member counting the invertebrates using the same measurement as above. The fourth team member then use the quadrate divided into 100 square lay on every 5 meters starting from zero, to estimate the coral cover on every transect made. The fifth team member then rewind the tape before moving onto the next transects. All team members were given the chance of taking fish and invertebrates counts, as well as coral cover estimates during the survey proper.

2.4 Result

Fish Abundance

The data collected from this survey showed that in Figure 1 and 2, *Scarids* (Parrotfishes) dominates Non Tabu and Tabu areas followed by Wrasses (*Cheilinus spp*) whereas those primary targeted fishes identified here were not present during the count. It implies that the area has been prone to intensive fishing pressure, substantiated by the information that night diving has been prevalent around Yanuca.

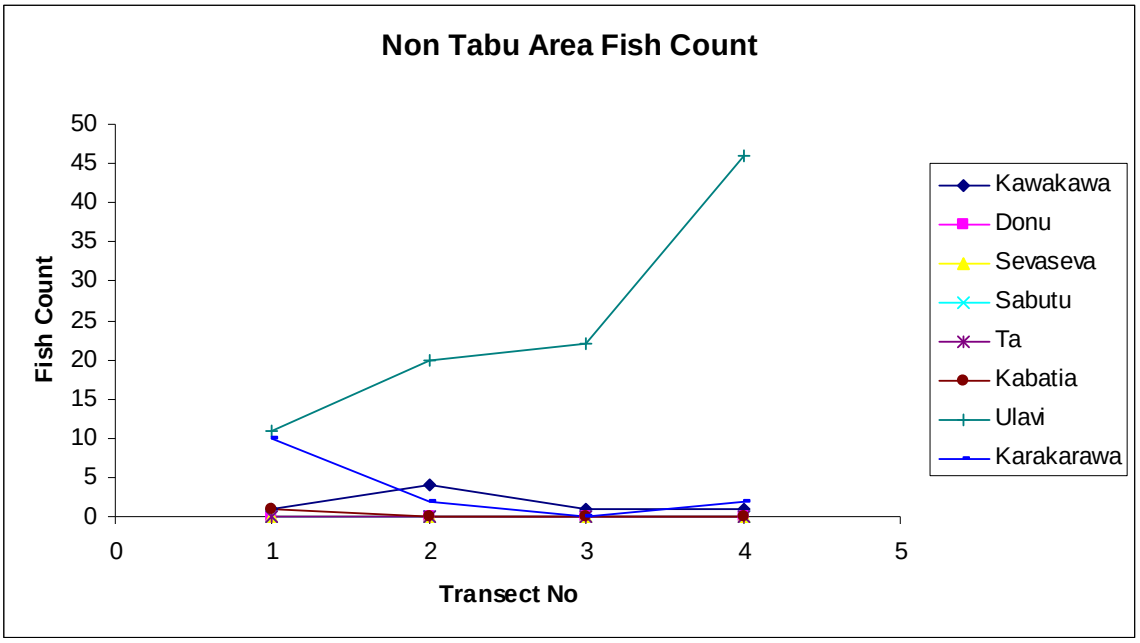

Figure 1: Fish Count in Non Tabu Site per Transect (Kawakawa – *Epinephelus spp.*, Donu – *Plectropomus spp.*, Sevaseva – *Plectorchinus spp.*, Sabutu – *Lethrinus mahsena*, Ta – *Naso unicornis*, Kabatia – *Lethrinus harak*, Ulavi – *Scarids spp.*, Karakarawa – *Chelinus spp.*)
RH Carcasson (1977)

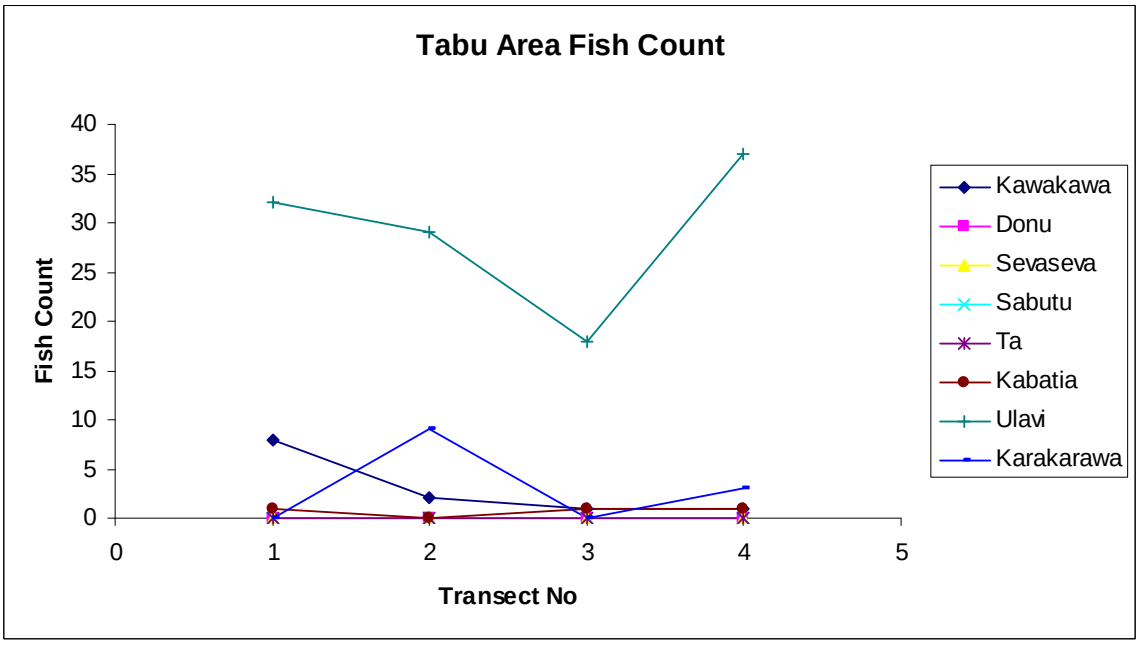

Figure 2: Total Fish Count in Tabu Site (MPA) per Transect (Kawakawa – *Epinephelus spp.*, Donu – *Plectropomus spp.*, Sevaseva – *Plectorhynchus spp.*, Sabutu – *Lethrinus mahsena*, Ta – *Naso unicornis*, Kabatia – *Lethrinus harak*, Ulavi – *Scarids spp.*, Karakarawa – *Chelinus spp.*)

Figure 3 illustrates that total count of fish in MPA areas is greater then what was counted in non MPA areas per transect. This trend would be expected to increase during the next phase of survey to be replicated on these sites in 6 to 12 months time.

The absent of targeted food fishes that were listed to be sampled will be another indicator that will measure the success of having Marine Protected Areas, when the next sampling schedule will be conducted in the next 6 months. It is expected that these fishes will be present during the next phase of survey.

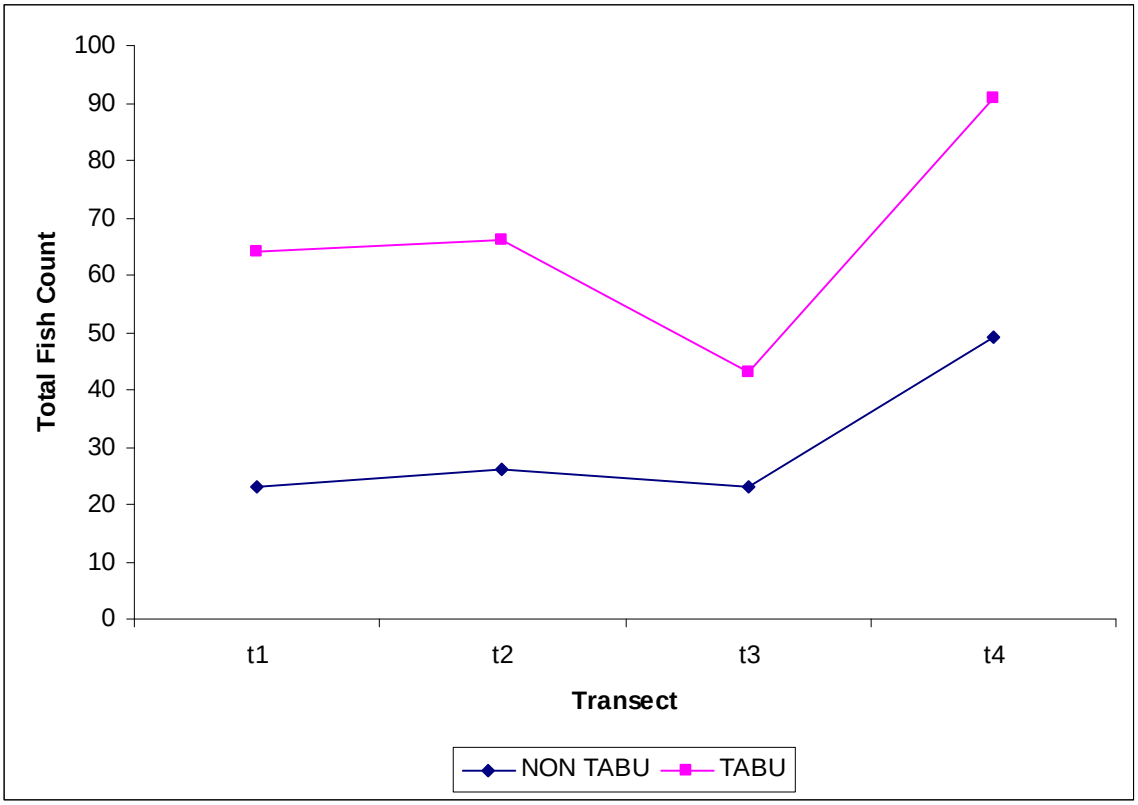

Figure 3: Total Fish Count in Tabu and Non-Tabu Areas

The dominant present of *Scarids* outnumbers all other fish species signify that the area surveyed were mostly coral reef where this fish species primarily lives.

Invertebrates

Figures 4 and 5 showed the counts of invertebrates from Non MPA and MPA sites that were sampled. The low number of invertebrates in both areas illustrates the intensity of fishing and gleaning the people of Yanuca and nearby fishermen have been exerting in this area.

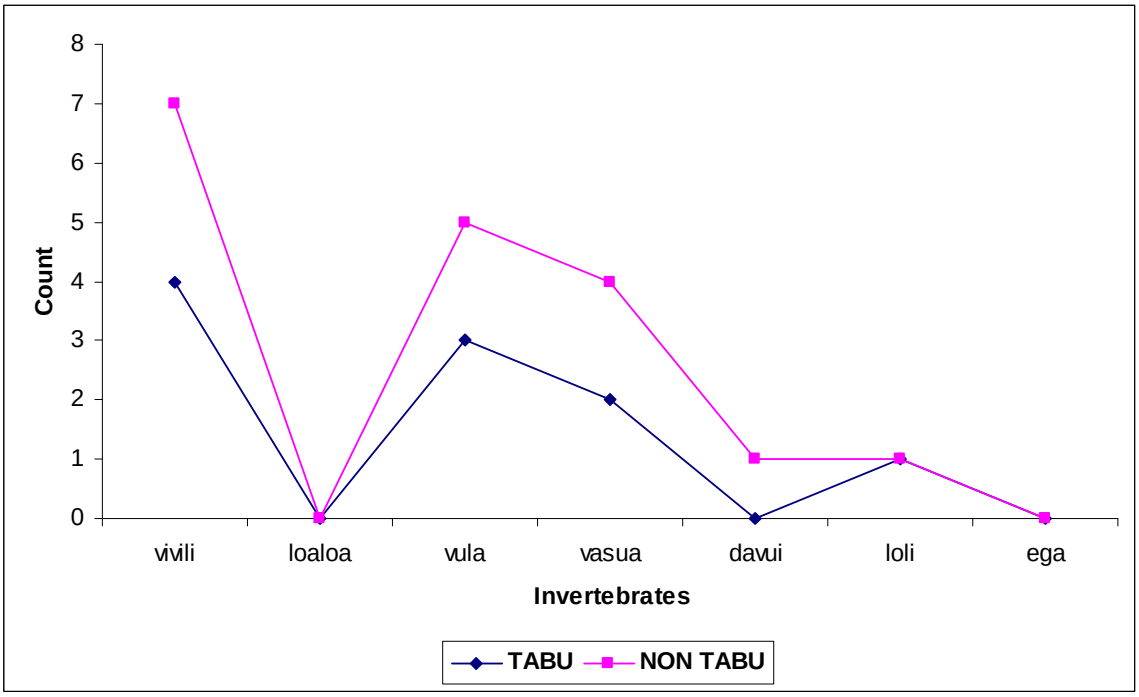

Figure 4: Count of Invertebrates in Tabu and Non-Tabu Areas (Vivili/Sici – *T. niloticus*, Loaloa – *M. nobilis*, Vula – B. marmorata, Vasua – *T. derasa*, Davui – *C. triotonis*, Loli – *H. atra*, Ega – *L. lambis*). Patrick Colin & Charles Arneson (1995)

In particular are the beche de mer species that are targeted for the lucrative Chinese markets. Locals have been using compressor and scuba to dive in deeper areas of 20 – 30 meters just to collect the whiteteat fish which is currently valued very high with a minimum of $30 per kg wet weight.

The count of invertebrates will also be a good indicator of the success of setting up of MPA's in this area when we do the comparison in 6 to 12 months times repeated survey.

Both MPA and Non MPA sites does not show any significant variation in the abundance of invertebrates. This was expected, since this is just the beginning of an initiative that will bear fruit later when these resources will renew and restore themselves accordingly during the natural process of regeneration using their unique biological structures.

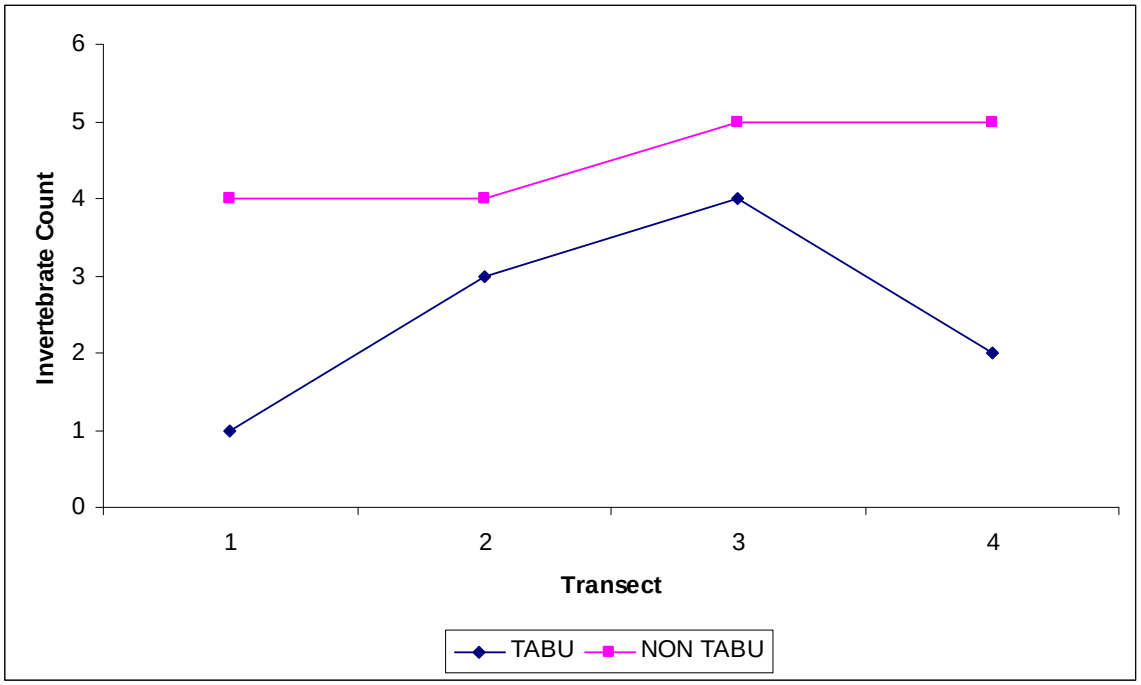

Figure 5: Total Invertebrate counts in Tabu and Non-Tabu Areas

Coral Cover

Figures 6 and 7 shows the average coral cover of the areas that were sampled separating the MPA and Non MPA sites. For the ten quadrats, the average coral coverage is not significant because there is not much variation according to the figure shown below.

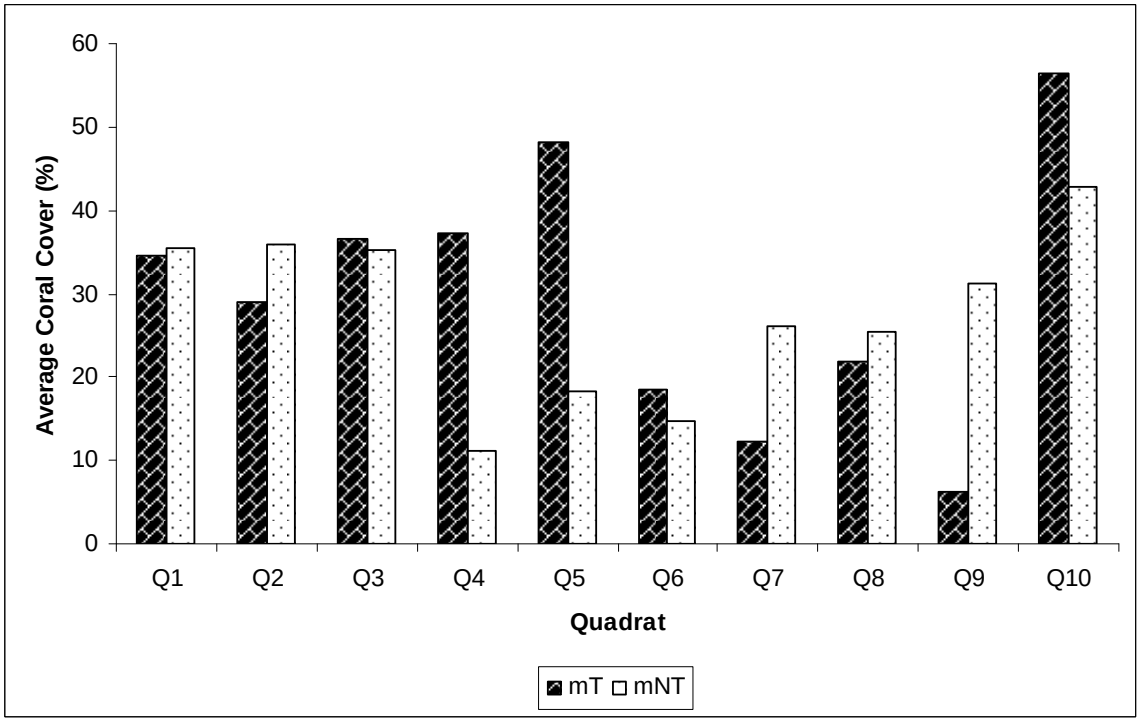

Figure 6: Average Coral cover per quadrat in Tabu and Non Tabu Sites

This is illustrated much clearer when we average out each transect according to the MPA and Non MPA sites. That is, the average coral cover is within 15 to 50% of the total coverage made on the 8 transects that was done.

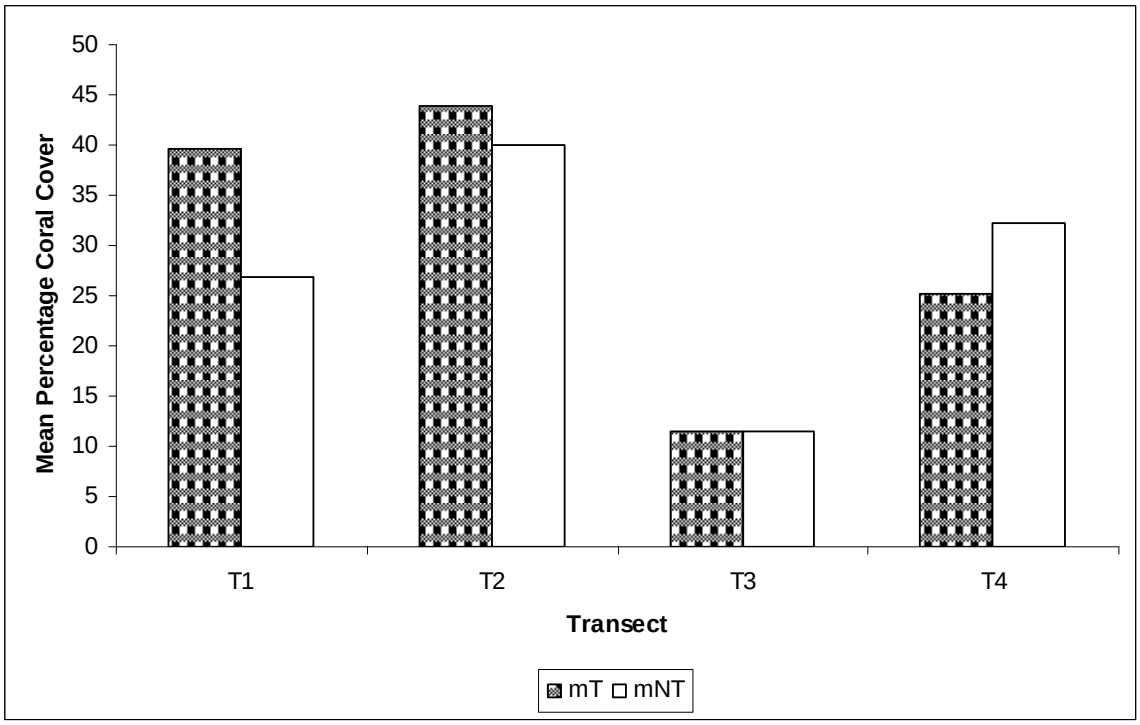

Figure 7: Average coral cover per Transect in MPA and Non MPA Sites

2.5 Discussion

Fish Counts and Abundance

The result of the survey showed that the population of *Scarids* is more then other fish species that were identified as indicator species. The second dominant species was from the Wrass family (*Cheilinus*). These two fish species are naturally found around reef areas and expected to dominate the composition and density since this survey was conducted primarily along the reef edges surrounding the island.

As far as fish abundance is concerned, the survey showed insignificant number of fishes according to the area that was surveyed. That is, the fish population is very low which could have been the result of the following observation:

- The fishes are scared of human activities as a result of intensive fishing probably night diving or derris (duva) etc., (*PDCF Report 2007*)
- There maybe fish poaching in the area from outsiders coming all the way from Suva or the main land, since the locals reported that light can be seen at nightfall;
- Or the fish are not active during this time of the day due to the weather or they may come out at night for feeding or the change of tide from low to high could also bring them closer for feeding instead;
- Another factor to consider is the disturbance made during the survey where the number of people involved could distract the fishes and scare them;

- Or the population of fish in reality is really low because of over fishing and the data collected is a good indicator of the status of fishery resources in Yanuca.

Invertebrates Population

The transect result showed that the number of invertebrates is very low in areas that were surveyed which indicates that the people of Yanuca have been utilizing them in a very intensive manner. This is true for all species that were identified as Indicators and probably had been their main source of income according to observation and information that were gathered. Some of this species that relates to Beche de mer are sold at very lucrative prices to the local Chinese markets. The other high value species like White Teatfish which is collected using compressor and scuba is very hard to find in nearby waters except in deeper places of more then 20 – 30 meters.

The list of these invertebrates will be used as good indicators on the progress of Marine Protected Areas in years to come. Since most of them will be breeding in this location and will not face fishing pressure, one can expect a change in the population densities of each invertebrate during the next survey phase.

Some of the likely issues that could affect the decline in the population of invertebrates are:

- Over fishing using scuba and compressor; *(PCDF Report 2007)*
- High consumption of invertebrates for food and markets;
- Seasonality problem where invertebrates prefer certain water temperature and climate for breeding etc.,
- The affect of tides and water quality could also attributes to the low density;
- Poaching of fishermen from other areas at night. *(PCDF Report 2007)*

Coral Cover Estimates

The average percentage live coral cover for Yanuca in this survey is between 15 to 50% of total coral cover. Yanuca had been collecting live corals for export for the last 10 years and one should expect degrading coral as a result of this exercise. Instead, we found that the live coral cover is in good standing and expected to improve the percentage coverage in the next six to twelve months in MPA sites.

One would expect variation in coral cover estimate but for Yanuca it seems that they have consistency in their coverage. Other areas adjacent to this site at the Beqa Lagoon was devastated by the last warm water smothering in the year 2000 where most corals were bleached. They have dead corals and live ones and those that survived the bleaching event.

It seems that the coral assemblage at Yanuca survives this phenomena and it could have been severe if the physical location was similar to Beqa lagoon. The corals surrounding Yanuca are located almost over 1 to 5 meters submerged into somewhat cold water which makes them more lively. The location of the island where it is continuously supplied with fresh sea water from the two passages on the western side of the island makes the live coral assemblage interesting to observe during the warm season.

The coral coverage is good and could largely improve if the following is done:

- Anchoring to be prohibited across the entire iqoliqoli -visiting boats and yachts, and local boats are damaging corals with anchor and chain
- Moorings should be installed immediately at all favorite fishing, diving and tourist spots, resorts and village bay.
- Extraction of live corals from the area is prohibited;
- Night Diving and Gleaning is to be stopped altogether, because its impact is very significant when corals are just destroyed unceremoniously;
- Fishing using derris or '*duva*', which is banned, should be stopped because corals are facing severe damage with this fishing method;
- Instead of extraction, the villagers can now embark on a coral replanting program where PCDF could assist in training and setting up coral farms;
- This farm could then lead to exporting of second generation corals as a means of income to the locals;
- Also the use of this farm to restore sites which have been damaged by anchoring.

In summary the work at Yanuca is just a starting of the initiative to support the locals in managing their marine resources as well as exploring other potential economic development incentives that will provide money for the locals in a sustainable manner. It is therefore commendable to establish their MPA site, install moorings to prevent anchoring, set up coral gardening program for the island and resorts and proceed into the export of live second generation corals as an alternative income generating activity for the village. The fish wardens have set up their own committee to manage their MPA site and they have organized themselves to survey their sites every six months.

3.0 References

Native Land Fisheries Commission Map, 1987: "*Yanuca Qoliqoli Map*"
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APPENDIX 1: FACILITATORS AND FISH WARDEN OF YANUCA ISLAND

1. FACILITATORS OF TRAINING WORKSHOP

Fisheries Department: Ratu Nemani Cavuilati
Watisoni Uluiviti

PCDF: Iliapi Tuwai
Etika Sing
Jiuta Korovulavula

2. FISH WARDEN


Epironi Takalevu


Epeli Bolatagici (Snr)


Epeli Bolatagici


Etonia Dokonivalu (Jnr)


Laisa Vulakoyaki


Jorama Raulevu


Etonia Dokonivalu (Snr)


Mitieli Namiri


Sireli Kago


Setareki Mataiwai


Osea Lewai

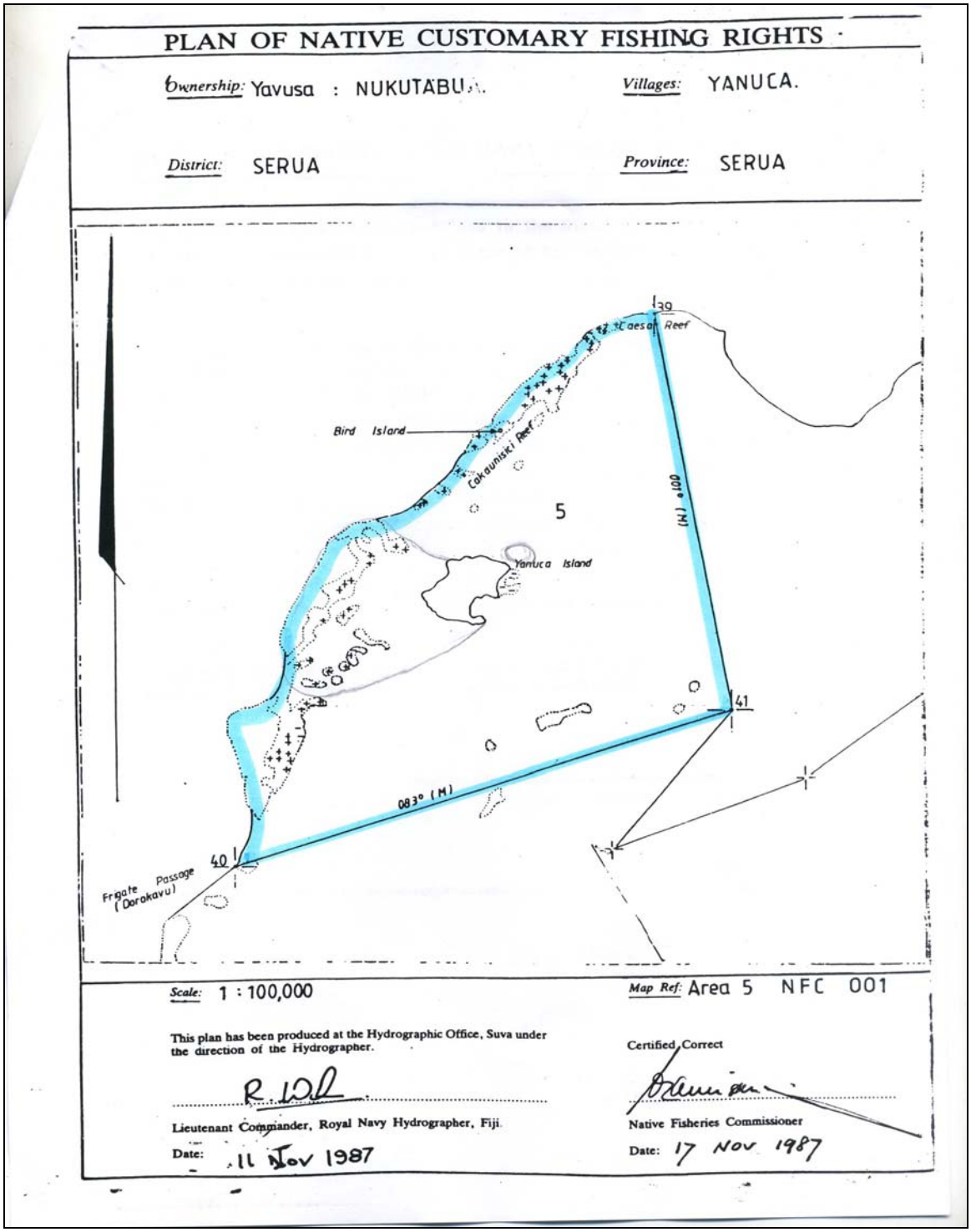

Viliame Kuruyabaki


Setareki Vulacadra


Abaitia Rosivulavula

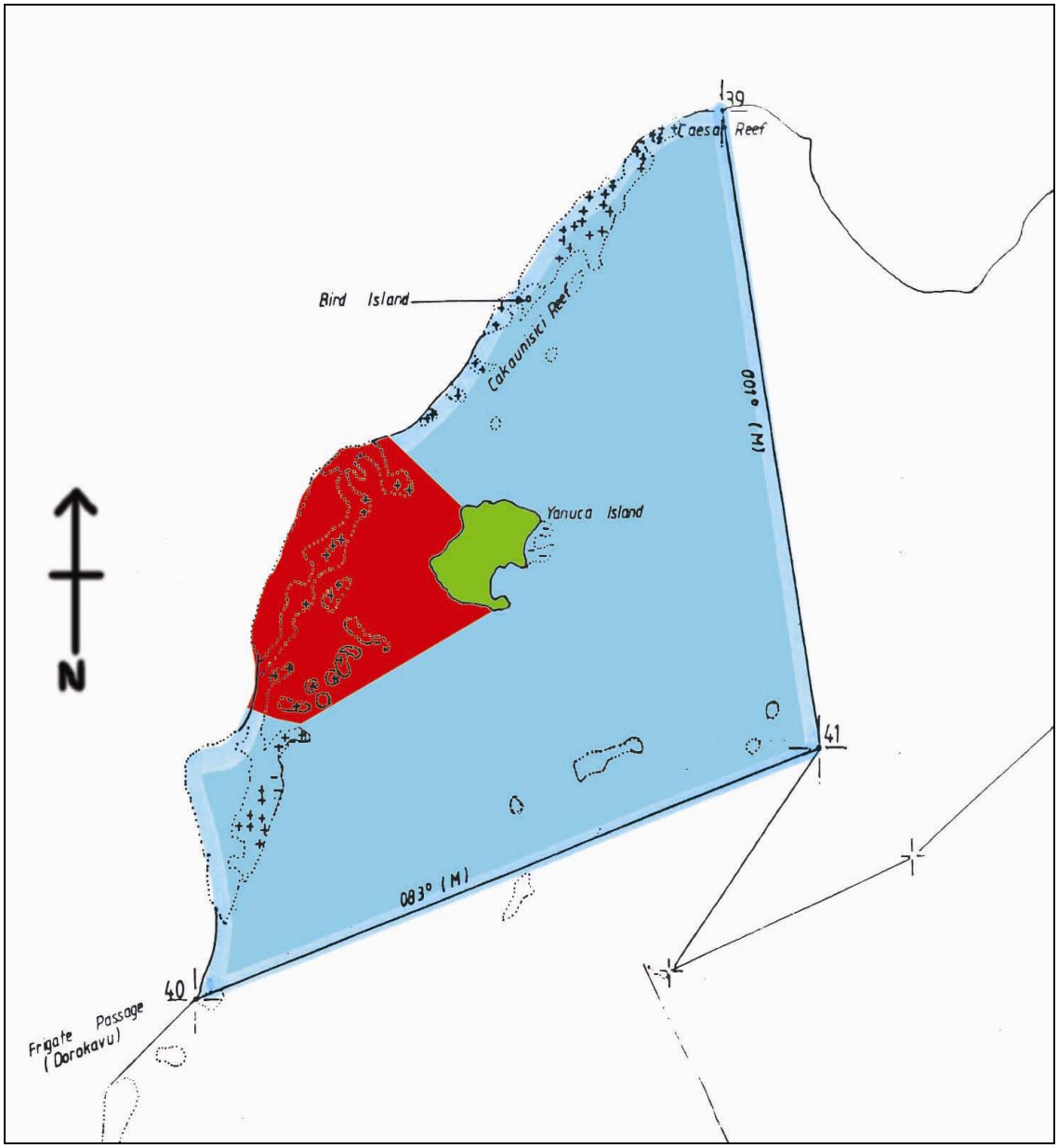

Jolame Bilavou

2006 Yanuca Island FISH WARDENS trained at Fisheries Dept, Tacirua, Suva.



APPENDIX 2: YANUCA QOLIQOLI MAP – CUSTOMARY FISHING RIGHT AREA

Native Land Fisheries Commission Map



APPENDIX 3: YANUCA MARINE PROTECTED AREAS (RED)

APPENDIX 4: FISH IDENTIFICATION – YANUCA

FIJIAN NAME	COMMON NAME	SCIENTIFIC NAME
Kawakawa	Rock Cod	*Epinephelus spp.*
Donu	Coral Trout	*Plectropomus spp.*
Sevaseva	Sweet Lips	*Plectorhynchus spp.*
Sabutu	Emperor	*Lethrinus mahsena*
Ta	Unicorn Fish	*Naso unicornis*
Kabatia	Emperor	*Lethrinus harak*
Ulavi	Parrot Fish	*Scarus spp.*
Karakarawa	Wrasses	*Chelinus spp.*

R. H. Carcasson, 1977

INVERTEBRATE IDENTIFICATION – YANUCA

FIJIAN NAME	COMMON NAME	SCIENTIFIC NAME
Sici/Vivili	Button shell	*Trochus niloticus*
Loaloa	Black Teatfish	*Microthela nobillis*
Vula	Brown sandfish	*Bohadschia marmorata*
Vasua	Clam	*Tridacna derasa*
Davui	Trumpet Triton	*Charonia triotonis*
Loli	Lollyfish	*Holothuria atra*
Ega	Spider shell	*Lambis lambis*

Patrick Colin and Charles Arneson (1995)

2012)

ACTIVITIES	WHO WILL DO IT	WHEN	INDICATORS	BUDGET ALLOCATION
1. Survey Kauviti Reef (TB)	Fish Warden Team (1 & 2) and Betani (PB)	Wednesday 9 – 10 of May, 2007	Done	Pacific Blue
2. Survey Nayamotu	Fish Warden Team (1 & 2) and Betani (PB)	Weds 9 – 10 of May, 2007	Done	Pacific Blue
3.Mark the MPA site	Fish Warden Team (1 & 2) & Betani (PB)	May the 1st - 2007	Done	Pacific Blue
4. Survey Wainibu (TB)	Betani (PB)	30 April, 2007	Done	Pacific Blue
5. Survey Daga (TB)	Fish Warden Team (1 & 2)	9-10 ni May, 2007	Done	
6. Next survey (6 months)	Fish Warden Team (1 & 2)	24-25 Oct, 2007	Done	
7. Next survey (12 months)	Fish Warden Team (1 & 2) kei PCDF	21-25 April, 2008	Done	
8. Review of Management Plan	Fish Warden Team (1 & 2) kei PCDF	21-25 April, 2008	Done	PCDF
9. Sign Board (Bill Board – Posters)	PCDF – Maps Board – Team 1 & 2	June	Sign Board available	Qoliqoli committee (team) Village committee
10. Distribute posters to Company and Hotels	Team 1 & 2	June – July	Done	
11. Next Survey	PCDF and the Team	April – 2009 April – 2010 April – 2011 April - 2012	Done	PCDF
12. Setup Fisheries Committee	Fish Warden	9 – 11 May, 2007	Committee exist	
13. Survey Gears	PCDF	30 April 4th May 2007	All in Place	

APPENDIX 6

BIOLOGICAL SURVEY AND FISH WARDEN TRAINING PROGRAMME
YANUCA
APRIL 23-26th, 2007

Purpose: To conduct necessary technical training activities to selected representative of Yanuca village of Serua District in:

i) biological survey methods and monitoring technique with low tech equipment as a capacity building and empowerment tool for the community;
ii) fish warden training for communities to manage their MPA's and fishing areas according to the traditional and national policy;
iii) conduct biological survey at each MPA sites near the villages represented from the district;

And to:

iv) assist and support villagers in marking of MPAs;
v) check and endorse villages marine management plan;

Objectives:

i) To train 10 fish warden to manage the MPA sites of the Yanuca;
ii) To train these reps in biological survey techniques and monitoring protocol as capacity building tool and as well as in conducting continuous survey and monitoring on their MPA sites;
iii) To mark and map MPA sites;
iv) To review/update/endorse the village's management plan;
v) To conduct training in coral and other invertebrates re-stocking technique using local managed resort MPA as pilot site;
vi) To train reps in fishing data collection activities in the village.

Expected Outcomes:

i) Ten Fish Warden for the village of Yanuca will be certified and graduated;

ii) Certified biological monitoring facilitators for the village will be identified;
iii) MPA sites are marked and mapped;
iv) The Marine Management Plan for the village is fully endorsed;
v) The Village reps will be familiar and qualified with re-stocking techniques for invertebrates and also as coral gardeners;
vi) The village reps will be qualified to collect fishing data from their sites.

Tentative Biological and Fish Warden Training for the Yanuca

Time	***Agenda***	***Objectives***
	Day One	
9.00 am	Prayer and Opening address by the Tui Daga	
9.30 am	Introduction and Objectives – Biological Survey	• Breaking the ice • Participants and trainers to understand their main goal and expectations • Explain Why?
	10.00 am - Tea Break	
11.00 am	What are the methods of survey?	• Participants to understand different method used and how to use them; • Groups to discuss and learn important of a methods
12.00	Practical Use of the Methods	• For participants to have a taste of the methods; • And how well their knowledge is of their natural resources
	1.00 pm - Lunch	
2.00 pm	Group Work – Practical in the Sea	• A real demonstration of how to survey the reefs and record;
3.00 pm	Marine Ecology – Matrix and identification of Indicator species	• Group work where all participants are expected to come up with a list of species as indicators
	3.30 pm - Tea Break	
4.00 pm	Map Drawing of MPA Areas	• Group work for all participants to draw their MPA areas and locate details, naming sites as much as possible
	5.00 pm - Prayer - End of First Day	
	7.00 pm - Dinner	
	Day Two	
8.30 am	Lotu and Recap of Yesterdays Topics	• Update

9.00 am	Introduction of Fish Warden by Fisheries Officer	• Understanding the function of the Fish Warden and their role
10.00 am - Tea Break		
11.00 am	Fisheries Act and Regulations	• Participants to be informed of the Law and Regulations that governs the Management Procedure of the Fishery Resources
12.00	Group Discussion	• How they see their role as Managers of their resources
1.00 pm - Lunch		
2.00 pm	Introduction to Biological and Monitoring Plan	• Group Work by the participants
3.00 pm - Tea Break		
4.00 pm	Presentation of the Plan	• Group Presentation
6.00 pm	End of Workshop - Prayer	
7.00 pm - Dinner		
8.00 pm	Presentation of Monitoring and Biological Management Plan then followed by closing from Tui Daga	• PCDF's appreciation of participant's presence and achievements

B. BASELINE SURVEY, BIOLOGICAL MONITORING AND FISH-WARDEN TRAINING AND BUDGET

1.	Transport	
	Boat Training	300
	Monitoring	300
	EY	50
2.	Personnel Allowances (5 officers@$20/day x 4 days) 3 NRM and Jiuta K plus 1 Provincial staff and Fisheries Officer for 2 days ($20/day)	440
3.	Good-will to Communities	
	Kava (Sevusevu/Tatau) @ $30/kg	90
	Meals and accommodation (4 days) (5 Facilitators @ $10/day for 4 days plus 10 participants @ $6/day for 3 days)	380
4.	Miscellaneous	300
Total		1,860