Marine Studies
The University of the South Pacific

Technical Report

1997 THE YEAR OF THE CORAL REEF-SAVE FIJI'S CORAL REEFS

SYMPOSIUM ON SUSTAINABLE HARVEST OF FIJI'S MARINE RESOURCES

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G Robin South

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1997 The Year of the Coral Reef - Save Fiji's Coral Reefs

Symposium on Sustainable Harvest of Fiji's Marine Resources

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edited by
G Robin South

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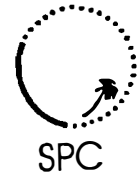

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FOREWORD

I thank SPACHEE and the sponsors of this Symposium who gave me the opportunity to participate. The Symposium was an important activity of the Year of the Coral Reef in Fiji, and provided a valuable opportunity for public participation. The issue of the *Sustainable Harvest of Fiji's Marine Resources* is of crucial importance to the well-being of the people of Fiji.

To begin I would like to quote from a recent review of coastal fisheries for the South Pacific Region[1]:

> *The greatest influence on coastal fisheries in the Pacific through the next decade is likely to come from Southeast and east Asia, where the demand for high value coastal fishes and invertebrates has led to large scale depletions and has motivated entrepreneurs to seek stocks in the neighbouring Pacific Islands.*

Coastal fisheries production in the South Pacific is estimated at 100,000 tonnes/annum, with a total value of approximately US$262 million. Eighty percent of this production is from the subsistence fishery (Dalzell *et al.*, 1996). Approximately 50% of the annual catch comes from the coral reef fishery. and of the species harvested invertebrates are the most valuable inshore resources. These include sea cucumbers (beche-de-mer), Trochus, and pearl oysters. In the small scale commercial coral reef fishery the most valuable resources are lobsters and mangrove crabs.

The current fisheries catch for Fiji is worth an annual FJ$64.1 million. Of this, by far the greatest value is from the subsistence fishery ($45,767,395), with the remaining $18,340.043 from the commercial sector. Almost all of the subsistence catch is from the lagoons and inshore waters. This poses an enormous challenge on the Government and the fisheries rights owners (*i qoliqoli*) to manage the fishery in a sustainable way. Sustainable management means that the catch taken is such that the resource will remain intact for future generations. Fisheries management in the future is likely to develop into an amalgam of conventional and traditional approaches, and it is therefore important that the traditional knowledge is not lost. The management approach must also take into account the realities of the needs of coastal and urban peoples in the Pacific region. Dalzell *et al.* (1996) state:

> *The challenge for coastal fisheries management into the next century will be to maintain production from the coastal zone as both human populations and the numbers of people turning to fishing as a livelihood increase.*

As a preamble to this timely Symposium, it is worthwhile to review some of the problems of management of coral reef fisheries. These were aptly summarised by

[1] Dalzell, P., T. Adams and N.C. Polunin, 1996. Coastal fisheries in the Pacific. *Oceanogr. Mar. Biol. Ann. Rev.* **34**: 395-531.

Dr Gary Russ in a recent article in NAGA. The problems can be categorised as follows:

Problems of coral reef fisheries are:

1. They are multi-species ecosystems;
2. The fishing effort is spread over the use of a wide variety of gear;
3. The effort is unevenly distributed;
4. There are large numbers of fishers - this leads to difficulties in gathering even basic fisheries information (e.g. catch, effort);
5. The are inadequate resources for research;
6. There is a disparity between the low importance of coral reef fisheries world-wide (total estimate of 0.5 million tonnes per annum) and their importance to low-income fishers;
7. Conventional controls on fishing are difficult to justify in developing nations experiencing rapid population growth and chronic poverty.

It is now widely recognised that reserves (10 - 20% of the stock or fishing areas) are one of the few measures that may prevent the ultimate collapse of coral reef fisheries. Reserves (e.g. closed areas for religious or other reasons) were a significant part of the traditional management of fisheries by resource owners. In the modern context, however, their importance as a major tool for coastal fisheries management is only recently becoming a part of resource management strategy in Fiji. It is incumbent on the Fisheries Division, the University and NGOs to work closely with the coastal communities of Fiji in promoting the establishment of Marine Conservation Areas (MCAs).

Recent surveys have shown that eighty percent of the population of Fiji lives within 5 km of the coast, and that 50% of rural households are involved in some form of fishing. The subsistence fishery is an important source of protein and hence of food security for most indigenous coastal dwellers.

The sustainable harvest of Fiji's marine resources is, therefore, of utmost importance to the future and security of the country.

G. Robin South
Professor of Marine Studies
The University of the South Pacific

WELCOME and INTRODUCTION[1]

by

Mrs Leba Mataitini

Mr role this afternoon is to welcome and introduce our Guest Speaker for this afternoon's symposium, Mr Peniasi Kunatuba. Before I do that I would like to echo the welcome that Isoa has extended to all of you and thank you for making time to come this afternoon. A special welcome to all the school children that are here.

I would like to set the scene this afternoon by reading a portion of `The Pacific Way', the Pacific Island Developing Countries report to the United Nations Conference on Environment & Development (UNCED) in Rio de Janeiro in 1992 describing our region. "The South Pacific is unique, not because our geographical, biological, sociological and economic characteristics are found nowhere else in the world, but because of the combination of these characteristics within our region. The South Pacific is characterised by small land masses dispersed over part of the world's largest ocean; a high degree of ecosystem and species diversity; an extraordinary level of endemicity, a high degree of economic and cultural dependence on the natural environment; vulnerability to a wide range of natural disasters; and a diversity of cultures and languages, traditional practices and customs which are central to the close and special relationship of Pacific peoples with their environments.

As a region we are custodians of a large portion of the Earth's surface. Our combined Exclusive Economic Zones (EEZs) occupy 30 million square kilometres of the Pacific Ocean - an area more than three times larger than the United States of America or China, and ten times the size of India. But the land area is only 1.8 per cent of that total. With an estimated population of only 5.8 million, our capacity to protect our fragile environments against damage from both internal actions and external influences is constrained. However, we accept the responsibility placed on our numerically small community as it is essential for the sustainable development of our region and the world as a whole."

In an article by Alan Mairson entitled `Saving Britain's Shore', which appeared in National Geographic in October, 1995 he states the following. "Why do coastlines in general evoke warm feelings in so many people? Some say that on the coast, nature speaks an eloquent truth, or that coastal erosion reminds us of our mortality and the sanctity of life, or that we flock to the sea because it is the cradle of life, mankinds watery womb.

I like the coast because, on a pristine stretch, I can stand on solid ground, turn my back on civilization, stare at nothing but the sea and sky - and stop thinking. I don't judge, classify, analyze, evaluate, remember, or forget. The mind stops. I rest."

[1] Mrs Mataitini was introduced by Mr Isoa Korovulavula, Coordinator of SPACHEE.

Linking in to the topic of today's symposium Michael Parfit in an article in the National Geographic in November, 1995 made the following statements. "The unthinkable has come to pass: the wealth of oceans, once deemed inexhaustible has proven finite, and fish, once dubbed `the poor man's protein,' has become a resource coveted - and fought over by nations. There are too many fishermen and not enough fish. Small-boat, traditional fisherman probably number 12 million yet they catch only about half the world's fish."

In some poor countries a small boat and a basket of line may be the last chance for a man to survive. Fish stocks are damaged by pollution, destruction of wetlands that serve as nurseries and provide food, by the waste of unprofitable fish by-catch, and by overfishing.

To tell us more I have great pleasure in introducing our Guest Speaker, Mr Peniasi Kunatuba. I first met Peniasi when he was an undergraduate student in Science at the University of the South Pacific in the early 1970s. It is indeed a pride of the University to see its graduates like Mr Kunatuba do well and become successful in their careers serving their governments and the region. Mr Kunatuba graduated with a Bachelor of Science degree in 1974 and joined the service of the Government of Fiji. Mr Kunatuba was the head of Forum Fisheries Agency based in Honiara, Solomon Islands for six years with the break of one year in between when he served as the Head of the Ocean Resources Management programme at the University of the South Pacific. Mr Kunatuba worked with the Pacific Island Development Programme based in Honolulu, Hawaii, for two years.

Mr Kunatuba is now back in the services of the Government of Fiji serving as Deputy Permanent Secretary in the Ministry of Agriculture, Fisheries, Forests and ALTA. The topic of Mr Kunatuba's speech this afternoon is the Sustainable Use of Marine Resources, please welcome Mr Kunatuba .

My other role is to introduce the Chairperson of the rest of the presentations this afternoon, Prof. Robin South. Prof. South is presently the Professor of Marine Studies at the University of the South Pacific. Fiji and indeed we are lucky to have a walking Marine Science expert working amongst us. Prof. South has 30 years of experience in Marine Science. Before coming to Fiji he was the Head of the Biology Department at the Memorial University of Newfoundland Canada, followed by the position as the Director of Marine Science Centre, St. Andrews, New Brunswick from 1985 to 1990. Prof. South is from Canada and yet has been able to obtain from the Japanese Government through the Fiji Government an aid donation of $12.5 million dollars to build what will become a centre of excellence at the University of the South Pacific, the Marine Studies Centre, We are indeed honoured to have Prof. South chairing this afternoon's panel of speakers, Prof. South the afternoon is yours.....

References

1) The Pacific Way, PIDC report to UNCED prepared by South Pacific Regional Programme, SPC, 1992.

2) Alan Mairson, National Geographic, Vol. 188, No. 4, October, 1995.

3) Diminishing Returns - Exploiting the Oceans, Michael Parfit, National Geographic Vol. 188, No. 5, November, 1995.

SUSTAINABLE HARVESTS OF FIJI'S FISHERIES RESOURCES

by

Peniasi Kunatuba

In Genesis 2:

After God had created man the bible says in v28
"And God Blessed them, and God said to them Be fruitful and multiply, and fill the earth and subdue it, and rule over the fish of the seas and over the birds of the sky and over every living thing that moves on the earth".

Our creator has charged us with a responsibility, a responsibility that we should and indeed shall be accountable for in the wise management of the fisheries resources he has placed at our disposal.

He has not given this task to anyone in particular but to all men. The tasking of the Fisheries Division to this role is a mere administrative arrangement to streamline how we operationalise our mandate. The onus therefore is on each man and woman to ensure the perpetual sustainence of our fisheries resources.

The Symposium Coordinator, the Organising Committee for the Pacific Sustainable Development Network Programme, SPACHEE Members, Panel Discussion Members, Distinguished Guests, Ladies and Gentlemen. I am deeply honoured to be invited to speak to you on a subject that is indeed very close to my heart.

One of the principles that has been the guiding force in the development of our fisheries resources has been:

- improving the regulation of inshore resources to maximise yields from reef and lagoon fisheries that are likely to approach maximum exploitation rates; by optimising the distribution of effort, controlling destructive fishing practices and increasing the market value of catches taken through improved handling and further processing.

This afternoon, I have been invited to speak on the Sustainable Harvest of Fiji's Fisheries Resources, with particular reference to the harvest of aquarium fish, bech-de-mer and coral.

I am sure, most if not all of you present here this afternoon are familiar with the term sustainable harvest. There is, however I believe no harm in refreshing our minds. Several authors have given their own definitions of sustainable harvest and I believe the most appropriate in our case is "the amount of fish that can be harvested from the wild;

be it rivers, lakes lagoons or the EEZ, without adversely affecting the stock levels, thus being able to exploit the resources in perpetuity."

One must understand that the sustainable levels of exploitation means: from zero harvest to maximum harvest. It has been observed that those who favour conservation measures are usually inclined towards zero harvest, while others whose livelihood depends on the same resources would favour the maximum harvest possible. An important issue that needs to be borne in mind is that zero harvest is excellent from a conservation stand point but is certainly an economic loss, if the resources are not harvested. To give you an illustration;

Live baits used by pole and line vessels have a short life normally between 30 to 40 days. Moreover, each mature baitfish produces several thousand juveniles and therefore, if the bait is not harvested they will eventually die within 40days thus a potential loss to the economy. On the other hand, the bait fish supports a pole and line fishery which is a very nature friendly mode of fishing currently, directly supporting over 1500 families.

In looking at resource management, one therefore needs to strike a balance between conservation and the economic needs of the local communities in whose `I qoliqoli' these resources are found. The underlying theme though would need to be the long term sustainability of these fragile and finite resources.

After all, this is the very purpose for which the Fisheries Division of the Ministry was established - to ensure that in whatever ways that the living marine resources are developed - it is to be in a sustainable manner to be sustainably carried out such that when our grand children come of age, the resources which have been the sources of economic gain for their grandfathers are still in ready abundance for the continuity of commercial operation.

I know exactly what is going through your minds - some of you are thinking - he is talking through his nose. Well I accept that, because this balancing act is not an easy exercise. The needs of the different communities are different as indeed their different levels of resource endowment.

Even Government's perception of the dynamics of Marine resource and their finiteness is entirely different from the long held traditional beliefs of the common villagers [Tongan Story]. I must commend the work of the USP's Marine Studies Programme in their attempt to increase the awareness of the rural communities on harmful fishing practices. This needs to be supported and expanded. The programmes of SPACHEE to this end are also commended.

The onset of a cash based economy has really played havoc with the balancing exercise of conservation versus economic gain within a sustainable backdrop. In areas where local communities have not been made aware of the implications of over-exploitation, the ready availability of cash for their products has often driven the people to unprecendented levels of harvests, with a high disregard to wasteful and harmful practices.

One of the major obstacles in our drive to achieve sustainable harvest is the lack of alternative income earning opportunities within these local communities. While other produce may be available, these may require a lot more hard work, but resulting in a lot less benefits to the people. We now have a whole new generation in the rural communities with no affinity at all to hardwork. The lure of easy money has indeed placed our marine resources at a far greater risk than before.

Given the insistent push by the various administrative set ups in these rural communities (Yasana) for monetary obligations (soli ni Yasana, for meeting houses, boats or other investments) these pressures bear directly on marine resources given that the return to the custodians from barely minimal work is indeed lucrative.

This then gives greater responsibility for all parties with a "real" interest in the resource to lock horns and work towards more lasting solutions to these issues.

The Sugar regime and its preferential prices under the Lome Protocol may come to an end at the turn of the century. When and if that does happen, there will be a shift in focus to marine resources for a "stand in" for the sake of the national economy. This inevitable outcome would need to be addressed now, such that come the end of the protocol, we would already have in place pragmatic management schemes that ensure returns to the resource custodians but at the same time safeguarding the vitality of these fragile and finite resources.

The Tourism and the Garment industries are the other major income earners for Government. These are both more fragile and with limited base for expansion. All it takes is a natural disaster to render our hotels non-operational. The opening up of China could adversely affect our garment industry. This would again shift the focus to other alternative income earning opportunities, and what better schemes than our Marine Resources to "prop" up our economy.

To you all represented here, the time is nigh upon us to get our act together towards this common goal. We should all work together now and set our house in order before the above realities do meet us face to face.

To Civil Servants, we need to get off our high horses. I know as a Civil Servant how you would like the protect your turf, maintain the independence of your territory especially from NGO's and more so if they are expatriates. Normally, if there is an inclination towards the greenies, then there is automatically a closed-door attitude.

The problems before us is real. Government has not got both the financial and manpower resources to see this through alone. We would need the support of the NGO's to complement and supplement our own meagre efforts in this area. We would push for more of similar programmes as these, but to be more focussed and practically oriented, such that the outcomes could be picked up by Government and thoroughly pursued to achieve our common Goal.

I thank you all for your interest and your indulgence. Vinaka Vakalevu and Gold Bless You.

Women's Changing Fishing Participation[1]

by

Aliti Vunisea

In the traditional context, fishing methods and technologies were socially or communally organised and monitored. Fishing was a way of life with fishing activities falling within socially defined roles. The ocean sustained people's livelihood thus its sustainability was entrenched in beliefs, customs or tradition. Changing fishing patterns and emphasis have resulted in increased fishing effort and the acquisition of modern fishing methods and technologies. In the process traditional fishing techniques and technologies, which were a vanguard against misuse or over-exploitation of resources are either bypassed or just totally lost.

The shift in focus in fishing practices and emphasis have been influenced primarily by the monetary needs generated by modernisation and people's changing lifestyles and food preferences. Apart for this, there are enormous consumption needs exerted on marine resources by increasing coastal populations and peri-urban and urban populations who depend on the local market for their sea food supply. Also obvious is the apparent increase in fishing effort and sophistication in fishing technology due to competition for resources by local and commercial (licensed) fishers. Under current regulations licensed fishers are allowed to fish up to the high water mark, which is described as state owned. To indigenous Fijians or custodians of "i qoliqoli" (traditionally defined fishing areas) the near coastal areas including reef flats are "i kanakana" or customary subsistence fishing areas. Thus increased fishing activities within the inter-tidal zone by licensed fishers have encouraged increased and intense fishing participation by locals.

Traditionally, fishing techniques or technologies were largely governed by species availability and natural factors such as the weather, seasons, winds, tides and moons while currently fishing focus is largely shaped by the market demand (price on the market, availability of buyer, preservation possibilities). These however are largely true for areas affected by commercialisation.

Women in Fiji dominate in the subsistence sector with a substantial proportion of their catches supporting household dietary needs. The majority of their fishing activities are concentrated on reefs and near reef areas (sand flats, mangrove areas, lagoons). Currently women are increasingly involved in the local commercial or village artisanal fishery through their harvesting, processing, preservation and marketing activities.

Women's involvement in the local commercial fishery has been through either their own, their husband's or other male relatives efforts. Thus at the village level (this is especially true for areas which have transportation access to main urban centres) women increasingly sell part or most of their catches at nearby municipal markets or along

[1] Based on studies in Ucunivanua and Kumi, Verata District, and other areas visited around Fiji.

Women's commercial involvement although small-scale, is regular, consisting of weekly selling of molluscs, crustaceans and a diverse range of coastal edible species. For example: Women from the Verata area sell ark shells (Anadara, kaikoso) almost weekly (at an average of about 10 bags per week, 30 kg per bag), at the same time sending 6-8 bags of kaikoso to buyers from the Western division (fortnightly). Women's rate of fishing and subsequent selling, occurring at most times on a weekly and during certain seasons on a almost daily basis is more regular than men's fishing activities. They also harvest a diverse range of species when compared to men whose efforts are focussed on a narrower range of more lucrative species such as beche-de-mer, octopus, lobsters, and large finfish.

Official statistics and documentation however do not portray women's fishing and local commercial activities as important because their fishing activities are usually interpreted as basically subsistence and without monetary significance. The changing face of the subsistence sector and the gradual commercialisation of basic marine food sources have been substantially overlooked. The Verata area for example is a major weekly supplier of seafood to the Suva market. The influence of commercialisation is evident in the increased effort in fishing and in households having their own smoking sheds, the presence of middle buyers in the village and selling within the community. With the minimal acknowledgement of women's fishing participation, the impact of their fishing activities on the reef systems are at the same time bypassed.

Traditionally, there were defined gender roles in fishing with women fishing the shallower coastal areas while men ventured out to the deeper seas. Thus women were associated with and more familiar with the immediate coastal and reef areas. Men on the other hand engaged mostly in ritualised fishing activities which were only occasionally practised for specific traditional occasions. These traditional fishing ventures which were mostly practised in deeper sea areas, only involved men from the master fishers clan; and at most times targeted certain species only (such as turtles or certain fish species).

Currently women increasingly fish into previously male-defined areas, and male-related fishing activities, with fishing effort becoming more pronounced to meet both consumption and market needs. Beche-de-mer is now also increasingly being dived for by women. Thus all these fishing activities place enormous pressure on reef resources. In Verata, women fish at times 5 days a week, with Wednesdays, Thursdays and Fridays being commercial fishing days. Men whose wives are not fishers also fish specially for marketing purposes on the same days. The area has extensive foreshore flats, with prominent sheltered inshore and offshore reefs which provide the base for its rich diversity of species. With the current rate of exploitation, some important reef species may be totally lost. Apart from this there may not be ample time for species to regenerate given the intense fishing activities. There would be the danger then of fishing out or over-exploitation of certain species resulting in the loss of reef ecosystems.

Social controls on fishing

There is limited evidence of direct monitoring or conservation systems within the traditional set up, but there were in place social systems or institutions which checked or

controlled marine resource use. These consisted mainly of customary protocols and beliefs. In Verata as in most villages in Fiji people belong to different clan groupings which have specifically designated roles. Therefore in a village organisation there would be a chiefly clan, warrior clan, carpenters and fishers clan (gonedau or kai wai). Master fishers or "gonedau" were considered the authority on fishing skills and knowledge and they would be most involved with fishing. These roles then restricted fishing participation. For example, women from the chiefly clan did not normally partake in fishing activities.

There were also traditional restrictions on fishing activities. Such restrictions or taboos were implemented on the death of a high chief, the birth of a first born in a chiefly family or periodic taboos on certain fishing grounds.

People did not fish when there were other communal activities to attend to. To do otherwise would be to go against the wishes of the "vanua." In addition if there were people who had differences with relatives or certain elders, their fishing ventures would be catchless. There was a high respect for the gods of nature and the wrath they could instigate (termed sau) on people who went against communal directives. Ritualised fishing activities had certain protocol to be observed before the fishing venture was actually carried out. In addition to these there were restrictions placed on fishing at certain periods and these resulted in partial closure of certain portions of fishing areas or "i qoliqoli." Therefore at the village level fishing was entrenched into people's way of life, and conservation was based on communal usage, needs and the social structure.

Changes to social structure

Modernisation and the associated rural-urban migration of people have immensely affected marine resource use. Currently a lot of village elders, chiefs and leaders reside in urban centres. Therefore there is a sort of absentee authority with chiefs or elders controlling village affairs from their new locations. Even though when this happens representatives of chiefs or clan leaders are elected, people are still subject to two sets of authority and there is an obvious loss of respect for the system. In addition monetisation has also empowered other people at the village level to exert their own authority. Thus people with educational standing and especially financial standing set up their own power bases. Western influence and teachings further aided by religious principles which undermine traditional practices contribute to an erosion of the traditionally based structure. All these changes to a certain degree erode respect for the supernatural and customary beliefs and their significance to marine resource use. Conclusively with these changes there are also changes to social controls that govern resource use at the village level.

Women's fishing methods

Basically women's fishing activities are simple, with tools and technologies primarily traditional. Fishing methods include gleaning (collecting, prising, breaking away from rocks, catching) trapping, (both mobile and immobile) stupefying, netting and line fishing. For most of these methods women use their bare hands, sticks, rods, kitchen

knives, scoop nets and hand lines. In most instances specific methods were employed for different species with the fishing pattern basically seasonal.

Fishing methods utilised by women usually require keen eyesight and skill with the use of the hand and feet. In addition, the intimate knowledge and understanding that women have of their immediate environment enables them to easily identify and catch prey. Women's fishing methods may sound and look simple but they are in reality complicated, and require extremely adroit use of the senses, and skilful utilisation of fisheries knowledge. Thus women, in their everyday interaction with their coastal marine habitats possess a "bank" or resource which had never been fully utilised because of traditional and societal constraints.

Some methods of fishing women utilised:

- netting (small-scale)
- chasing fish into shallower areas and catching fish bare-handed
- gleaning-picking, prising, digging-seasonal collection-"ika ni yabaki"
- mobile traps-only catching fish trapped within circular or other enclosures
- line fishing

Women however increasingly use detrimental methods such as the stupefying of fish and breaking up of octopus lairs.

Changes brought about by modernisation and other factors include:

* the increased intensity in fishing effort and participation
* use of advanced fishing technologies such as high-powered boats and advanced diving gear.
* increased use of detrimental fishing methods-"duva"
* the loss of certain traditional restrictions
* women fishing into male defined areas eg. beche-de-mer diving
* increased involvement of women in fishing and marketing
* change in fishing focus from the provision of seafood for home use to fishing for the market with the surplus kept for family use
* fishing pattern determined by market and other external forces

Although women are actively involved in the local commercial fishery their harvest levels are still low, thus their fisheries are one of the most sustainable. Their fishing activities are constrained by, the lack of more appropriate transportation to the markets, limited preservation facilities, poor marketing facilities, lack of finance and credit support systems and limited access to and use of modern technology. Technology usually benefits men thus women's fishing methods are still basically simple and traditionally employed. These simple fishing methods place a check on their fishing activities.

To overcome problems that may arise as a result of a lack of proper monitoring of women's fishing activities:

1. There should be more education of fishers at village level. Such workshops should also target women fishers in particular. Village fishers should be educated to assist in their understanding of marine life, ecosystems and resource depletion and this should include:

a) target group education to create an awareness of existing ecosystems and understanding of the fragility of reefs and the reef ecosystem. This should also include an awareness of the effect of land-based activities on marine habitats.

b) simple methods of conservation such as turning back overturned stones, putting back in estuaries dead mangrove branches and leaves after fishing expeditions, restraining from breaking of coral branches and the use of "duva" which destroys ecosystems and young marine life.

c) women should also be trained to exploit the advantage they have as educators of *children or the younger generation.*

2. There is a need for a re-strengthening of traditional institutions which helped to control marine resource use. This should be a joint effort by the government and the people. For example the role of the master fishers could be legalised so that they could be utilised as managers and monitors of resources. Social restrictions could be legalised. Regulations that control marine resource use should be updated to meet current context (increased commercialisation of fisheries). Village leaders, elders and chiefs should also be made aware of their vital role in marine resource use and management. There should be more community participation in the planning, implementation and monitoring of resource use systems. There is a definite need to include women, who are major users of the reefs in such planning.

3. A restructuring as mentioned should then result in an integrated approach where village fishers or custodians of resources are involved in conservation plans regarding their fisheries.

4. There is a definite need for a monitoring system that checks fishing in the subsistence sector. Although women's fishing activities may be seen as trivial, consistent and pronounced use may result in the loss of species, loss of habitats and the loss of traditional fishing methods. A neglect of the mangrove and coastal habitats could result in the degradation of the habitats themselves and the loss of nurseries or breeding grounds for a diverse range of reef species. On the other hand if women's fishing activities are not properly monitored, and they are not brought into the mainstream of fisheries development, the enormous skills and knowledge that they possess cannot be fully utilised. Thus an undermining of simple but continous fishing pressure on reef systems may result in well protected reefs which lack the diversity of species and ecosystems they now have.

LIVE CORAL HARVESTING

by
Walt Smith

With the recent articles being published about concern over the companies who engage in the harvest of live coral I would like to take this opportunity to perhaps set the record straight with regard to the grossly misinformed statements I have seen published as of late. As I sit quietly and read most of these statements one fact becomes clearly obvious.....there is a justified concern that we all share over the future of our worlds last frontier.....the coral reef. Another thing that strikes me quite oddly is that although a great number of arrows are shot in my direction not one person has approached me or, given me the opportunity to inform or educate people exactly what is that we do until now. It is true that public opinion has us labelled as terrible villains who stalk the innocent, rape the resources and move on to better pastures.

At the risk of sounding overly defensive allow me to dispel some of the popular but uninformed views regarding my company's activities. It is true that there is two other companies such as mine but I can only speak for myself and our commitment to ensure a sustainable harvest. I sincerely hope that some useful knowledge may be gained before a viable and sustainable industry is destroyed out of innocent, however, ignorant paranoia.

I have been involved in this industry for the past twenty five years. During that time I have seen great advancement in the technical achievements in this hobby. From a crude beginning in the late 1960's our industry is responsible for bringing about change not only in the aquarium hobby but in the scientific community as well. The life support systems available today compared to those of only twenty years ago are like comparing a paper plane to a ticket ship. These advances created by our industry's desire to learn and preserve have made possible many scientific observations and discoveries. It can easily be stated that most marine biologists today got their first glimpse of the wonders of the sea through an aquarium. By the same token many of the world's public aquariums have provided a great deal of knowledge about the sea to people who never have had a chance to experience it's wonders first hand. Where do people think all this stuff comes from? Our industry serves to educate and initiate concerns for our reefs for millions of people world wide. Let the truth be known that we too are very concerned for the future of this important resource. Who is in a better position to appreciate it's wonders then someone who has spent his life trying to share it with others? As an architect many years ago I did not need this business to survive, I chose to be a part of it because of an undying love the sea and the creatures within it.

Before receiving the approval to operate in Fiji our company was the subject of several studies conducted under the highest standards by those that have the appropriate knowledge to make such an assessment. The most recent was conducted by the South Pacific Commission with a team of seven scientist from several South Pacific countries including Tahiti, Fiji, Tonga, Samoa, New Caledonia and Vanuatu. In compiling their data they spent two very close weeks with our company in Tonga observing our technique and making very precise surveys to determine if our activities were

environmently sound and the resources sustainable. Although this report was conducted in Tonga (our parent company) the subsequent report concluded that we were highly professional and operated with great care and posed no threat to the environment. Based on their recommendations to the government, Tonga now allows for five licences to be held for the export and their area of reef is only a small fraction of that of Fiji, who only allow three such operators. This proves that the Ministry of Fisheries is well aware of what is a sustainable limit and they have set some very clear guidelines for the three companies to strictly follow. The other organisations that have conducted similar studies at the request of the government were S.P.R.E.P. (South Pacific Regional Environment Programme, Oliver/Smith) and Dr David Clump of James Cook University in Australia. All reports have concluded that we engage in a sustainable harvest and operate with concern for the environment and each report is a matter of record filed with the Fiji government. Furthermore, our company came highly recommended by the Ministry as "one of the most professional and environmentaly conscious companies in this industry today" and in their bid to F.T.I.B. in a required letter of support it was stated that "allowing our company to operate would bring more professionalism to this industry in Fiji".

Whew! after having said all that I would like to present the following facts to perhaps quieten some of the nasty rumours being spread at this time and maybe enlighten you a little bit about our trade.

Q) It is said that our company has left Tonga or even has been deported since I have taken everything from the sea and now I am about to do the same in Fiji.

A) Nothing could be further from the truth! My company still operates in Tonga and as a matter of fact, ships about twice a week to our station in Fiji. What few people realise is that 40% - 50% of our entire stock actually comes from another country, which of course has no negative effect on the Fiji reef system. This has been a part of our plan from the beginning and has a great deal of support from the fisheries because of it's obvious relief to the local resources. At present we bring in from two other countries but have plans to include seven more countries to our export and make our Fiji station a true representative of the region and at the same time greatly increasing the export dollar for Fiji.

Q) Some people claim that I will soon "rape" everything from the Fiji reefs and then move on.

A) Hardly true! We have made a very serious commitment in Fiji. Our station is already recognised as the most modern and technologically advanced installation of it's type in the South Pacific. To date we have spent over $600,000.00 and by the time we are finished with our final phase of construction we will far exceed the million mark. I would have to be a real fool to invest that kind of money on a temporary or "fly-by-night" operation. I love this industry and the animals that I am privileged to take care of. My attitude is to spare no expense to ensure their good health and well being while they are in my care as well as in transport. One look around my facility will prove this point.

Q) Many people claim that I will soon take all the coral from the tourist and divers view?

A) In most of the studies done it is estimated that only about 0.5% of the visible coral on any given location is even appropriate for our use. Most of the coral is either too big or not detachable enough to sustain live. You must remember, we are in the "live" coral business and if it is too big to transport or we have to break it up then there is a good chance it will die and only becomes waste product for us. We spend a great deal of effort to train our divers not to waste the resource, after all, those big pieces will give you a harvest next year and many years after. We don't just go out there and start bashing around with a hammer like some people have accused us of doing. Our collecting habits are very selective. We train our divers to look only for solitary pieces at about 8-12 cm. Most Acropora sp. (one of our target species) is capable of growing up to 15cm per year so in many cases we are interested in less than one years growth. There are other trades that use crowbars and rip up everything in sight but this type of collecting would serve no purpose to our industry. It has been said by one of the dive operators in Tonga, where we have worked for the past eight years, that he has seen our boats on the same reefs week after week and he still cannot see where we have been when he dives there.

Before I received my licence to operate in Fiji I had several meetings with the fisheries regarding the tourist industry. I expressed my concern that I did not wish to harvest in any areas where dive companies took their tourist on a regular basis, for obvious reasons. We sat down with a map and circled what would be the most appropriate areas to start my work. One exception is the product called "live rock" which is collected on the coral coast.

Q) Now, you might ask, what exactly is live rock?

A) Live rock is really one of the most misunderstood items that we deal with, perhaps because of it's name. It is actually pieces of porous rock or very old dead coral that has been covered over by an encrusting red/purple algae. These algae are called "coralline" and they grow very fast and cover and smothers most stationary corals in there path. Our industry has a market for this algae covered rock because of it's colour and it's biological properties. The coralline algae actually have the ability (in simple terms) to absorb the dangerous build up of nitrate which can kill fish also, it is possible to place some of this rock in your aquarium and in time all your rocks will be a beautiful colour of red or purple. However, on the reef, this encrusting algae can be devastating to some of the more stationary types of live coral and if you have ever been snorkelling on the coral coast lately you may have found yourself wondering why they call it the "coral coast" in the first place. Of course, the muddy river run off from forestry and various forms of pollution from pesticides and large scale construction have also done their bit.[1]

But it never fails, whenever someone watches us picking up these dirty old rocks full of weeds their comment is "look at all the coral"! My usual response is to ask them if they

[1] Editors Note: The crustose coralline algae are actually an important part of the reef since they are the cement that binds it together. They are not harmful but very beneficial.

can identify which one of these rocks they would call "live coral". Little do they realise that our work has just begun as we now have scrub and clean all the mud and grime off the rocks and "cure" them in our system for a week to make them suitable for export to our market. Another thing that is not mentioned is the claim that we are removing all the rocks, again we have to point out that the major portion of the rocks are either lacking the coralline algae or are far too big for our purpose. No one seems to notice that by removing some of these harmful algae we can actually do our small bit to help the reef recover. As we move up and down the coast collecting this algae covered rock it is very easy to see that over 90% of all rocks are still in place. I repeat, we only sell the algae ....not every rock in sight!

Q) Others claim that we are taking advantage of the poor people from the villages by stealing their resources and then moving on?

A) We have always had a very serious commitment to the people we work with. Once a village proves to us that they have the right type of product suitable for our export we meet the chief in the traditional way (Sevu-sevu) and become committted to helping them as much as they help us. I am not a new comer to the island way of life and tradition, I am very cautious not to take the Fiji people for granted. I have watched just one village that we work with receive over $90,000.00 in the last eight months from our company for their fishing royalties. They now have lights in the village, a finished community center, toilets and they have just approached me about a new phase of their school project. I am proud to say that I have helped to make this all possible for them. I remember reading in one article a few weeks back that a man was proud to be making $60.00 per day from our trade when he only received that same amount for a whole weeks work in the hotel. The writer sneered as if this was disrespectful, I say, what's wrong with this man to be proud to have a job to better provide for his family just because the other man doesn't understand it.

When fisheries first came to see me they made it clear that part of my responsibility was to ensure employment for those in some of the outlying villages where employment was hard to come by. We now work with two very remote areas who have little chance of finding a good job other than by moving into the already overcrowded cities. With over 65 employees I believe we are doing our part in a small way to help in the economic development in Fiji, not to mention the export dollars that this country benefits from our export twice per week.

Q) It is often asked how do we express our concern over an environmentaly safe future for the coral reefs in Fiji?

A) The answer is obvious. There are some people that will say no harvest of any kind is the only answer. On the other hand there are some scientists who claim that small amounts of removal can actually have a positive effect on the reefs ecology. With the proper reef management in place and by the Ministry of Fisheries limiting the operators to just a few skilled and qualified companies who have been properly screened and meet the F.T.I.B. requirements and approvals, there is little doubt that the harvest within this industry will definitely remain sustainable.

One example is to look at is the destruction that a cyclone can cause. Even though this example is in the extreme, the reef flat and the upper portions of the slope suffers almost total destruction yet it has been proven to be almost fully recovered in about five years. It is easy to point the finger at us because we are the most obvious target with live coral exports in plain view. However,, it has been proven by the experts that we actually cause little threat to the environment while fisheries monitors our activities and is responsible for choosing the most professional companies to operate. Admittedly there is a fine line between harvest and economic value to the community and we are certain that we have proven our worth while causing no negative side effects. We are also very concerned with reef damage and sustainable harvest and understand the consequences if this resource is not properly managed, more perhaps than most people here today, after all .....our livelihood and reputation depend on it if we are to survive.

In my eyes the true culprits who never even get a slap on the wrist are mother nature herself with her devastating cyclones (we can't do much about her). Industrial waste pumping millions of gallons of very yukky stuff out into the reef every day. Ever visit the discharge from the sugar mill in Lautoka? Or, check out the river in Lami but be sure to hold your nose first.

What about the tourist industry itself? Yes, there are more pieces of dead, bleached white coral (with eyes glued to them or something just as silly) on the shelves of souvenir shops, trinket shops and roadside stands then I will ever export in five years....but people say....that's for the tourist!

What about forestry by clearing the land and sending acres of mud down the rivers to smother the reef? Then there is farming, every time it rains rivers of poisonous pesticides poor over the reef. Then there is road building and large scale construction and of course don't forget the dynamite fishing (but of course, nobody knows it's still going on, after all, it's outlawed). You see, I am also very concerned for the need of good reef management and am very aware of what should be considered a sustainable harvest. SUSTAINABLE is the key word here and we have made certain to play by all the rules, had all the reports in place and proven beyond a shadow of doubt to those with the proper knowledge that our company operated under the highest standards of professionalism. All of the marine biologists who have visited our facility have been amazed at the degree of professional standard in which our facility has been implemented. It seems that only those without this background and experience are those willing to make the loudest noise. We set standards for our divers and expect them to follow our training which includes proper reef management and how to recognise the appropriate harvest to minimise any waste. Those that do not follow our rules are finished.

Q) Do we allow outside visitors into your station?

A) As I have mentioned earlier, we are very proud of our installation. I often get requests to come and see what we do and if I know that the person is genuinely interested they are most welcome and I wll be happy to give them a tour. However, about a month ago we had an incident where a van pulled up and a man jumped out with cameras around his neck and started clicking pictures at the speed of light. When I

finally made it over to him and asked him why he was here taking all those pictures he lied and told me that he was with the government agency and was here to run operations like mine out of Fiji. When I asked him to please stop taking pictures he got in his vehicle and continued to click away. Of course I consider this behaviour rather abusive and threatening and am not keen to leave myself open for that kind of attack again.

However, another thing that I might mention is that part of our proposal to the government was to open our facility one day each week to the school system. This is something that we started in Tonga and is has become a very popular day trip for the all students. We believe that by showing them first hand some of the creatures in the sea they have an opportunity to start appreciating this vast wonderland at a very young age. We make certain tanks available for touching and we give them interesting talks about the different creatures and their habits. As soon as our facility is completed here in Fiji we will be contacting the schools and scheduling one school per week throughout the school year.

In conclusion, I would like to take this opportunity to read some parts of a letter that was sent to me by Eseroma Ledua, a reef scientist working with the South Pacific Commission in New Caledonia.

I guess it can be answered...do we care about a sustainable reef management?

You bet we do, and we will offer any help or information to those concerned.

FISHERIES MANAGEMENT PERSPECTIVES : CORALS/ BECHE DER MER/AGRICULTURE FISHERY

by

Aisake Batibasaga

CORAL FISHERY

The Fisheries Division views corals or any other targeted fisheries as a renewable resource that should be developed, be it for subsistence, commercial or export purposes as a source of revenue earnings. However it is the Division's duty to see that coral harvesting and exporting is done in a conservative and sustainable manner. It would be wrong and counter-productive if Fisheries tries to block-off the development of a resource that could generate income to coastal people, add foreign exchange for the country and provide employment opportunities. This is the Division's objectives. People may be looking at coral fishing activities as the main threat to coral reefs ecosystems, which could be fairly debatable.

Threats to the health and productivity of coral reefs are many. Even without the impacts of humans, there are impacts sustained by natural causes/stresses such as cyclone, storms, seasonal floodings and outbreaks or predators of corals like Crown of Thorn Starfish, and diseases. Siltation, sewage pollution, badly planned coastal development and tourism, over-exploitation of fish and destructive fishing methods all contributes to coral reef degradation. Coral harvesting, unless carried out in a sustainable manner, will exert an additional pressure.

USES OF CORALS

1. Marine curios

A wide variety of reef corals are being harvested and exported as marine curios, others are exported dead to decorate marine aquaria particularly to the US. About 50 species are collected for this in Fiji, but 70% of these are in the genus Acropora (using fast growing, branching corals).

2. Live Corals and Live Rock for Marine Aquaria

Dead corals have been used for many years to decorate private and public acquaria. Recently, however, there has been a dramatic increase in the use of live corals for this purpose. This is because of new, simple technology to maintain tropical organisms or "mini-reefs" in tanks. The main corals used are Catalaphyllia, Euphytha, Goniopora and Favites.

Trade in "live rock" has also grown dramatically in recent years. Live rock is loose coral rubble or chiselled off pieces of coral limestone with marine organisms attached. This

material provides a more natural environment for reef animals, is decorative, and has an important role in mini-reef tanks as a natural filtering system.

3. Medicinal Uses

Reef corals are used in bone graft operations to replace sections of damaged bone. In time, new bone grows over the template provided by the coral. The advantage of using coral implants over bone implants, which is the technique usually used, is that the human immune system does not seem to recognise coral as foreign material and so does not reject the implant.

This technique has been used in Europe and Asia since 1982. Experimentation is underway for its use as prosthetic materials for eyeballs.

4. Research

Many coral reef scientists need to remove specimens of live coral for further studies in laboratories and universities. The amounts of harvested coral are usually small, and the removal should always be conducted using required procedures.

Coral and Coral sand is also used for the purpose of building materials, and the use of coral for septic system construction in Fiji has been on going for the last 30 years. This poses a lot more destructive impacts than harvesting or collecting corals or live rocks for the Aquarium Market.

Coral harvesting for exports first started in 1984 in Fiji with one operator for Ornamental Corals. Under the Fisheries Guidelines, Coral is a living organism and as such is renewable and can be developed as an income earner if harvested and regulated in a sustainable fashion. However, this income is very small and the benefits intangible if compared to the value of reefs lost to fisheries, protection of coastlines and low-lying islands, tourism and other natural measurable benefits.

CORAL PRODUCTION 1996

a) Live Coral (1996)

COMPANY	VOLUME EXPORTED
1. Acropora Fiji Ltd	102953 Psc
2. Ocean 2000	83183
3. Sea King	277
4. Turagaiviu Ent.	1010
5. Walt Smith Int.	26901
TOTAL:	214324 Psc

a) Coral Rock Base (Aquarium rock)

COMPANY	VOLUME EXPORTED
1. Koroi & Sons	1163 Kg
2. Ocean 2000	146900
3. REL Fishes	89900
4. Sea King	72
5. South Seas Export	97588
6. Walt Smith Int.	88300
TOTAL:	423923 Kg

Existing Management Guidelines :

There are no formal regulations which specifically cover corals (now being reviewed) except the number of management guidelines which were set by Government over the past years and were continuously being updated or amended.

1984 Guidelines :

Set the criteria for private sector involvement and also provide the basis to develop and test management measures before refining them and incorporating them into a fisheries regulation.

1991 and 1993 Guidelines :

New management guidelines were established and revised, which cover harvesting procedure for corals. (Supplementary Harvest Guidelines).

The harvesting of Corals for exports has recently become an important commercial activity, and has attracted a number of foreign investors to set up business in Fiji, in partnership with local Fijian entrepreneurs. The situation is becoming of great concern to a lot of people especially to traditional customary fishing right owners, conservationists and the general public.

To improve the current situation, a proposed management framework might ease these concerns.

General Guideline for Harvesting of Coral

1. No person shall take any coral (live or dead) in Fiji waters unless that person has obtained a valid licence.

2. Licensing Elements

- Approval to harvest corals : Any person or firm that wishes to engage in the harvesting of coral in any Customary Fishing Rights Area (CFRA) should seek and obtain an approval letter from the CFRA owner for endorsement by the Provincial Administrator (Commissioner) and to submit such approval letter

to the Fisheries Division or Lands Department (for dead corals) for processing of a licence.

- Coral assessment surveys : Prior to issuance of a licence, FD will undertake a coral assessment survey to : (a) establish a quota (number of pieces) to be harvested from the area surveyed; (b) demarcate the harvest area, including any restricted area (no picking of corals); (c) indicate the collection method to be used by the collectors.

- Issuance of Licence : Following the survey, FD or Lands Department (for dead coral harvesting) will issue the Licence and a map indicating the area where the harvest of coral should take place.

3. Coral Collection

- Coral Collection : The local resources custodians or fisherfolks should be involved, to the maximum extent practicable, in the collection of coral.

- Gear Restriction: The use of SCUBA gear equipment is prohibited. The collection of coral is to be done by hand.

- The company will be responsible for the actions of the collectors.

4. Exporting Procedures - Export Permit

- An exporter of coral products should obtain an Export Permit from FD for each export consignment. When applying for a permit, the exporter should submit separate records of:

    - species of coral
    - the number of pieces of coral
    - total weight and
    - monetary value for the shipment

- FD should visit the packing site to check the records provided by the exporter during the packing of the shipment before issuing the export permit.

5. Number of Operators

Government (FD) should restrict the number of coral operators to six (the present number).

Existing Problems :

1. The current Management Guidelines apply to all coral harvesting categories and all coral operations. The guidelines do not differentiate between the different coral categories or market.

2. There are two government agencies involved in administering the licensing procedures: FD (for live corals) and Lands Department (for dead corals and "live rocks"). This has created some confusion among the operators and developers, and has made it difficult to monitor coral harvesting operations. Hence at present, the collectors have been collecting corals without any baseline surveys being done by FD as required in the existing guidelines.

Solution :

It is therefore proposed that :

1. Designate one agency to receive and process all applications to obtain licences to harvest coral or export permits to export corals.

This would avoid any exporter from seeking consent to extract or export coral from a number of separate government agencies. The single Office should process all applications and would secure approvals from the other agencies or authorities. The other agencies should delegate their authorities to the single office.

- Fisheries Division is considered the appropriate body to receive and process all applications for licences to harvest corals or to issue export permits. The Lands Department might consider delegating its authority to FD to issue licences for the harvest of Live Rocks or Aquarium Rock Base. The would avoid the problems encountered in following guidelines and monitoring.

2. Proposed specific Management Guidelines for each type of Coral harvesting.

Harvest and Export of Live Corals/Coral Boulders for Ornamental Purposes

Fisheries Division has carried out a number of coral assessments in a number of "qoliqoli," and the results obtained to date indicate that medium to large scale harvesting of live corals is detrimental to the coral reef ecosystem and the related subsistence and commercial reef fisheries. The methods used for the removal of live corals or coral boulders are very destructive.

The harvesting of live coral and coral boulders should be carefully monitored and controlled. Government should seriously consider banning or limiting the exports of live coral or coral boulders for ornamental or decorative purposes. However, a number of operators are already engaged in this and considerations need to be given to the implication of a ban. Otherwise, it should adopt a cautious development approach, and consider imposing stricter management measures to control the fishery.

Guidelines for harvest of Live Coral and Coral Boulders

The operator should follow the guidelines described under the General Guidelines and shall also observe the following additional guidelines:

1. FD will, following the initial coral survey on an area, issue the Licence to the operator. The Licence will show the species of coral to be harvested, the quotas (tonnes) to be harvested, method of collection, and area of operation (fringing reefs and inner lagoon reefs). The proposed allowable quota is 1.0 tonne per hectare (ha) per year. The operators will meet the observers' incurred expenses.

2. During the harvest of live coral in an area, FD will carry out periodic monitoring (6 months-1 year) of the stocks and the harvesting operations (observers to be deployed for a week on a monthly basis) and will advise the custodians and the collectors when the operation should cease in that area. FD shall rotate the harvesting areas.

3. No harvest of live coral or coral boulders should begin in a new area without a coral survey being carried out. Operators should notify FD of its intention to harvest a new area, at least six months prior to harvesting.

4. The operator shall allow FD observers to monitor the harvesting of corals.

Harvest of Coral Rock - base ("live rock") for Aquarium Purposes.

The collection of dead coral (live-rock) for aquarium purpose has been proven to pose no dangers to the coral reef system. The harvesting techniques used involve the removal of limestone rocks using limited tools or the collection of loose limestone boulders with algal coverage by hand. The harvest of dead corals for aquarium purposes can be pursued but within strict guidelines to ensure the protection of the reefs and the associated fisheries.

Guidelines for Harvest of "Aquarium Rocks"

The operator will observe the guidelines described under the General Guidelines for all coral uses (above) including the following:

1. FD should carry out an initial coral assessment survey before the harvesting of dead coral (aquarium rock) can take place in any one "qoliqoli."

2. FD will submit its coral survey findings to the Lands Department, which will issue the Licence for the operator to start the harvesting of dead coral. FD will impose a quota system for the harvest of corals; the quota for each area surveyed and the methods to be used should be indicated in the Licence. The proposed quota is 1.5 tonnes per hectare (ha) per year (the quota to be reviewed by FD).

3. Collection of the corals to be carried out during high tide to reduce damages to the coral reef system.

4. The use of SCUBA diving equipment and hookah gear shall be prohibited.

5. Operators should not start harvesting new reefs without notifying FD and only after satisfying (1) and (2) above.

ORNAMENTAL FISH PRODUCTION (1955 - 97)

	1995				1996				1997			
Company	Volume (psc)	Mean (month)	Range	Mean (per wk)	Volume (psc)	Mean (month)	Range	Mean (per wk)	Volume (psc)	Mean (month)	Range	Mean (per wk)
1. Aquarium Fish Ltd	163100	13592	9400-16700	3398	169600	14133	10,700-18,200	3533	26,400			
2. Koroi & Sons	948	2 months			200							
3. Tasu Ltd	trial											
4. Turagaiviu Enterprise	829	3 months										
5. Water Life Exporters	5800	644			8350	928	300-2300	232	2877	1439	970-1906	360
6. Ocean 2000									4000			
7. Walt Smith Intenl.					942							

4 Companies operating in 1996 - 97

Aquarium Fish Trade : introduced and ongoing for the last 20 years.

1. Not used as food fishes (commercial or subsistence).
2. Fast growth, high fecundity and short life cycles - most in months.
3. Have high density per given reef area eg. damsels, butterfly, angelfishes, gobies, etc.
4. Do not significantly contribute to the food chain, since most relatively small in size, not attractive as food for larger predatory fishes, well sheltered (refuges are crevices and coral undergrowths) and some inconspicuous.
5. Aquarium Fishing is highly selective on species, does not target all small reef fishes, low catch rates (using wall nets having a 50 - 50 chance of making a catch.

Restrictions Needed :

1. Licence to be issued for each fishing ground, and restricted to two collecting areas per company.
2. Permits to be paid - say for over 1000 pcs per export permit.
3. Monitoring by Fisheries to be done at any time to be paid by the Company.
4. Number of developers to be maintained at 4.
5. Quotas per company not to exceed 150,000 (fish) per year.

If harvested sustainably with good management guidelines, then should not impact on the ecosystem as a whole. There should be tight monitoring introduced so that cyanide or any other chemicals should never be used. Only nets to be used. 1982 Guidelines and 1984 Cabinet . Guidelines address the sensivity of issues associated with the Fishery, the number of applications and the resource stock level in each goliqoli.

Beche de mer (Holothurids)

This is one of the most valuable marine invertebrate Fisheries in Fiji and the Pacific region. There are approximately 12000 species presently described, but only a few of the 300 species that occur at less than 30m depth are harvested (of which about 18 species are being harvested and processed for export from Fiji). They are gutted, boiled, smoked and dried for export. The export destination is predominantly Asia (mainly Hong Kong and Singapore) where they are considered a culinary delicacy, and also useful as medicines.

Some beche-de-mer species are consumed locally (mainly sandfish, black and white teatfish, and brown sandfish), hence sandfish (dairo) has been banned for export, perhaps with the aim of restricting the resource for subsistence needs. Holothuria scabra has restricted distribution, being confined near estuaries and inner lagoons with terrigenous influence. Its accessibility makes it prone to overfishing in very short times, hence the ban. However, it is now continuously exported due to exemptions and simply non-compliance. Beche-de-mer exports from Fiji have fluctuated around the last 15 years, peaking in 1988 at 717t and declining thereafter between 30 and 400t. The export volume in 1995 was 276t, rising again to 630t in 1996.

Beche-de-mer species are found mainly on sheltered lagoons and reef flats, and even on deep lagoon slopes with sandy slopes and passages down to over 40m (for redfish and white teatfish). Scuba and Hookah gears have recently been used for harvesting the deeper reef slopes and lagoons. The initial exports of BDM were mainly for the high value species (sandfish, white and black teatfish). But with the expansion of BDM markets due to expansion of Chinese Communities, and high demand and overfishing- has resulted in the creation of markets for lower value species. Hence the export of BDM, instead of declining has recently been increasing. The export volume has been maintained at that level most probably through the exploitation of new or distant reefs and the harvesting of lower valued species such as lollyfish, prickly red fish, stonefish, triggerfish, and so on. (see listing for 1996 Exports).

A comparison of the few assessments made on BDM in Fiji has indicated that stocks are presently over exploited (eg. Gentle 1979, Stewart 1993, Fisheries Surveys 1994 & 1995). Other surveys has also confirmed that villagers (eg. Beqa and Tavua) have ceased gathering due to over-fishing. However, it must be noted that the BDM Fishery in any country has been characterized as a "Bust and Boom" industry, as could be gauged from the last 3 - 4 centuries of the trade in this resource.

The BDM resources provide an attractive and easy source of income for many village people to supplement their basic needs. The increase in the number of buyers visiting villages and islands, encourages competition and subsequently increase the prices to the local fishers, who are now in a much better position to manage their resources.

Issues for Management :

- The interactions between the artisanal fishery for export and the traditional fishery for local consumption with regard to sandfish (dairo).

- The non-compliance with the guidelines especially the use of SCUBA and Hookah gear equipment for commercial fishing.

- The need for more research work on the biology of the main BDM species, which is crucial to understanding the dynamics (esp. recruitments) and life histories of BDM.

- The "exemption" clause (1988 Guideline) is creating management problems for sandfish. Permit issued under the exemption provision should have restricted time, say for 6 months.

- The vulnerability of villagers and chiefs to requests from interest groups, middlemen and others to harvest the BDM despite the bans being in force and scarcity of resources-even to using Scuba and Hookah gear in their "qoliqoli."

1996 Beche de mer Export Production

(A) HIGH VALUE	EXPORTS VOLUME (KG)	
1. Sandfish (H. scabra)	10,616	
2.Whlte teatfish (H. fuscogilva)	21,913.52	High value-fetches up to $40/kg to collectors.
3. Black teatfish (H. nobilis)	21,304.74	
(B) MEDIUM VALUE		
4. Prickly Redfish (Thelenota ananas)	7,867.95	Medium value - $18 - 25/kg to local collectors or processors
(C) LOW - VALUE		
5. Deepwater Redfish (Actinopyga echinites)	4,835.32	
6. Stonefish (Actinopyga lecanora)	11,853.46	
7. Surf redfish (A. mauritiana)	13,923	
8. Blackfish (A miliaris)	13,607.45	
9. Brown sandfish (B. marmorota/vitiensis)	29,762.92	
10. Lollyfish (H. atra)	147,060.60	Low value species contributed 90% of total
11. Pinkfish (H. edulis)	190,020.50	Export Volume for 1996
12. Elephant trunkfish (H. fuscopunctata)	14,317.86	Prices from $3 - $15/kg dried product.
13. Greenfish (Stichopus chloronotus)	7,617.63	
14. Curryfish (S. variegatus)	17,577.87	
15. Amberfish (Thelenota anax)	10,065.77	
16. Snakefish	19,682.70	
17. Sea cucumber (Mudra)	8,380.00	
18. Tiggerfish	21,913.52	
TOTAL EXPORT :	630.505 mT.	

1995 Export Volume was 276 mT. The last peak Export Volume was 717mT in 1988.

OCEAN 2000 LIMITED

by
Nemani Turagaiviu

BACKGROUND INFORMATION:

- Owned 100% by indigenous Fijians
- Operating for 4 years
- Involved in the export of live corals, live fish
- Major export markets North America, Europe
- Operations extend around Viti Levu & Lomaiviti
- Employ or contract over 50 people in rural coastal areas

AREAS OF COLLECTION:

- From Kiuva - Ovalau
- Malomalo
- We endeavour to make sure that our collection areas do not conflict with other people or businesses that derive income from the reefs
- We supply a regular income for individuals and the community in areas that do not have a normal business infrastructure

PERSONNEL:

- We utilise local people for daily operational needs of the Company
- Collection of live product is not performed by Ocean 2000 but by the people who own the fishing grounds
- Ocean 2000 provides all training, and assists villagers start their own business
- Ocean 2000 utilises overseas consultants to provide technical help where and when required consultants will be used constanly to update our ability to compete on the open market

EQUIPMENT & TECHNOLOGY:

- We have invested in providing the latest technology and equipment for our people to use in the handling, warehousing and transportation of these live animals

RESOURCE MANAGEMENT:

- The best method of managing the resource is with Ocean 2000 the exporting company to order only those corals which we require from the collectors
- Collect from numerous sites for different products
- To order only corals which are in abundance in those areas of collection
- To have the Dept. of Fisheries inspect all out going shipments of coral

Coral reefs benefit humans commercially, recreationally and environmentally, and are among the most diverse, complex and beautiful ecosystems in the world. The declining state of coral reefs is of great concern for scientists, governments and the general population world-wide. Coral reef ecosystems are under increasing pressure, and the threats of human interaction compounded with the effects of natural disturbances can lead to the total loss of the world's coral reefs.

I would like to use this time to share with you a little history, and current procedures of the aquarium fish industry.

The aquarium industry is a 4 billion dollar industry annually, and fueling the financial growth of the industry are the technical advances and environmental awareness made throughout the past decade. The aquarium industry has been under great scrutiny over the past 20 years due mainly to poor collection and harvesting practices in the Philipines and Indo-Pacific regions. Methods using cyanide, bleach and other harmful chemicals led to the demise of over half of the coral reefs in the Philippines between 1986 to 1991. Using these chemicals to catch fish kills the coral that the fish live in, and ironically enough, leaves irreparable damage to the actual fish being caught and in many cases, leading to death of the fish. But with world-wide pressure being applied by the aquarium industry on these harmful practices, many collectors have eliminated the use of these methods, and the results have been healthier fish and a sustainable industry.

Living in a country like Fiji which is surrounded by one of the most beautiful coral reefs in the world, a majority of Fiji's citizens have never been exposed to the undersea world that surrounds us. The look is of disbelief on people's faces when they view corals and aquarium fish for the first time, and most people are unaware that this beauty is right in front of us.

The aquarium industry promotes education and world wide awareness of coral reefs. A hobbyist must wear the many different hats that are associated with the responsibility and survival of owning a salt water aquarium. Just like owning any other type of pet, owners must learn about the needs of their pet. This includes water quality, chemistry, lighting and the proper nutrition for their fish and coral.

Hobbyist world wide are writing books, giving speeches and like myself, starting businesses using modern practices ensuring sustainability, not only for the aquarium industry, but sustainability for the world's coral reefs.

The aquarium industries largest area of growth over the past 8-10 years has been in "live coral reef aquariums". Technical advances in filtration, lighting, water supplements and nutrition during this time has given, almost anyone, the ability to maintain a healthy and natural coral reef in homes, offices, restraunts and even in converted hotel swimming pools that allow visitors to swim with reef animals in a natural, yet controlled environment.

Technical advances have only helped to a point. Along with these advances came the need for healthy product. My belief is that the ultimate responsibility lies with the people who collect and harvest the animals. Harvesting live corals and fish is very

selective. Most corals on the reef are not even qualified for the aquarium trade due to size or lack of color. Most corals harvested for the aquarium trade are between 5-20 centimeters and must have bright colors. By limiting the size of the corals harvested to only a very small percent of the reef, this helps to ensure the replenishment of our harvesting areas.

In the case of collecting fish, the same guidelines apply as that of coral, only one more step is taken. The small fish eat small "micro-algae". If all of the small fish are removed from an area, then there is a possibility that the small "micro-algae" will grow and become large, this can cloud the water. The cloudy water can reduce the amount of sunlight that reaches the coral which can cause the coral to slowly die. By only collecting a small amount of fish from each area, fish populations are able to reproduce and areas can be collected from year after year.

The aquarium hobbyists and scientists are learning that the past could be our best teacher. As mentioned earlier, harmful collection and harvesting methods can lead to the ultimate demise of the aquarium industry and coral reefs. Educating collectors on proper procedures is not a luxury, it is a necessity to ensure that generations to come can enjoy coral reefs not just in the ocean, but in their homes as well.

MARINE PARKS AND PROTECTED AREAS

by

Birandra Singh

Measures used by traditional societies to conserve marine resources represent a significant opportunity to manage marine protected areas. Here in Fiji, such traditional measures include, the fishing rights, limiting access to fishing by licensing and approvals of traditional communities, closed seasons and closure areas for traditional ceremonies, catch restrictions, harvesting areas and use of traditional year.

In the past, new and modern concepts for managing protected areas have most often overlooked the traditional knowledge of communities that depend on marine resources for subsistence. In some areas the enforcement of conventional protected area policies and legislation without consideration for customs has impaired the local support for the area.

As information is becoming available on the relationship of traditional communities and the adjacent marine areas so is the need for multi-disciplinary efforts to develop policies and management schemes as pilot studies to be tested in this country.

One of the pilot programmes the National Trust is involved in is the setting up of the marine parks around Treasure Island, Beachcomber Island, Vomo and Vomo-lailai islands. Work on this started some thirteen years ago with consultations between the Trust and other stakeholders identified at that stage. Since then the Vuda tikina approved the setting up of a formal protected area and then taking up a resolution to the Ba Provincial Council. The resolution was approved by the Provincial Council. The Trust is seeking a lease over the seabed in the proposed protected area and will also enter into an agreement with the traditional landowners and the resort and dive operators. This is a pilot project for which we seek assistance and advice from the scientific community, the traditional community and the commercial sector so that at least we can have one legally established Marine Park in the country.

Some of the objectives, the Trust is seeking in their pilot programme are:

- the conservation of the resources and habitats of the main area including coastal, nearshore and offshore areas;

- the management of human activities including traditional cases so as to protect the various components of the area while making provisions for all reasonable and compatible uses to continue on a sustainable basis;
- the regulation of activities exploiting components of the system so as to minimize negative effects on the system;

- the reservation of some areas or components of the system for the sole purpose of appreciation and enjoyment by the public;

- the monitoring and periodic review of the area and flexibility in adjusting the management regime to respond quickly to changes in natural systems, resource users, community needs, and other management factors; and

- the setting aside of sufficiently large and appropriate areas in their natural state, with willing participation of traditional communities for purposes of maintaining biological diversity.

The recent adoption of a National Heritage Policy by the Government of Fiji states " The Government of the Republic of Fiji recognises that Fiji is a unique and in some respects highly vulnerable country with it's own delicately adapted flora and fauna, and significant sites of human occupation. These treasures of natural and cultural/historic features form an important part of the National Heritage.

And considering that the existing international conventions (Convention for the Protection of the World Cultural and National Heritage and the Convention of Biodiversity, of which Fiji is a signatory, the Government of Fiji recommends that the setting up of cultural and natural sites of national heritage be considered an important function in the development and life of the community of Fiji and further recommends the intergration of the protection of that heritage in all planning programmes.

The Government of the Republic of Fiji also accepts that the National Trust for Fiji would be a key organisation responsible for the protection, management and preservtion of national heritage sites in the country in close co-operation with other governmental and statutory institutions."

A good policy foundation to further progress this pilot programme which has received considerable support from all concerned, the traditional fishing right owners, the resort operators, members of Fiji Dive Operators Association, and the Government agencies of Environment, Fisheries and Lands.