



Issue 18 – March 2008

# WOMEN IN FISHERIES

## information bulletin

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### Editor's note

Welcome to this issue of the *Women in Fisheries Bulletin*, which highlights gender issues in development, social issues in fishing communities, women's fishing activities and subsistence fisheries.

In the first article, "Development of marine resources, fisheries policies and women's rights in the Pacific Islands", Vina Ram-Bidesi reflects on the importance of marine resources in the Pacific Islands. She also analyses the current issues in fisheries policies and how they affect women in the region. She points out that the basic problems of limited access to resources and subordination continue to persist for women. In addition, new and complex problems are now facing women because of globalization of the fishing industry. These require a greater evaluation of fisheries policies at a higher level and the involvement of women in decision-making at national, regional and international levels to help reduce the negative impacts of the global fish trade.

There are two research reports on gender issues in the Pacific Islands. In the paper on "Combining traditional and new fishing techniques", Mecki Kronen describes fishing techniques used by fishers from Niue, Papua New Guinea, and Wallis and Futuna. Her paper discusses the commonalities and differences of fisherwomen and fishermen, the techniques and the boat transport that they use, habitats that they prefer to target, and their productivity. In the second report, Ferral Lasi and Mecki Kronen discuss the *ungakoa* fishery in Niue and the Cook Islands. *Ungakoa* are vermetid worms and are regarded as a rare fishery. In the case of fishing communities surveyed in the Cook Islands (Aitutaki, Mangaia and Rarorotanga) and in Niue, the *ungakoa* emerged as one of the most sought-after local seafood specialties. The authors note that the *ungakoa* fishery was developed in areas where people have access to other highly exploited invertebrate species, such as giant clams, sea cucumbers, sea urchins and crustaceans.

There are two case studies on women's fishing activities. In the Yap case study, Mecki Kronen and Andy Tafileichig describe traditional marine resource management and the role of fishermen and fisherwomen. There is a clear distinction in gender roles. Men are mostly engaged in fishing for finfish, while women are engaged in reef and soft benthos collection. Fishermen also have diverse fishing activities, including invertebrate collection, free diving for lobsters and giant clams. Men may also collect other invertebrate species while on their way to fishing. This is strongly influenced by Yapese traditions and culture. Yapese communities still enjoy a traditional lifestyle where each household has about two members regularly fishing. Seafood consumed is from their catch or given as gifts from a family or community member.

In Fiji, Lilian Sauni, Veikila Vuki, Susan Paul and Marica Rokosawa discuss women's role in the subsistence fishery in Nadoria. Women fish for both subsistence purposes and for income. Seafood is the main protein component of households' diets, and subsistence fishing plays a vital role in supporting village households. The sale of marine products contributes to household income in villages. Revenue from the sale of fish and marine products are spent on school fees and buying household necessities. Women's ability to earn income and contribute financially also enables them to participate more actively in household decision-making.

In a study of subsistence fisheries and fish consumption patterns in Lau Lagoon, Solomon Islands, Toata Molea and Veikila Vuki reveal that fish constitutes the major component of the diet of the lagoon's inhabitants. The study shows that fish consumed at the household level constituted a small proportion of the day's catch because the larger fish are sold at market outlets. Fish were used in exchange for food crops and other agricultural produce from the Malaita mainland. Fishing operations for the lagoon people have shifted from traditional communal setting into a family or individual business. Several reasons account for this. Fishing gear that was not accessible in the past, is now available through government fisheries centres in rural areas or through commercial shops in Honiara. There is a preference for modern fishing gear because it is easier to handle. A fisherman or woman can fish alone without the help of others in the village. Traditional fishing gear often requires the participation of the whole community. In addition, modern fishing gear is now affordable and can be purchased using modern currency instead of custom money.

In "Poverty in paradise?", Susan and Leon Zann describe the rapid changes in traditional Fijian villages due to modernization. They discuss major indicators of poverty in three Fijian coastal fishing villages. Two of the three villages surveyed fall within the category of "extreme poverty", while the other village was considered to be in the "moderate poverty" category. Although there was no evidence of starvation, diets were considered poor in all three villages because of excessive amounts of starch.

In her paper "The 'culture of silence' and fisheries management", Aliti Vunisea briefly discusses management initiatives in Pacific Island countries. She describes some of the challenges of promoting fisheries management while also allowing people to meet their economic and social livelihood demands.

A brief summary of community engagement in Ailuk in the Marshall Islands is presented by Sylvia Pinca and Frankie Harriss. The authors attribute the success of the project to several factors, including strong community leadership, partnerships with government agencies and researchers, socioeconomic surveys, science-based reef surveys, partnerships with funding agencies and educational institutions, and non-governmental agencies.

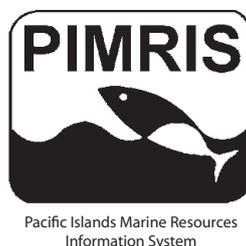
This issue of the *Women in Fisheries* bulletin discusses issues of poverty in fishing villages, women's fishing practices, subsistence fishing, and issues of management and development. I welcome any feedback on the articles in this issue and encourage you to submit articles about gender and community fishing issues from your country and region.

Veikila Vuki

Cover picture: Image by Mecki Kronen ©.

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PIMRIS is a joint project of five international organisations concerned with fisheries and marine resource development in the Pacific Islands region. The project is executed by the Secretariat of the Pacific Community (SPC), the Pacific Islands Forum Fisheries Agency (FFA), the University of the South Pacific (USP), the Pacific Islands Applied Geoscience Commission (SOPAC), and the Pacific Regional Environment Programme (SPREP). This bulletin is produced by SPC as part of its commitment to PIMRIS. The aim of PIMRIS is to improve the



availability of information on marine resources to users in the region, so as to support their rational development and management. PIMRIS activities include: the active collection, cataloguing and archiving of technical documents, especially ephemera ("grey literature"); evaluation, repackaging and dissemination of information; provision of literature searches, question-and-answer services and bibliographic support; and assistance with the development of in-country reference collections and databases on marine resources.

## Development of marine resources, fisheries policies and women's rights in the Pacific Islands

Vina Ram-Bidesi<sup>1</sup>

### Introduction

This paper illustrates the importance of marine resources in the Pacific Islands, and analyses current and emerging issues relating to fisheries policies and how these may affect women in the fisheries sector in the region. Some initiatives to integrate gender issues are outlined and other possible avenues for women's greater involvement through incorporating their interests and concerns are discussed.

In setting the scene, a brief background on the importance of and major issues associated with the fisheries sector in the Pacific Islands is presented, followed by a description of efforts in mainstreaming gender concerns. This paper points out that while basic problems such as limited access to resources, and subordination, continue to persist, there are new and more complex problems now facing women (e.g. the globalization of fishing industry), which require greater scrutiny of fisheries policies at a higher level. Some options are explored, including suggestions such as involving women in higher levels of decision-making on fisheries issues, and a regional and international action plan to reduce the negative impacts of the global fish trade.

### Importance of marine resources for Pacific Island economies

The Pacific Islands region<sup>2</sup> consists of only 550,000 km<sup>2</sup> of land with 5.2 million people spread across 33 million km<sup>2</sup> of ocean. Except for Papua New Guinea, which accounts for 83% of the region's total land area, all the other islands are small, with land accounting for only about 2% of the total area. The region occupies one-sixth of the earth's surface, an area three times larger than the United States or China (Low no date). The small landmasses distributed over a large area of ocean are linked and controlled by the marine environment.

The dependence of Pacific Island countries upon marine resources has been a vital part of their social and economic development. As population increases, this dependence has become even more critical. The ocean is seen as a lifeline that "provides the greatest opportunities for economic development" (Secretariat of the Pacific Community 2002). The coastal and marine ecosystems of the Pacific Islands region are extremely important habitats for sustaining the livelihood of the region's people by providing food and nutritional security. The exclusive economic zones (EEZs) of Pacific Island countries support the world's largest tuna resources, which are worth over a billion dollars. It is estimated that the region contributes to about 60% of global tuna demand for canning and 30% of the tuna for the high-value Japanese sashimi market (Gillett et al. 2001).

The fisheries sector in most Pacific Island countries is divided in two main types: coastal (characterized by artisanal technology, community-based systems, inshore or nearshore areas, formal and informal production systems) and offshore (characterized by capital intensive, export-orientated, industrial) activities. These divisions are used to show their relative importance in Pacific Island economies and the major issues surrounding the fisheries sector.

### Offshore fisheries

The highly migratory tuna resources in the EEZs of island countries largely dominate the offshore fisheries.

The tuna industry is characterized by foreign purse-seine operations under access agreements, largely targeting skipjack tuna for canning and yellowfin tuna for the frozen tuna market. The longline fishery consists of foreign and domestic vessels that target the fresh and chilled sashimi markets. Foreign vessels currently dominate the fishery. In May 2005,

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2. Includes 22 Pacific Island countries and territories: American Samoa, Cook Islands, Federated States of Micronesia, French Polynesia, Fiji, Guam, Kiribati, Marshall Islands, Nauru, New Caledonia, Niue, Northern Marianas, Palau, Papua New Guinea, Pitcairn Island, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu, and Wallis and Futuna.

87% of the vessels on the Forum Fisheries Agency Vessel Monitoring Register were foreign vessels and 13% domestic flagged vessels (Forum Fisheries Agency 2005).

The current stock assessment of tuna resources by the Secretariat of the Pacific Community (2003) indicates that the skipjack population is in a healthy state, while yellowfin are nearing full-exploitation and levels of bigeye exploitation appear not to be sustainable. Conservation and management concerns over the long-term sustainability of stocks has led to the establishment of the Western and Central Pacific Fisheries Commission, whose membership includes distant-water fishing nations and Pacific Island countries. Since fishing efforts are likely to be curbed under the new Commission, issues on possible allocation are likely to arise, and these will have implications for women who are directly or indirectly involved in the sector. The international trade and development agenda overlies this, particularly through the influence of the major donors who also have fishing interests and who are members of the Commission, and who have the world's major tuna markets. This creates another complex scenario that is likely to affect how the fisheries sector in the Pacific Islands region will progress and its effect on women's work.

### Coastal fisheries

Because the majority of Pacific Islands are atolls and small islands surrounded by coral reefs, the principal targets of coastal fisheries are species associated with coral reefs and lagoons. Coastal fisheries are extremely important in the Pacific Islands because they provide a major source of employment, food and nutritional security. As many as 83% of the coastal households of the Solomon Islands, 35% of the rural households of Vanuatu, 99% of the rural households of Kiribati, 87% of the households in the Marshall Islands, and half of the rural households in Upolu, Samoa fish primarily for local consumption (World Bank 1995; Dalzell et al 1996). Further evidence of Pacific Island dependence on subsistence fisheries for food security indicates that seafood comprises 28%, 33%, 67%, and 77% of all animal protein consumed in Fiji, Vanuatu, Kiribati and Solomon Islands, respectively (World Bank 2000; Dalzell and Schug 2002). It is estimated that some Pacific Island countries would have to spend an additional USD 7–18 million a year for imported protein if subsistence fisheries did not exist (World Bank 2000).

While the socioeconomic importance of coastal fisheries is underscored, there are however increased fishing pressure on these resources due to changing lifestyles that create greater economic pressure to increase production. The rise in population and adoption of efficient fishing technology further adds

to this pressure. Coastal fisheries are also vulnerable to environmental impacts of land-based activities and pollution. The inadequacy of centralized management systems has seen a trend towards devolving fisheries management responsibilities to coastal communities. Anecdotal evidence, however indicates that women continue to play subordinate roles even when there is a move towards revitalizing such community-based fisheries management systems.

### Initiatives to incorporate gender issues in the fisheries sector

Many Pacific Island countries are signatories to international conventions and agreements to improve the status and well-being of women in their countries such as the Convention on Elimination of all forms of Discrimination Against Women (1979) and the Beijing Platform for Action (1995). The sustainable development agenda also requires the integration of economy and environment with gender equity and justice. This is clearly stated in the United Nations Conference on Environment and Development (1992), the International Conference on Population and Development (1994) and the World Summit on Sustainable Development (2002). At the regional level, the adoption of the Pacific Platform for Action (1994) indicates the collective concerns and reaffirms the commitment by Pacific Island countries for national action to promote the advancement of women.

Some notable progress has been made in the last 10 to 15 years, such as the establishment of the South Pacific Women's Bureau at the Secretariat of the Pacific Community (SPC), appointment of a Gender Issues Adviser, a Gender Working Group within the Pacific Islands Forum Secretariat, and the strengthening of the regional role of the United Nations Development Fund for Women. The Coastal Fisheries Programme at SPC focuses on women's issues in fisheries under its Community Fisheries Project. This project is commendable in that it carries out basic research on documenting women's contribution to household income and food security. It also runs workshops for women in countries on fish processing, small business management and other value-adding activities. The need for such research and data is however based on individual country needs and priorities where SPC plays only a facilitating role. SPC also produces an information bulletin under the Special Interest Group for "Women in Fisheries" to inform readers about its activities and research findings.

At the national level, each country has a national plan of action and has established a focal point or a department that is tasked to promote the advancement and welfare of women. There are women's networks in the three sub-regions and women-focused

non-governmental organisations (NGOs) that play important advocacy roles in terms of addressing women's practical needs such as access to credit, improving literacy levels, and improving awareness of family nutrition and health. These activities are not necessarily fisheries-sector specific, but they do benefit women in general, including fishers, in fulfilling their basic needs. The fisheries departments in the region also have a designated person responsible for addressing gender-related concerns and/or to oversee women's projects.

Fisheries departments throughout the region have become more aware of the role women play in coastal and inshore fisheries in relation to providing for food security, generating household income, and in alleviating poverty. This realization of gender-disaggregated information into the fisheries sector has largely been through donor-led initiatives and NGO advocacy such as the Women and Fisheries Network. Donor policies such as those of the Canada International Development Agency (CIDA) require gender analysis for all its projects. While the process is ongoing, it is still slow. Fisheries extension officers are however more tolerant on gender issues because of the realization that women do play a key informal role in coastal project implementation even though they may not necessarily be the main beneficiaries or recipients of project assistance. Thus, community workshops on new projects such as seaweed and pearl farming or coral planting most often encourage women to be present when providing advice on the technical details of the projects that are targeted at men as project leaders.<sup>3</sup>

In short, the process of mainstreaming gender into national planning and integrating gender considerations into project development is continuing, but progress is slow due to both practical and strategic reasons. Complications arise further as fisheries managers and policy makers now have to grapple with the rapid transformation and change in the fisheries sector. It seems that considering gender dimensions could only eventuate as an after-the-fact issue. There is, therefore, a need for greater advocacy and awareness into the medium- to long-term policy considerations in the fisheries sector. This will require a coordinated effort by NGOs, women's groups and researchers.

## Women and development issues

Some preliminary insights into gender-related policy implications within the fisheries sector are discussed by focussing on the industrial and artisanal sectors. A gender perspective aims to expose the contradictory processes that are at play with the shift towards a globalized economy aimed at improving the welfare of society at large. The political underpinning of donor assistance to help Pacific countries integrate into the world economy is explained by looking at the case of the European Union, which has been a major donor in the region since the independence of the Pacific Island countries.

### *ACP-EU Economic Partnership Agreement*

The objective of the economic and trade cooperation between the African Caribbean and Pacific (ACP) states and the European Community under the Cotonou Agreement (2000)<sup>4</sup> is to "foster the smooth and gradual integration of the ACP states into the world economy, thereby promoting their sustainable development and contributing to poverty eradication in the ACP countries" [Article 34(1)]. The Economic Partnership Agreement (EPA) must be one that is mutually beneficial to both parties, as opposed to the previous Lomé Convention that was non-reciprocal. In the case of Pacific ACP states, fisheries and tourism are the key sectors identified as areas of mutual interest in fostering trade relations. The western and central Pacific fisheries resources, particularly tuna fisheries, are of interest to the European Union (EU), which represents the world's largest canned tuna market, while the Pacific tuna has the world's largest tuna stock. Negotiations for an EPA are continuing while a number of bilateral fisheries agreements are already in place.

The Cotonou Agreement provides the umbrella framework for EPA negotiations. The most notable of the provisions that determine preferential access of the PACP exports to the EU market is that of the conditions of the Rules of Origin (RoO).<sup>5</sup> Under the RoO, fish caught outside of ACP states' territorial seas will only be granted originality status if the vessels that caught the fish comply with registration, ownership, flag state and employment conditions. For example, if fish caught within the EEZ of a

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3. This is because women, as members of their households, often ensure the project remains viable and survives in order to ensure there is flow of income for the household. Fisheries officers also realize that the credibility of the project hinges on women who take on the practical responsibility of the project. Problems sometime lie in women's lack of access to loans and/or social attitudes that men — as heads of households — should be the key targets for project acceptability in traditional communities.
  4. This is a successor agreement to Lomé IV Convention between the African, Caribbean and the Pacific (ACP) States and the European Community that provides the regulatory framework for preferential access to the EU market for the ACP countries. The Agreement sets a timeframe for a progression towards reciprocal Economic Partnership Agreement between the EU and ACP countries. The Agreement places emphasis on providing an integrated approach to poverty reduction through strategies that focus on economic development, social and human development, and regional cooperation and integration.
  5. Cotonou Agreement Annex V Protocol I - Rules of Origin (RoO) lays the criteria for determining the economic nationality of the goods. The aim is to ensure that concessionary market access granted to a given country or a region, benefits the intended recipient(s).

ACP state by vessels owned by third party country, will not be treated as originating fish unless there is a joint ownership of the vessel of at least 50% by the nationals of ACP states, the EU or its overseas territories or if the crew composition is at least 50% of the nationals of the ACP, EU or its overseas territories. Vessels will also need to be registered in and fly the flag of the ACP, EU or its overseas countries and territories.

In the case of lease or charter arrangements, the ACP state has to first offer the opportunity to negotiate a fisheries agreement with EU and only when they have not accepted the offer then vessels could be chartered or leased under certain conditions. Provisions relating to processed fish and rules on derogation are also restrictive.<sup>6</sup>

The EU's RoO are highly restrictive in granting of preference to third countries that may operate in the region. EU canneries such as those in Spain and France are protected through tariffs applied to imports from third countries. This protection under the RoO is applicable to the EU tuna fleets, which indirectly prevents the Pacific ACP states from using fish caught by foreign non-EU vessels to produce originating fish. In practice, this means that ACP states have to grant EU vessels preferential access to their EEZs as against those from third countries in order to gain preferential access by duty concessions to the EU market.

Furthermore, the EU's proposal to the World Trade Organization (WTO) negotiations on fisheries subsidies provides another insight into the EU's real intention in terms of re-structuring its own members' vessels and their fishing industry. Subsidies for permanent transfers of fishing vessels to third countries, including through the creation of joint enterprises with third country partners, are considered as prohibited subsidies, whereas subsidies to mitigate negative consequences of restructuring the fisheries sector is considered as permitted. Among these include support for diversification and limited modernization that improve quality, safety, and working conditions (WTO 2003; WTO 2005). In other words, vessels that could be temporarily moved to new fishing grounds become beneficiaries of government assistance such as those that shift from over-exploited fishing grounds to less exploited areas like those that move to the western and central Pacific.

Thus, while the EPA's intention is to assist Pacific Islands in developing partnerships in industry, the above developments effectively mean that the EU is largely interested in accessing the vast tuna resources of the western and central Pacific. This allows for a

continuous supply of fish to its canneries and, where vessels would have preference to land catches in EU member ports, to benefit from the concessions.

What are then, the gender implications from this emerging development in the tuna industry? First, it creates a move away from domestic industry development to providing access to EU vessels that seldom land catches for domestic processing. Instead they use local ports to transship their catches to be processed in EU member countries or their own territories. The strict RoO requirements for originating fish also limit the use of third country vessels to land catch for domestic processing that could qualify for preferential access to the EU markets. Consequently, this has the potential to reduce shored-based development activities and therefore reduce employment and other benefits, from-value adding in the region where women have been the major players. The EU's stringent quality-control requirements also limit processing and exports from the Pacific Islands to the EU. There is a need to lobby for a flexible RoO so that fish caught by other third country vessels in the EEZ, such as domestic based foreign vessels, could be landed and processed in the Pacific Islands for the EU markets under preferential access.

In order to access the EU preferential market for processed fish, one Pacific Island country has licensed domestic based foreign vessels to fish within its territorial seas in order to qualify for originating fish. This is a rather worrying trend as most of the subsistence and artisanal fisheries also exist within territorial seas. Having foreign vessels fish close to coastal areas for industrial processing is likely to create conflicts with artisanal fishers. The fishing grounds used by women in particular may be particularly vulnerable.

Under the Development Assistance component of the Cotonou Agreement, capacity building and training has been ongoing in order to assist Pacific Island countries in meeting EU export quality standards (e.g. funding for training in Hazard Analysis and Critical Control Point — HACCP). However, if EU vessels have little incentive to land their catch in local ports, then while there may be some spin-off benefits from capacity building, accessing the EU market continues to remain a hurdle. Another component of the Development Assistance also focuses on assistance to the artisanal fisheries sector to generate income and reduce poverty. Commercial production in the artisanal sector has been limited to commodities where women are not direct beneficiaries of projects but participate by default, such as the cultivation of seaweed and pearl farming.

6. See details in the Cotonou Agreement – Annex V, Protocol 1 – Article 3.

The informal nature of women's work limits their direct accessibility to such development assistance schemes.

### ***STDs/HIV infections through increase foreign fishing fleets***

A major policy initiative of a number of Pacific Island countries has been the development of their domestic tuna industries through various strategies in order to increase their economic benefits from tuna resources. While increased transshipment activities and domestic basing of foreign vessels provide increased economic benefits, they also increase social problems and the risk of sex-related diseases for women. Studies as well as anecdotal information indicate an increase in social problems related to alcohol and drugs and the rise in prostitution where there is increase in sea port activities related to fishing fleets (Pacific Islands Forum Secretariat 2000; Vunisea 2005a). There is also a correlation between such activities and an increase in sexually transmitted diseases (STDs) and HIV/AIDS infected cases (Vunisea 2005b). In all the major ports throughout the Pacific Islands, where foreign fishing vessels berth, there is increased concern by health authorities because this is a growing problem affecting young women. Women, as young as 15 years old, have been apprehended by police officers on fishing vessels when in port (Vunisea 2005b). Social problems increase when female victims have difficulty in raising their children when such crew are gone from the scene as noted by Agassi (2005) in the Solomon Islands.

The need for tighter security in port areas to both deter young women from loitering around and keep track of crew that come ashore (as monitoring and surveillance measure, without violating human rights) is necessary. The legal system in many of the Pacific Island countries is inadequate to handle such offences because there is lack of policy and inadequate supporting legislation. Police do not have the power to deter, arrest and prosecute in most cases. While efforts are made by health authorities and NGOs to raise awareness, it is insufficient to convince women who may be hard pressed to earn a living to support their families and or because of the breakdown of traditional societal moral values. Regional fisheries departments do not see this as a fisheries sector problem, and neither the Ports nor Maritime Authorities recognise this under their ambit. There is a need for greater cooperation and coordinated effort among the various institutions to minimize the risks associated with such activities.

Fisheries policies could be designed with clearly laid out rules and regulations on the conditions of access. For example, requiring foreign vessels to employ local crew that would not only increase

domestic employment but would minimize the exploitation of young vulnerable island women since it would be culturally unacceptable for them to be prostitutes with men of their culture. Also, using local crew would mean that the men would return to their families, unlike foreign crew who come to relax without much commitment when they are in foreign ports.

There is a need for people in policy decision-making positions who are sensitive to real problems that are not only social and cultural in nature, but have huge long-term economic costs by affecting women's reproductive health and well-being. New innovative ideas need to be designed to tackle these cross-cutting issues.

The increased globalization of the fishing industry means the movement of fishing vessels from industrialized countries to developing and least developing countries will accelerate. There is therefore a need for a concerted and coordinated effort to design a regional and/or international action plan to deter and reduce the risks associated such activities because the victims are women in both developed and developing countries. An educational awareness program, including provisions for counselling may also be necessary for women who may fall victim.

### ***Creating efficiency in fish processing sector***

An examination of globalization and the effects of development policies on women in canneries and processing plants raises concerns on the status of women and their work. In the processing sector (e.g. fish canneries), women make up the bulk of the labor force (90%) and in the fresh tuna processing establishments they comprise 30% to 80% of the workers (Pacific Islands Forum Secretariat 2000). The majority of these women continue to be involved in routine work along the processing lines that command the lowest wages.

With trade liberalization, there is a subtle effect of driving down wages to maintain a company's competitive edge. The case study of the Pacific Fishing Company (Pafco) by Rajan (2005) clearly demonstrates how market pressures influence the working conditions of women. Women workers remain in "temporary" positions for several years, and as many such as 20 years, receiving very little (if any) pay increments. While some women have received on-the-job training, this has not been reflected in their wages. By keeping a large number of female employees as casual laborers, a company avoids paying any benefits that may otherwise accrue to staff. Performance standards are set at such high levels that women find it hard to achieve the targets to gain any promotion or pay increment.

The globalization of the tuna industry by multinational companies such as Bumble Bee, in the case of Fiji, has strategically taken advantage of vulnerable situations like Pafco. Many canneries and processing factories are located in remote locations of developing countries where employment options are limited (Bonanno and Constance 1996). Women are drawn to such employment opportunities but find that the chances for progress are limited. In such rural settings, female workers also have domestic responsibilities to fulfil, which increases their workloads, thus affecting their health and productivity. There is little community response and corporate concern over these issues (Ram-Bidesi and Mitchell 2005). Women who cannot maintain the required levels of performance are simply seen as lazy and incompetent.

In rural societies where educational levels are low, people still consider that the primary responsibility of women is to maintain the household even if they are in full-time employment. Changing this stereotype and giving adequate recognition to women's work still remains a challenge.

### ***Loss of self-reliant strategies***

While women are the major labor force within shore-based industrial fish processing, they also play a crucial role in subsistence fisheries by facilitating household food and nutritional security in the Pacific Islands (Matthews 1995). Based on the level of household needs, women have carefully switched between formal and informal activities. However, the influence of market opportunities is now affecting this delicate balance between meeting subsistence needs and generating cash. The increased demand for marine products and greater accessibility to urban markets has led to the desire to increase cash incomes. Women try to sell their products and use cash instead to purchase cheaper but nutritionally inferior foods. The artisanal commercial activities they engage in increasingly target export markets with non-edible products such as aquarium fish, shells, coral and non-edible seaweeds. This diverts fishers' dependence towards more cash-based economic production and therefore reduces their reliance or time available for subsistence activities. While this may improve their economic independence in the short term, it also creates greater risk of losing their self-reliant food production strategies and traditional knowledge associated with such strategies. Increased consumption of canned foods, processed starch and sugars has also resulted in increase cases of communicable diseases in Pacific Island countries.

Moreover, the biological and ecological characteristics and resource status of most of these new fisher-

ies is not adequately known. In the event of over-exploitation and collapse of such fisheries, women would be left with few resources and traditional skills to support their future livelihoods.

Careful management measures that include women as important stakeholders are required for such market-oriented commodities for their exports to remain viable and sustainable in the long term (Ram-Bidesi et al. 2003).

### ***Overexploitation and degradation of coastal areas***

A number of case studies show that easily accessible areas that are in close proximity to villages are overexploited because of increased fishing pressure, generally by women and children (see Novaczek et al. 2005). Often, women's fishing activities are considered informal and, therefore, insignificant but with increased demand for food and income, such areas become vulnerable to increased fishing activities. The situation is further exacerbated with the impact of other coastal development activities that either compete within the same coastal space or cause destruction to fish habitats.

Because women's fishing activities are seen as marginal, women and children are rarely targeted as key players to implement resource management and conservation activities. The economic underestimation of women's contribution to household food and nutrition leaves them without a voice in coastal development projects, and so consequently they receive little or no compensation.

To deal with localized areas of overexploitation, women must sometimes travel farther away in search for more productive fishing grounds. This not only imposes additional fishing costs but also leaves women with less time to do household chores and attend to other social responsibilities. In addition, it extends women's working hours by further putting pressure on their physical health.

### ***The catch in community-based resource management systems***

The recognition of the relative effectiveness of community-based fisheries management systems, as opposed to centrally managed fisheries, is widely accepted in many developing countries. For example, community members are able to exclude outsiders from using their fishing grounds, thereby limiting open access to fisheries. There is an increased effort on reviving traditional customs, values and beliefs to guide resource use and management practices. As this community-based resource management approach gathers momentum and community rules and regulations are further articu-

lated, one should not lose sight that traditional regulations and practices may often deprive representation of women and their active involvement in decision-making processes. In community hierarchical structures, elderly males such as village chiefs or headmen often make crucial decisions on behalf of their people with the view that the decisions are in the best interest of the community at large. However, these decisions may fall short of integrating factors that may affect women's fishing activities or their access to resources. Coastal tourism projects provide a good case of such attitudes. Village decision-making is often a male dominated process in Fiji where men gather over a *kava* bowl to discuss community development activities, such as whether to allow resort or infrastructure development and the level of compensation and/or royalties. In the process, women are not adequately consulted or the informal nature of their fisheries gets inadequately assessed in terms of determining the impact that a new development may have on them.

Because men and women often have different roles and responsibilities in their households and communities, their knowledge and perceptions on resources use and management are not necessarily the same. In the case of resource management decisions, by not including women, it is likely that decisions will poorly understand by them or that women may have less incentive to follow the decisions. This can eventually lead to the failure of management decisions.

It is important that community projects, whether they are development or conservation focused, are thoroughly assessed and evaluated using a gender sensitive feasibility analysis to ensure that women's views are integrated into project formulation and implementation.

As the demand for fisheries resources increase and are accompanied by improvements in fishing technologies, there is considerable pressure to implement rights-based fisheries systems to achieve long-term sustainability of resources. Pacific Islands societies are predominantly patrilineal, with males as heads of households. It is likely that despite women's active involvement in fishing activities, their entitlements to fishing rights and quotas will be limited, thus restricting their access to fully participate in fishing and aquaculture.

The inclusion of women in determining the type and nature of fishing rights (such as in formulation of any allocation criteria) is important in order to integrate women's interest and their views. Furthermore, responsible fisheries can only be achieved if all stakeholders participate and follow the given guidelines.

## Action for change

For the maritime regions of the Pacific, while the marine resources provide an important economic potential and place the islands in a strategic position with regards to their fisheries resources, they also pose several threats. Overexploitation and unsustainable resource use can lead to a major collapse of fisheries, leaving little alternative resources of a similar scale as a fall back. Realizing the development potential and sustainable management options are important for all Pacific Island communities, including women who depend on these resources.

The globalization of the fishing industry and the liberalization of international trade means new challenges for Pacific Island women. To understand these challenges and the means to overcome them will require more detailed research, gender advocacy and an active role by women at higher levels of policy decision-making.

A number of NGOs and women's groups are actively working on women's issues but are primarily focussed on meeting women's basic and immediate needs. They do not have the resources and capabilities to deal with sector-specific, medium-to long-term policy issues. Where women are able to mobilize to coordinate their perspectives, they often face institutional hurdles such as a lack of any effective mechanism to influence high-level policy decisions. Women are not represented at any of the higher-level decision making bodies in the fisheries sector. There is no coordinated effort and as individual groups, women's voices are not heard. Change is needed not only to mainstream gender issues but also to ensure that fisheries policies are sound and rational and that they accommodate the interest of the wider Pacific Island communities.

## Way forward

In order to address some of the critical issues highlighted, it is important that Pacific women's groups cooperate and coordinate their activities in order to have a stronger and united voice to influence higher levels of policy within the fisheries sector. NGO groups such as the Women and Fisheries Network (consisting of researchers, academics and students) could focus on research and technical aspects of the fisheries sector, while the recently established NGO group Pacific Women in Maritime Association (PacWIMA), which consists of female activists, industry managers, policy makers and fish workers, could promote the advancement of women's rights and interests in the maritime sector through their varied roles and representation. They could also play an important role in raising awareness and influencing policy decisions in their own right as individuals and as a group.

Representation at the Forum Fisheries Committee (the regional decision-making body on tuna and offshore fisheries) and the Heads of Fisheries Meeting of the Secretariat for the Pacific Community (regional decision making body on coastal fisheries) must be sought for a greater impact on gender issues in regional fisheries policy decisions. If women's groups are more coordinated into a partnership arrangement or a coalition, it may be easier to influence decision-making at this higher level.

One of their early tasks will be to formulate a regional action plan that looks into minimizing risks related to the sex trade associated with fishing vessel activities. This could also include a Code of Practice for vessel crew and operators as part of the conditions for fishing access agreements that are concluded by the regional island governments. In the context of coastal fisheries, ensuring that women's interests (e.g. their access to fishing grounds and fish resources) are incorporated in any allocation of fishing rights or that they are adequately compensated for any losses related to other coastal activities.

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## Combining traditional and new fishing techniques: Fisherwomen in Niue, Papua New Guinea and Wallis and Futuna

Mecki Kronen<sup>1</sup>

### Fisherwomen in Niue

For both men and women, reef fishing in Niue is mostly a matter of lifestyle and enjoyment rather than need. Fishing is an integral part of the island's lifestyle but is not necessarily a source of income. Traditionally, there is a strong preference for reef fish, and prices fetched for the small amount caught and sold locally are higher than those for pelagic fish.

Seasonal *atule* (*Selar crumenophthalmus*) fishing is a highlight for female and male fishers, who use the same techniques when fishing from the intertidal reef flats (Fig. 1). Both sexes use modern (Fig. 2) and bamboo rods, with a double-line bamboo rod often used to increase the likelihood of a bite (Fig. 3). Gender differences in coastal finfishing in Niue relate to the use of paddle canoes, which are used almost exclusively by men. Those who use paddle canoes also target pelagic fish, which is probably why the average annual catch for men is higher than for women finfish fishers (Fig. 4). The latter only target smaller reef fish accessible from the tidal flats. It is therefore unsurprising that while 36% of all fishers are women, they account for only about 24% of the total annual



**Figure 2.** Niuean woman, accompanied by her children, fishing at night with a modern fishing rod [Mecki Kronen]



**Figure 1.** Niuean woman fishing with a bamboo rod from the intertidal reef flat [Mecki Kronen]



**Figure 3.** Niuean double-line bamboo rod [Mecki Kronen]

1. Results presented here refer to the coastal component of the PROCFish programme only. The programme is funded by the European Union and is implemented by the Secretariat of the Pacific Community (SPC), Reef Fisheries Observatory, Noumea, New Caledonia  
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finfish catch (Fig. 4). In addition, a few Niuean men may go spear diving for finfish and invertebrates on the rare occasions when sea and wind conditions are suitable. Spear diving was not reported by any of the women interviewed.

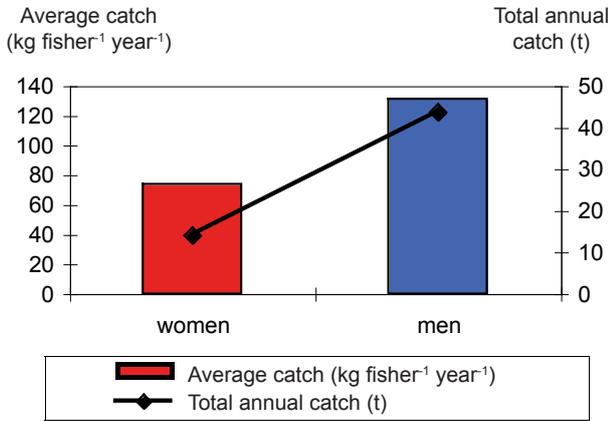


Figure 4. Average and total annual finfish catch for male and female fishers in Niue

### Fisherwomen in Papua New Guinea

Socioeconomic fisheries surveys carried out in four Papua New Guinea communities show that similar numbers of women and men participate in finfishing (Fig. 5). Of the three communities surveyed, the Tsoilaunung site was the largest with a total of 363 households, while the other sites had only 70 (Panapompom), 77 (Sideia) and 85 (Andra) households. For all communities, there were differences in both the average annual catch rates obtained by women and men and in the habitats targeted (Fig. 6).

Firstly, women focus on habitats that are closer to the shore, such as sheltered coastal reef and lagoon areas, while men tend to target the outer reef. The differences in habitats targeted by men and fisherwomen also depend on the availability

and accessibility of fishing grounds. When outer reef habitats are very close to shore and easily accessible, there may be few or no gender differences in habitats targeted, as is shown when data for Panapompom and Sideia are compared with that for Andra and Tsoilaunung. The differences that are found may be explained by the fact that in rural coastal communities, men are still the main breadwinners, while women are responsible for the well-being of the family and thus a range of associated duties. As a result, men who go fishing for income are able to spend more time on a fishing trip and target more distant and promising habitats than women, whose budgets are limited and whose main aim is to fish for the family meal.

This argument is supported by the fact that there is only a slight difference in the average catch per trip for women and men if the same habitat is targeted. Women have a slightly lower average because they tend to stop fishing once they have enough to feed their family (any surplus may be shared with relatives and neighbours), while men may keep fishing after meeting the family's immediate needs with the aim of selling the surplus. In Papua New Guinea, women used different fishing techniques depending on their objectives. As shown in Figure 7, fisherwomen on Andra Island, who may also catch fish to be sold at the mainland market, may go spear diving or take an active role in gillnetting with their husbands or relatives. However, if their main objective is to catch enough for the family meal, they usually go out on their rafts and use handlines (Fig. 8). Although fewer women than men are involved in catching fish for selling, an increasing number of women in Papua New Guinea either catch fish for selling or organise a network to collect fish from other fisherwomen for processing and marketing (Fig. 9). These women use motor boats, when available, to fish, collect fish and seafood from other fisherwomen, and to travel to the mainland market to sell smoked fish and fresh seafood (Fig. 10).

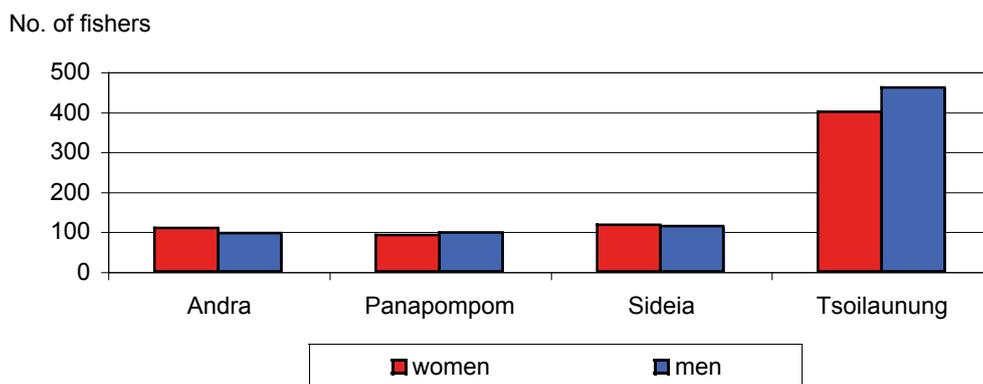
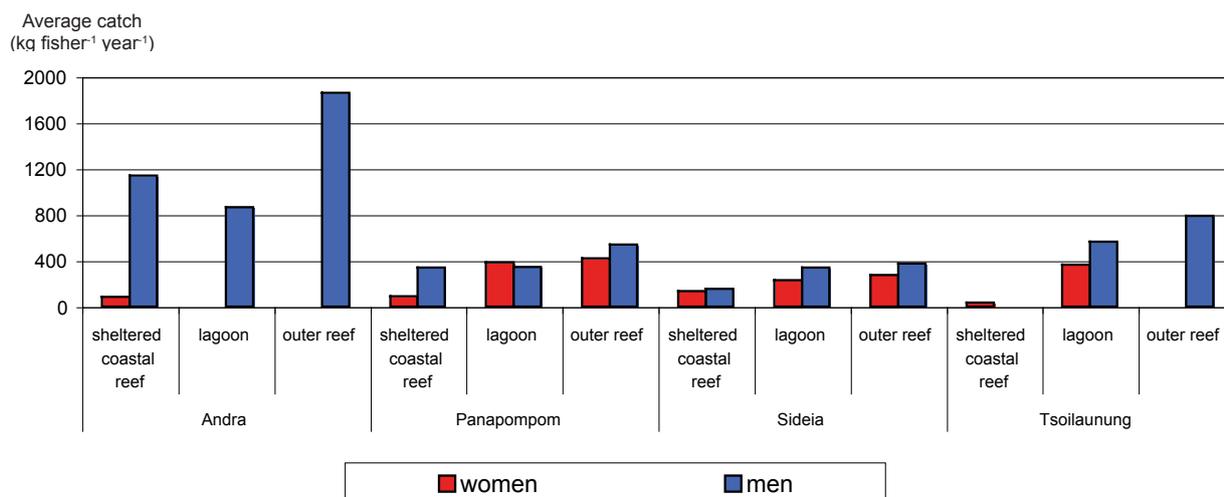


Figure 5. Number of finfish fishers by gender in Papua New Guinea communities.



**Figure 6.** Comparison of average annual finfish catches by habitat fished, gender and community in Papua New Guinea



**Figure 7.** Spear-diving fisher on Andra Island, Papua New Guinea [Mecki Kronen]



**Figure 8.** Fisher from Tsoi, Papua New Guinea, on her outrigger canoe, handling for the family meal [Mecki Kronen]



**Figure 9.** Women from surrounding islands selling smoked fish at the Loringau market (Manus) [Mecki Kronen]



**Figure 10.** Tsoi fisherwomen selling smoked fish and fresh seafood (mud crabs) at Kavieng market, Papua New Guinea [Mecki Kronen]

## Fisherwomen in Wallis and Futuna

Data collected in comparative surveys of four major communities in Wallis and Futuna showed that in Futuna, women and men participate in finfishing almost equally (Fig. 11). In Wallis, where two major fishing communities were surveyed, women participated much less than men in finfishing.

Again, when the average catch per fishing trip for women and men is compared, there is much a smaller difference for Futuna than for Wallis (Fig. 12). A possible explanation is that on Futuna, reef fish is not usually caught to sell. Futuna enjoys a very traditional way of life and fish is still widely considered as a non-monetary commodity. In addition, unless fishers have a motor boat, the geomorphology of the island limits finfishing to casting or netting from the intertidal flats into the outer slope during low tide. Recently, the adoption of trolling from motor boats, which requires a much larger investment than netting or casting by walking along the reef flats, has triggered commercial selling of pelagic fish at the local level, and to some extent for export to Wallis. On Wallis, both reef and pelagic fish are commercialised and fishing is an important primary or complementary source of income. Here, women fish occasionally, rather than regularly, for leisure and for home consumption, while fishing on a regular basis for selling is the domain of men.

Both traditional and modern fishing techniques are used on Futuna. *Atule* (*Selar crumenophthalmus*) is a special, traditional fishery harvested exclusively by women on Futuna. Although women reported changes in the seasonality and amount of *atule* occurring along the usual shorelines, they continue the traditional practice of harvesting this fishery between January and July each year. Usually, at least two to three, but often all the women (20–30) of a community, fish three to four times a week for *atule* during the high season. A 200-metre long gill net (or

2 x 200 m) is set in shallow water (Fig. 13) and a traditional wooden canoe is used to transport the net and the catch. Each trip takes around 2 hours and no ice is used. An average catch is about 50 to 100 *atule* of 24–32 cm fork length. It was reported that in the past, catches were much bigger, averaging 500 to 1000 *atule* of 24–32 cm fork length. According to tradition, the *atule* catch cannot be sold but is distributed among fisherwomen and other community members. When targeting other reef species, 10 to 20% of all fisherwomen were found to use cast nets, in the same way as fishermen (Fig. 14). Cast nets may be used exclusively or in combination with handlines or gill nets. However, men were more likely to use hand-held spears, and spear diving, in combination with the use of gill nets (Fig. 15). Scoop nets (*kuki*) are popular for catching small fish on an ad hoc basis for the next meal and were used by about 10% of all fishers, particularly women (Fig. 16). Fish poisoning is rarely practised.

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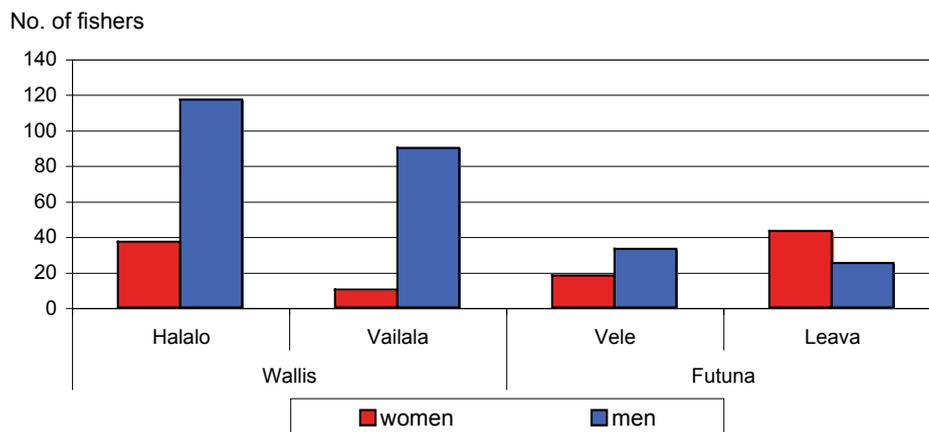


Figure 11. Number of finfish fishers by gender and community on Wallis and Futuna.

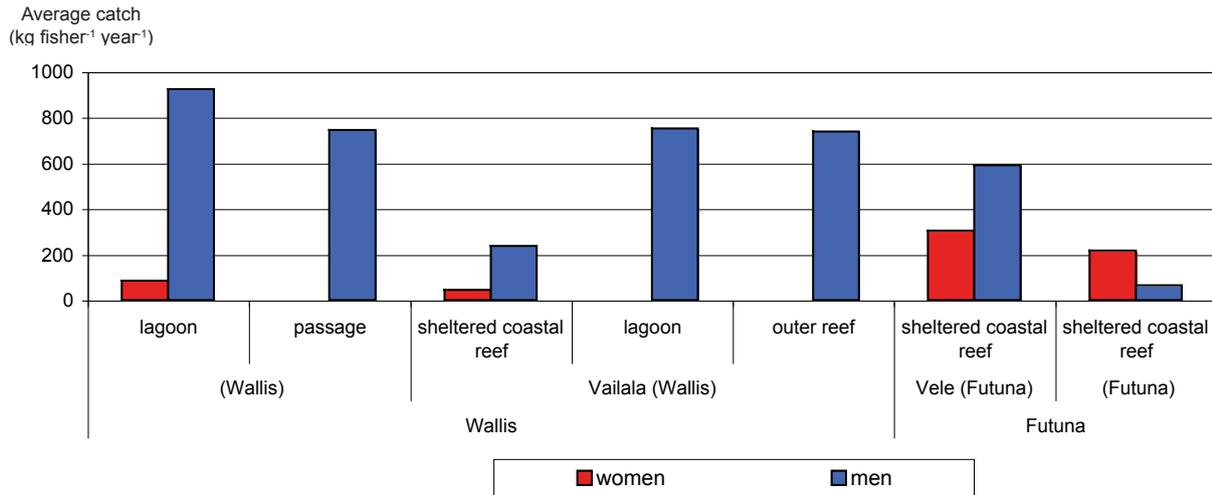


Figure 12. Average annual finfish catch by habitat fished, gender and community on Wallis and Futuna



Figure 13. Futuna fisher with atule net [Mecki Kronen]



Figure 14. Futuna fisher throwing a cast net, a technique that is also frequently used by local women [Mecki Kronen]



Figure 15. Futuna fisher cleaning her gill net, [Mecki Kronen]



Figure 16. Scoop net “kuki” used to capture small fish on Futuna [Mecki Kronen]

## “Ungakoa” – fishing for a rare delicacy in the South Pacific

Ferral Lasi<sup>1</sup> and Mecki Kronen<sup>2</sup>

“Ungakoa” or “ugako” — here referred to as *ungakoa* — is a local seafood specialty in the Cook Islands and Niue. *Ungakoa* represents a group of sessile gastropods, more commonly known as vermetids or worm-shells. Their vernacular name comes from their worm-like tube shells, which may be regularly or irregularly coiled. The shells are usually cemented to hard substrates (Fig. 1).

During the Pacific Regional Oceanic and Coastal Fisheries Programme (PROCFish-C), a number of rural coastal fisheries communities and their fishing grounds were surveyed in 17 Pacific Island countries to assess the current status and usage of reef and lagoon resources. Structured questionnaires were used to collect fisheries data from female and male fishers of invertebrates and finfish. Socioeconomic baseline data and seafood consumption information were also collected for households. (Socioeconomic surveys show the types of fisheries that exist and the extent to which these have developed in response to natural habitat endowment, subsistence needs, consumer preferences and income opportunities.)

For the fishing communities surveyed in Cook Islands (Aitutaki, Mangaia, Rarotonga) and Niue, *ungakoa* emerged as one of the most sought-after local

seafood specialties. According to our knowledge, *ungakoa* can be regarded as a rather rare fishery. It is also interesting to note that in all the places where there is an *ungakoa* fishery, people also have access to other, often highly exploited invertebrate species, such as giant clams, sea cucumbers, sea urchins, crustaceans, etc.

*Ungakoa* seem to prefer hard limestone and basalt substrates. Niue, also known as “the rock of the Pacific”, has a land area of 259 km<sup>2</sup> and is the largest raised coral limestone island in the world. The island is built on a volcanic foundation and has a maximum elevation of 68 m. Its coastline consists of cliffs with “staircase” terraces (intertidal fringing reef flats, “*tofolā*”) and narrow subtidal fringing reefs that quickly descend to over 1000 m within 5 km of the shore. *Ungakoa* is found on the intertidal reef flats.

*Ungakoa* also prospers on the hard limestone and basalt intertidal reef flats (<100 to a maximum of 300 m depth) around Mangaia, a small island south-east of Rarotonga. Here, the animals are found either fully exposed or submerged in pools of water during low tide. On the flat, *ungakoa* densities are observed to be highest just behind the algal crest (in Mangaia, the algal crest is the slightly raised zone of the reef-flat immediately behind the surf zone) where the appropriate substrate is also abundant. The high density observed in this zone may be due to the clean water with high levels of oxygen that is available there. Beyond the reef flat, higher densities of predominantly larger specimens are found in the subtidal zone (3–6 m) behind the surf. Women cannot access this high energy zone for gleaning, which may explain the high abundance and significantly larger specimens of *ungakoa* observed there. *Ungakoa* was also reported by fishers living on Aitutaki, and in the communities of Titikaveka and Ngatangia on the southeastern and eastern sides of Rarotonga. Aitutaki lies about 225 km to the northwest of Rarotonga. Aitutaki is termed an almost-atoll as it has a lagoon enclosed by a peripheral reef and reef flat



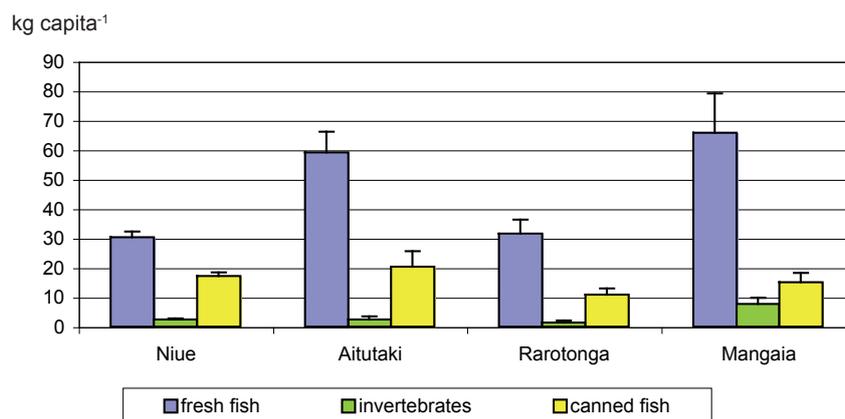
Figure 1. Ungakoa worm-like tube shell (Niue)  
[Mecki Kronen]

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3. Results presented here refer to the coastal component of the PROCFish programme only. The programme is funded by the European Union and implemented by the Secretariat of the Pacific Community (SPC), Reef Fisheries Observatory, Noumea, New Caledonia.

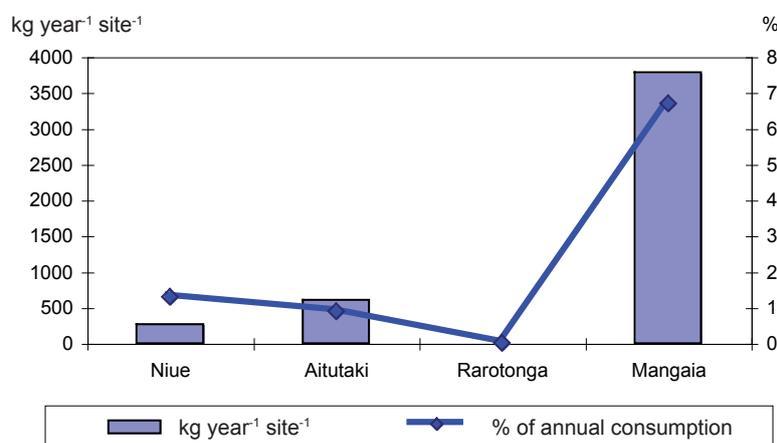
(typically 0.5 to 1.0 km wide), but it also has a relatively large volcanic island (Araura). Two of the 15 small islands or *motu* around the rim of the peripheral reef are volcanic in origin. Rarotonga is the emergent summit of a Pliocene-Pleistocene volcanic complex that consists mainly of basalt rock types (Thompson et al. 1998). The island is surrounded by a shallow, narrow lagoon system that is defined by an equally narrow barrier reef system. In both fishing grounds, *ungakoa* is found on intertidal reef flats composed of basalt and hard limestone.

From a socioeconomic point of view, the development and persistence of the rather rare and particular *ungakoa* fishery are interesting given that both Niue and Cook Islands enjoy a well-developed lifestyle that combines traditional Polynesian and Western values. Both are closely affiliated with New Zealand, sharing its currency and educational system, and receive significant external economic assistance. Although seafood is still a traditional and important component of the people's diet, and they continue to fish and collect invertebrates, salary-based employment and urban living have brought changes in diet and the wide adoption of a cash-based and relatively costly lifestyle. The present resident populations are estimated at ~1,700 people on Niue, and ~19,000 people in Cook Islands. Niue has one of the highest education levels in the region. Alternative income opportunities in the government sector, private business, and tourism in the case of Cook Islands, along with external economic assistance, explain why fishing (reef and open water) is more often undertaken for leisure rather than to supply food and income.

In this context, the data collected were assessed to determine the role of *ungakoa*. Figure 1 shows that in each of the four communities surveyed, seafood consumption is still important. The annual per capita consumption of fresh fish ranges from 30 to 65 kg, and that of invertebrates, expressed in edible meat weight only, from 2 to almost 10 kg. Interestingly, a comparison of the consumption of fresh seafood and canned fish shows that a considerable share of people's protein is supplied by



**Figure 2.** Per capita consumption of fresh fish, invertebrates (edible weight) and canned fish for each of the communities surveyed



**Figure 3.** Total annual consumption and proportion (%) of *ungakoa* in total annual invertebrate (edible weight) consumption for each community surveyed

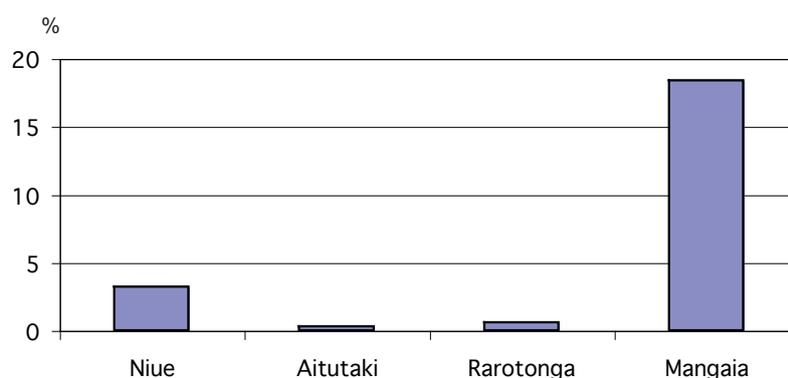
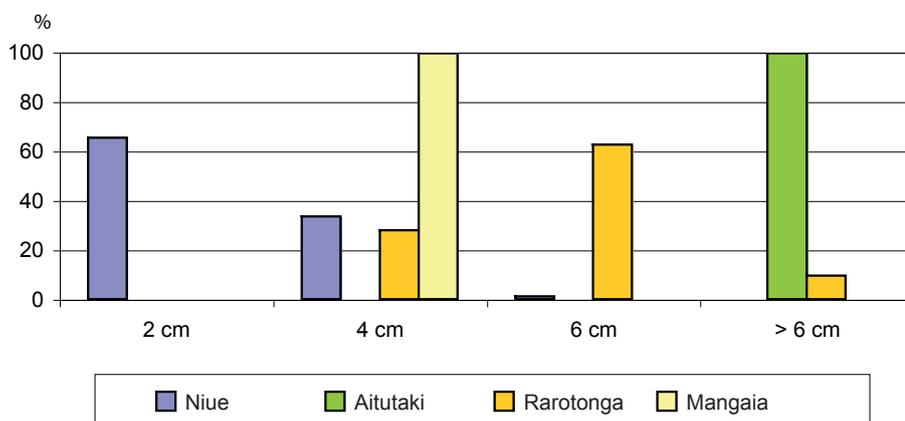
mostly imported canned fish products, i.e. from 10 to 20 kg per person per year.

If only invertebrate consumption is taken into account, extrapolation of data collected from respondents in each of the four communities shows that total annual *ungakoa* consumption (edible meat weight) is as little as a few kilograms for Aitutaki but reaches as much as 3800 kg for Mangaia (i.e. given a total population of 660 people, this figure corresponds to an average per capita consumption of 5–6 kg per year). As also shown in Figure 3, the proportion of *ungakoa* in total annual invertebrate consumption varies considerably, and reaches as high as 7% for Mangaia.

Interviews with invertebrate fishers revealed significant variations in the total annual invertebrate catch in terms of quantity and gender participation (Table 1). For instance, in Mangaia and Rarotonga, women collect most of the invertebrate catch, while in Niue and Aitutaki, gender participation

**Table 1.** Recorded and extrapolated total annual invertebrate catch (wet weight) and the percentage contribution of male and female fishers by community surveyed.

Community	Recorded total annual catch (t year <sup>-1</sup> ) (wet weight)	Extrapolated total annual catch (t year <sup>-1</sup> ) (wet weight)	Male invertebrate fishers (%)	Female invertebrate fishers (%)
Niue	11.6	35.3	47.4	52.6
Mangaia	14.1	129.9	29.0	71.0
Aitutaki	4.2	109.7	57.8	42.2
Rarotonga	3.8	36.3	8.3	91.7

**Figure 4.** Proportion (%) of *ungakoa* in total annual reported invertebrate catch (wet weight) by community surveyed**Figure 5.** Average size frequency distribution of reported catches from Niue and Cook Islands

is balanced. A comparison of the total annual harvest in biomass (wet weight) by species shows that *ungakoa* usually makes up only a small, if not insignificant amount of the biomass harvested, except for Mangaia where *ungakoa* makes up about 18% of the total annual invertebrate harvest (wet weight) (Fig. 4).

*Ungakoa* is mainly collected by women but also to some extent by men, except in Niue where *ungakoa*

gleaning seems to be in the women's domain. Men took only a minor part in any invertebrate collection on Rarotonga and *ungakoa* was not mentioned as a target species by male respondents.

The figures for total consumption and the overall representation of *ungakoa* in the diet and fisheries of the various communities may be considered low. However, *ungakoa* is tedious and labour intensive to collect and individual specimens weigh only a few



**Figure 6.** Niue fisher equipped with axe and basket on her way to collect *ungakoa* [Mecki Kronen]



**Figure 7.** On Niue, the tube-shell is destroyed to retrieve the vermetid [Mecki Kronen]



**Figure 8.** Mrs Oiana Pukeiti, Mangaia, shows the hooks used to extract small or larger *ungakoa* specimens without damaging the tube-shell [Mecki Kronen]

grams. On average, collecting a handful (50–100 g) of *ungakoa* on Niue's intertidal flats takes between 2 and 3 hours. Women equipped with a hammer and basket (Fig. 6) venture out if favourable tidal conditions coincide with an appropriate time of day. Niuean women use axes and hammers to chip away at the reef and dislodge the tubeworms (Tuara 2000). These methods have the potential to destroy live corals growing on the hard rocky substrate. However, the reef flats concerned do not host a rich array of marine life and if the process is done properly, only the tubes are destroyed and little damage is done to the reef surface.

In the case of Mangaia, Cook Islands, *ungakoa* can only be collected when tidal conditions, wind and time of day are all favourable, which happens only rarely in many places around the island. For Aitutaki, the considerable distance to reef flats that provide good breeding grounds for *ungakoa* means that it is harvested only occasionally. In Rarotonga, invertebrate and finfish fisheries in the reef and lagoon are very limited due to increasing awareness of the risk of fish poisoning. All these factors may explain the differences in the level of exploitation of *ungakoa* between the four communities surveyed, and overall, the relatively small annual quantities harvested.

*Ungakoa* represents a number of different genera and species, which is reflected in the average size reported by fishers (Fig. 5). In Niue, the length of specimens collected ranged from 2 to 4 cm, while in the Cook Islands it ranged from 4 to 8 cm.

From a biological and taxonomic point of view, *ungakoa* are all members of the Vermetidae family, which are derived from the super-family Vermetoidea (Phylum: Mollusca, Class: Gastropoda). The family Vermetidae is represented by four genera: *Dendropoma*, *Petalconchus*, *Serpulorbis* and *Vermetus* (Wilson 1993). The *ungakoa* specie(s) utilised for food on Mangaia is a member of the genus *Dendropoma*, but the species name cannot be ascertained. The two distinct size classes of the species exploited in Mangaia and other Cook Islands sites suggest that two different species of *Dendropoma* are being harvested. In Niue, there are suggestions that the *ungakoa* is a member of the genus *Serpulorbis*. For Mangaia, the species name cannot be ascertained. Proper taxonomic keys are needed to make identification to species level.

Destruction or preservation of the tube-shell is the major difference between the *ungakoa* harvesting techniques used in Niue and Cook Islands. In Niue, hammers are used to break the shell (Fig. 7), enabling retrieval of the *ungakoa*. In Cook Islands, special hooks have been developed (Fig. 8) to retrieve the *ungakoa* without destroying its tube shell. The hooks vary in size depending on the size of the

specimen targeted. Some believe that if the shell tubes are not destroyed, new animals can use the empty shells to grow and propagate faster. However, unlike hermit crabs, each *ungakoa* specimen has to produce its own shelled burrow. Therefore, the use of the hooks avoids the task of pounding burrows and possibly crushing live corals, but is unlikely to enhance regeneration of stock. There is also a belief that destroying the tube shells enhances reproduction. There is no biological evidence for either of these beliefs.

Vermetids are suspensory feeders. They catch and feed on micro-plankton or detrital fragments suspended in the water column. This feeding strategy is commonly used by bivalves but is uncommon in gastropods. The sessile nature of vermetids is related to this kind of feeding strategy as the animal cannot move around to browse for food. Vermetids use two means to capture suspended food particles. Particles may be washed into the mantle cavity with the incurrent water and trapped on the gill filament with the aid of mucous from the gill before being shuttled to the mouth via a special ciliary tract. The other method involves deploying mucous nets in the water and then drawing them in to be swallowed when the particles are trapped. Most vermetids use both methods to obtain their nutrition but some specialise in using one method or the other.

Unlike other sedentary animals, vermetids have separate sexes. However as they are sessile, they do not copulate. Sexual reproduction occurs when sexually mature males release packages of sperm into the water. Some of these are captured during feeding by females and eventually fertilise the female's eggs (Wilson 1993). Fertilised eggs are brooded in the mantle cavity of the female. Embryos are maintained there until they have passed through the larval stages and have metamorphosed into little juvenile snails, and crawling or free-swimming larvae are released. These larvae spend around an hour free-swimming before cementing themselves to the substrate.

*Ungakoa* was reported to be sold in some of the communities surveyed. On Niue, 20% of the catch was reported to change hands on a commercial basis, while 66% of all *ungakoa* catches on Mangaia were sold locally. Mostly women confirmed that they collected *ungakoa* to earn some additional income. Several women are known to be efficient

and experienced *ungakoa* fishers and they are contacted on a personal basis when *ungakoa* is needed for a family meal. In fact, the demand for *ungakoa* is so high that most of the catch is sold on a one-to-one basis rather than at the weekend market. On Mangaia, a 2-litre ice-cream container filled with *ungakoa* meat is worth NZD 50.00 on average.<sup>4</sup> The containers, which are the most common local unit for selling *ungakoa* meat, hold about 1 to 1.5 kg of meat and may contain at least 100 *ungakoa* specimens. There are many ways of eating *ungakoa*. Fishers eat it raw on site. At home it may be eaten raw or seasoned with lemon juice. Some women prepare *ungakoa* meat as a cold or warm dish with coconut milk, or it may be used as an ingredient in a warm seafood dish.

### Acknowledgements

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## Traditional rights and management of Yap's coastal fisheries and the role of fisherwomen

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### Background

Yap State consists of a cluster of high islands and 134 scattered low atolls and islets, 22 of which are populated. It is situated in the Western Caroline Islands between latitudes 7–10° N, and longitudes 137–148° E. The low coralline islands and atolls are referred to as the outer or neighbouring islands, or *Remathau*.

Mainland Yap includes four high islands, Yap, Tamil-Gagil, Maap and Rumung, within an extensive fringing reef system that is 31 km long and up to 12 km wide. There are eight deep channels through the outer fringing reef and three of these lead to a deep embayment (Orcott et al. 1989). Mangroves make up to 12% of the vegetation, and there are extensive seagrass meadows with at least seven species of seagrass (Falanruw et al. 1987). There are 99 species of algae reported as well as 169 species of hard corals, 426 species of fish and four species of sea turtles (Tsuda 1978; Falanruw et al. 1975).

According to the 2000 census, the total population of the state was 11,241 with a population growth rate of about 2% per year.

### Coastal fisheries

Fishing activities on Yap are guided to some extent by a complex system of traditional rights, restrictions and controls (Falanruw 1994). However, the strength of these systems has been substantially weakened over the past two decades by changes in Yap's social, religious, economic and political systems (Graham 1991). Recent changes include the introduction of motorised boats, flashlight spearing and gillnets – all techniques that also enable bypassing of regulations. Thus, fishing at night and with flashlights, and outside the permitted fishing ground, is now common. Estimates made in 1987 suggested that night and day spearing combined accounted for 57% of the reef fish catch (44% by night), while surround nets and gillnets accounted for only 17% (MRMD 1987).

The remainder was caught by fish traps, throw nets, scoop nets and hook and line. The increased importance of salaries has lessened the time available to employ traditional and more time-consuming fishing techniques. It has also increased market demand for reef fish and other seafood, and not all individuals within the community contribute to controlling fishing activity at the community's reef.

Today, there is an overlap between traditional and commercial fishing, with citizens of Yap selling some or all of their harvest to local retail outlets or sending it off-island. Any activity involving commercial exploitation of Yap's reef and lagoon first requires the consent of the traditional leaders and custodians of that resource. In that respect, traditional controls are still maintained, but these relate mainly to whether or not an activity should occur rather than to how it is managed. There is increasing concern being expressed that the sale of reef fish in local stores and restaurants is contributing to overfishing and depletion of fish stocks.

### Customary tenure and fisheries management

Traditionally, two basic characteristics of Yapese customary tenure systems helped to avoid overexploitation: (1) ownership of reef areas and fishing rights by small groups, such as villages, *tabinaw* (estate, or household and associated resources), and village associations; and (2) ownership of marine resources that are not purely private but subject to hierarchical systems of control. This system of quasi-private ownership and associated fishing rights included regulations on the use of geographical areas or habitats, gear, methods and target species. Attached to the regulations were explicit "rules of conduct and obligations for distribution of catch" (Falanruw 1991). Fishing rights sometimes also involved reef closure practices to restrict effort. Falanruw (1991) describes the existence of "an ethic of not taking more than one's share, or of not harvesting all out of deference to social and spiritual sanctions".

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3. Falanruw and Faimau (in: MRMD 1987) referred to 125 named fishing methods on Yap that can be categorised into 15 major groups: (i) fishing with curved sticks (*tholom*), (ii) using poison (*yuub*), (iii) using nooses, (iv) spear fishing (*piska*), and (v) using rafts, as mini fish aggregating devices while spear fishing (*pipi fafat*), (vi) hook and line, (vii) butterfly (*yinup*) hand nets, (viii) push nets (*manago*), (ix) fishing for flying fish using sailing canoes and hand nets (*magal gog*), (x) net fishing, (xi) use of leaf sweeps (*ruwol*), (xii) individual fish traps (*yinup*), (xiii) large bamboo fish weirs (*sagel*), (xiv) stone fish weirs (*ach*), (xv) collecting invertebrates by various methods.

Yapese villages are grouped into networks of chiefly villages and lower ranked allies. Management of marine resources serves to support the hierarchical system of each network. Marine resources are exploited for subsistence use, to support cooperative efforts within the network, and to support the head of the network. Access to fishing grounds, fishing gear and fishing rights is managed within the hierarchical system. In general, fishing methods involving the most elaborate equipment (such as special canoes and gear) are limited to higher groups. They are controlled by fishing masters of each method who oversee the conduct of the fishing, often in response to requests from, or in support of, their chief. In addition, particular species are the property of certain higher ranking people.

The inshore waters of each village are within the jurisdiction of the village, and, except in the case of some fishing methods, outsiders are prohibited from exploiting the resources. Some methods are available to all fishermen within a village, while other methods, and sometimes the area in which they can be used, are vested in certain estates. The lowest ranking villages have no land or fishing rights except for a few methods practised in specified limited areas. The servant level has land, but the title belongs to a high chief to whom "the first fruits" and other tributes and services must be given.

### Current reef and lagoon fisheries

In 2006, under the Pacific Regional Oceanic and Coastal Fisheries Programme (PROCFish), surveys to assess the current status of reef resources and their use were carried out in two Yapese communities: Riiken (including Wanyaan) located on the eastern coast, and Yyin (including Gilfith) on the western coast of Yap proper. The survey covered 74% of Riiken and 77% of Yyin communities. Fully structured questionnaires were administered to heads of households to collect data on general demographic, socioeconomic and consumption indicators, and to male and female fishers to collect data on finfish and invertebrate fisheries.

The survey results showed that both communities still enjoyed a rather traditional lifestyle, mingled with modern influences. Traditionally, Yap was supported by a subsistence economy, and the survey confirmed that is still largely the case. Each household has about two members who regularly fish, and all households confirmed consuming fresh seafood, mostly invertebrates. The average per capita consumption was as high as ~ 44 kg (SE ±7.3) in Riiken and ~47 kg (SE ±12.8) in Yyin. Most seafood consumed was from the household catch or offered as a gift, on a non-monetary basis, by a family or community member, pinpointing the importance of reef fisheries at the subsistence level.

However, the volume of imported food, fuel, manufactured goods, machinery and vehicles in these communities is increasing. The strong influence of a westernised cash-based economy was highlighted by the fact that most households surveyed depended on salaries, small businesses and money from retirement funds, family support and welfare payments for cash income. Fishing was not the principal source of income for either community and did not play a significant role as a source of complementary income.

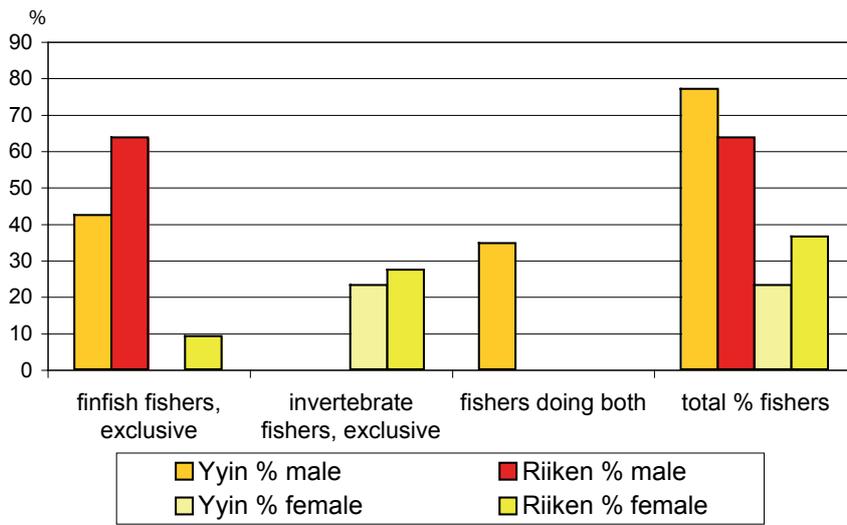
### Women in fisheries

Fishing in Riiken and Yyin is performed by both men and women (Fig. 1). Overall, women's participation is low (23–36% of all fishers are women), while 68% and 42%, respectively, of all male fishers in Riiken and Yyin exclusively target finfish. Surprisingly, only a low proportion of women engage in invertebrate collection: ~17% of all women in Riiken and 23% of all women in Yyin confirmed collecting invertebrates at some stage. Men do not usually specialise in invertebrate fisheries, but 11% of male fishers from Riiken and 35% from Yyin said that they gleaned or free dived for lobsters and giant clams in addition to finfishing.

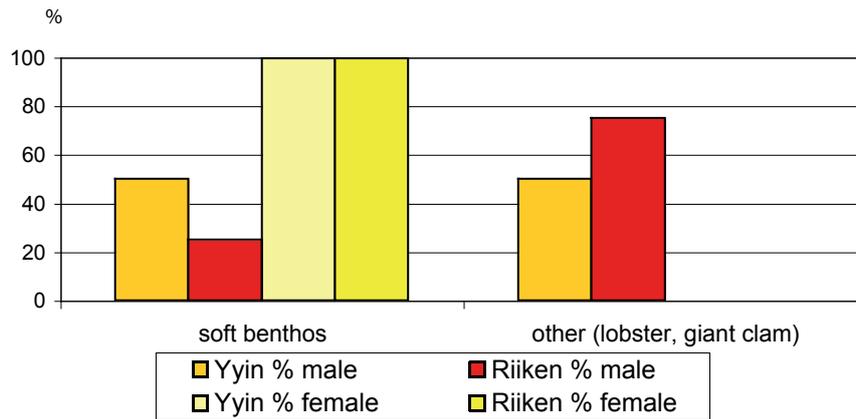
The lower percentage of fishers pursuing invertebrate fishing, and the low diversity and productivity of this fishery, suggest that the invertebrate fishery is now less important than finfishing. In both communities, invertebrates are collected from the reef top or soft benthos, while divers collect lobsters and giant clams. In Riiken, the soft benthos and reef-top habitats may be jointly targeted during a fishing trip, while they are individually targeted by Yyin fishers (Fig. 2). Women collect invertebrates exclusively from the soft benthos and reef top, while men target the soft benthos and reef tops for gleaning and also go free diving for lobsters and giant clams. Soft benthos collectors mainly target *Gafrarium* sp. (*dab*), *Nerita polita* (*ligarich*), *Nerita albicilla* (*mire*), *Donax cuneatus* (*tuntheth*) and *Anadara* sp. (*goy*). Respondents confirmed that invertebrates are collected throughout the year. Frequencies of fishing trips are low, at most once a week, but usually only once a month. Each trip takes between 2 to 4 hours. Most fisherwomen glean according to the tide, i.e. during the day or at night.

Figure 3 shows that the highest average annual catches by wet weight are obtained by women gleaners from Riiken (reef top, soft benthos) with over 400 kg wet weight caught per fisher per year on average, while divers for lobster and giant clam collect less than 100 kg each per year.

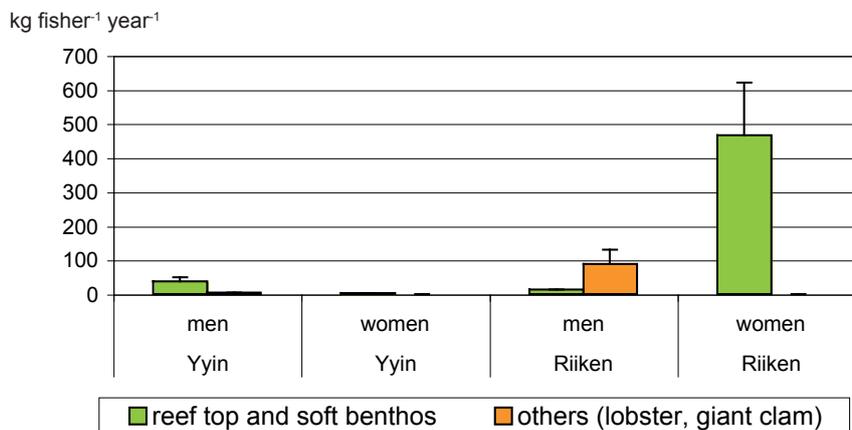
The total annual catch volume extrapolated for the Riiken community was 5.99 t, while data suggest



**Figure 1.** Proportion of fishers that target finfish or invertebrates exclusively, or both fisheries (not necessarily during one fishing trip). Figures are in percent of total fishers (all fishers = 100%)



**Figure 2.** Proportion of male and female fishers from Yyin and Riiken taking part in various invertebrate fisheries



**Figure 3.** Average annual invertebrate catch (kg wet weight per fisher) by gender and fishery

an annual total catch of only 0.24 t wet weight for Yyin. In Yyin, most of this very small annual harvest consists of giant clams, which are, to a large extent, collected by men (86% of the total annual catch). The opposite is true for Riiken, where women are responsible for most of the annual catch (~90%), targeting lobsters and giant clams mainly (Figs 4 and 5).

Regarding general socioeconomic changes and trends reported for Yap's coastal fisheries, the surveys in the Riiken and Yyin communities confirmed that fisheries continue to play an important role in the subsistence economy. People mostly fish for leisure and to satisfy their own needs. Per capita consumption is high considering that the island sustains a healthy agricultural potential and thus offers alternatives for nutrition. Models indicate that, based on purchasing equivalent produce in a cash economy, Yapese coral reefs produce a value

of around USD 3.5 million in seafood annually (Marine Resources and Coastal Management Plan; Smith (undated); Tafleichig and Inoue 2001).

Results of the 2006 PROCFish survey also showed that very few households generated income from fisheries. In this paper, we have not dealt with the finfish catch as it is an almost exclusively male activity. However, for each community, about half of the total annual finfish catch is sold outside. In the case of invertebrates, less than 1% of the total annual invertebrate catch is sold. Thus, our survey showed that the finfish catch is used both for sale and to satisfy local community demand, while in the case of invertebrates, all fishing pressure is imposed by community demand only. However, when considering fishing pressure on invertebrates, it should be noted that fishers target one or only a few species, and the available fishing grounds are limited, sug-

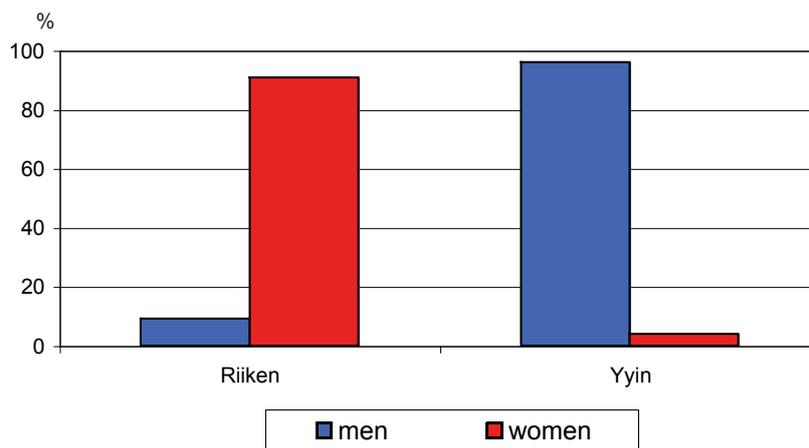


Figure 4. Contribution (%) by women and men to total annual reported invertebrate catch (wet weight)

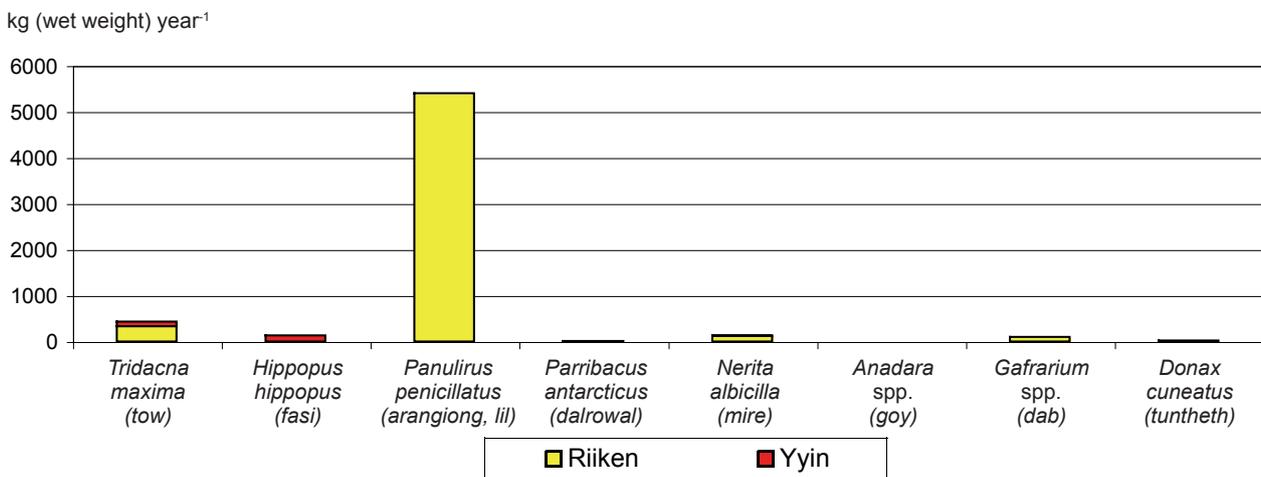


Figure 5. Annual extrapolated catch (wet weight) by species collected from reef tops, soft benthos and by free diving for Riiken and Yyin

gesting that possible detrimental effects may need to be monitored.

For example, in the case of Riiken, the highest invertebrate fishing pressure was observed for lobsters, which make up most of the total annual catch (wet weight). Assuming a reef length of 7 km to support lobsters, and given the total number of fishers targeting lobsters in Riiken, we may assume a fisher density of one fisher per kilometre, with each fisher collecting about 40 to 80 kg per year. Yyin has very limited reef surfaces suitable for gleaning, and hence a high fisher density of 13 per kilometre. Taking into account that each fisher may collect between 25 and 50 kg per year and that only a few species are targeted, again possible detrimental impacts may need to be monitored.

The survey also revealed a clear distinction in roles by gender. Men engage mostly — if not almost exclusively — in finfishing, while women engage in reef and soft benthos gleaning activities, but only to a relatively limited extent. Male fishers do not appear to specialise in invertebrate collection only, but are likely to free dive for lobsters and giant clams as well, and may also pick up other invertebrate species in addition to finfishing. This result supports the strong influence of Yapese traditions and culture discussed above.

In terms of women and men's participation in fishing, the major difference between the two communities surveyed is mainly explained by the fact that almost no invertebrate collection is done in Riiken (0.24 t year per year) compared to Yyin (~6 t year per year wet weight). Given the very low annual catches reported for Riiken, any small differences in data obtained from male and female fishers can result in misleadingly high percentages.

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## Women's subsistence fishing supports rural households in Fiji: A case study of Nadoria, Viti Levu, Fiji

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### Introduction

Women actively participate in fisheries activities throughout the Pacific Islands (Vunisea 1996). Despite their active involvement, the role of women has been underestimated and overlooked, with the primary emphasis on men's fishing activities. Women's fishing activities are mainly confined to intertidal areas, although some women fish offshore using motorised boats and canoes.

Women in many Pacific Island countries rely on nearshore marine resources to feed their families. Marine invertebrates, such as shellfish, form a significant portion of these women's catch. Shellfish is a major source of cheap protein for human consumption, and is a source of income (Davis et al 1998; Fay-Sauni 2001).

There are very few income-earning opportunities available to Pacific Island women, who often have a very limited educational background. Their experience lies primarily with household-related activities, and so it is important to explore avenues to use their individual expertise and experience. The knowledge and skills they have with regards to their fishing-related roles are not easily transferred to other types of occupations.

Among the few documented reports on the involvement of women in fishing activities, there are very few quantitative or qualitative studies that have specifically focused on women in subsistence fisheries in the Pacific Islands. Such information is crucial to the overall management of marine resources and in the design of small-scale development projects for women. Because of increasing pressure on intertidal and shallow water resources, studies of this nature are needed in most countries in the region.

This study focused on the involvement of women in the subsistence fishery in Nadoria village, Rewa Province, Fiji. Subsistence fishing activities and

their importance at the household level in Nadoria were investigated. Because subsistence fisheries are particularly popular among women, they formed the basis for exploring the extent to which women support their families through subsistence activities and alternative means of earning money.

### Study area

The village of Nadoria is on the southeast coast of Viti Levu, the largest island in the Fiji Group (Fig. 1). The village is close to the mouth of the Rewa River, the country's largest and longest waterway. Suva, Fiji's capital, is 30 km away, and Nausori, the nearest town, is about 15 km away. Nadoria is accessible by bus, taxi and private vehicle, and can also be reached by boat from the seaside.

In December 1996, there were 34 households in the village, and the population was 139. The village lies in an area of about 280 m from north to the south, and 540 m from west to east (Biturogoiwasa and Walker 2001). The village is surrounded by mangrove forest and the Toga River flows nearby.

### Methods

There were two components to the study: a household survey and a creel survey. The household questionnaire survey was designed to extract socio-economic information from individual households of fishers residing in Nadoria. This socioeconomic information was essential in assessing the role of women in subsistence fisheries. The overall aim of the creel survey was to determine the amount of fish and marine products caught by women, measured in kilograms per hour of fishing.

The household questionnaire was used in interviews with 16 fisherwomen. A maximum of two hours was devoted to completing each questionnaire. Fisherwomen were asked questions about household size

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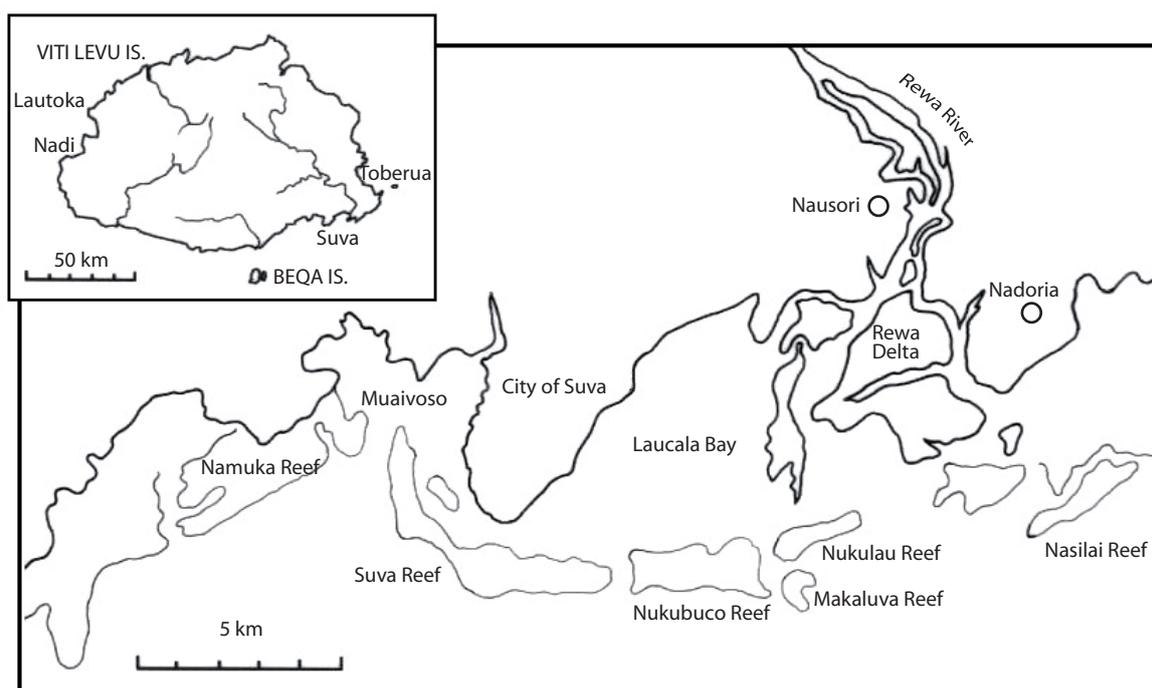


Figure 1. Nadoria Village near Rewa and Suva.

and composition, occupation of each family member, other employment opportunities, level of income from fisheries activities, and fishing methods used by women. The individual experiences of the women within their fishing areas, methods, catch composition and effort were also recorded.

The creel surveys determined the amount of fish caught by women. This was assessed by weighing each woman's catch using a handheld spring balance during the survey. Fishing effort was measured in the number of hours fished. The women were interviewed on their return from fishing, and were asked about their fish catch by species. Additional information was asked about fishing methods, fishing habitats visited, and time spent fishing.

## Results and discussion

### Demographics and household details

The subsistence fishery is an important fishery in many Pacific Island countries, including Fiji. In Nadoria, fisherwomen between the ages of 20 and 50 are likely to be unemployed and, thus, engaged in subsistence fishing, which is done in addition to their routine domestic activities.

Older fisherwomen are perceived to be more efficient and skillful in gleaning and fishing. These women have extensive local knowledge relating to tides, moon phases, cloud cover, and the best conditions for certain types of fishing. It is particularly obvious in Nadoria, where the majority of fisherwomen use

their traditional knowledge to carry out rotational fishing for mangrove crabs, *Anadara*, and reef fish. For some women, fishing skills and knowledge are handed down, and these women were reluctant to discuss them when they were interviewed.

Although women's involvement in fisheries is mainly at the household subsistence level, fishing has recently become a more commercial endeavour, thus highlighting the development in women's participation in fisheries activities. In addition, many women have gained an added sense of security and respect within their households through income generated from selling marine products.

In December 1996, there were 139 residents in Nadoria: 68 of whom were females (48.9%) and 71 (51.1%) of whom were males. The average number of people living under the same roof or household was 5, although there was a considerable range, from a single household resident to as many as 11. Women between the ages of 20 and 60 were mainly responsible for the sustenance of households.

About 56% of respondents were unemployed and 38% had paid employment. About 6% of respondents received social welfare from the government. Women who lived within households where a family member had some form of employment were still engaged in harvesting marine products to supplement earnings or help reduce spending on other protein sources. The variety of job opportunities and fortnightly earnings varied greatly. Some respondents received up to USD 200 per fortnight.

There is an important relationship between fishing and the average household income. Fishing activities correspond directly with relatively low-income households. Some 56% of respondents stated that they did not receive any income from paid employment. The most probable explanation for the survival of households with no income from paid employment is their reliance on the harvesting of marine products for protein and their sale for income.

### **Women's fishing activities**

The women of Nadoria carry out fishing activities as part of their daily schedule. Most households have only one woman engaged in fishing, although some have two fisherwomen. Older (i.e. middle-aged) women are active in subsistence fishing activities in Nadoria. Women 19 years of age and less rarely fished. This trend is explained by the fact that most teenagers attend school or an institution of higher education.

In rivers and estuaries, women search for freshwater eels and shrimp. Women use drag nets, baskets and traps to catch freshwater prawns (*Macrobrachium* spp.), freshwater eels (*Anguilla* spp.), goby (*Sicyopterus* spp.) and crabs (*Scylla serrata*). Women travel to fishing grounds either on foot or by punt.

Women are also experts in trapping mud lobsters (*Thalassina anomala*). They do this by locating the lobster's burrow in the mud among the mangrove roots. Fisherwomen insert a bamboo tube (with a string) into the mud in order to form an extension to the mud lobster's tunnel. When the mud lobster surfaces from the mud, its movement triggers the spring trap, and the mud lobster is caught in the string.

Women use knives, spears and baskets when gleaning. In Nadoria, fisherwomen, glean the mudflats and reefs for many types of shellfish, including trochus (*Trochus niloticus*), giant clams (*Tridacna maxima*, *T. squamosa* and *T. derasa*), driloli (sea cucumber, (*Stichopus chloronotus* and *Holothuria scabra*), veata (*Dolabella auricularia*) and cawaki (sea urchin) (*Tripneustes gratilla*).

Other species collected from the mudflats include kaikoso (*Anadara antiquata*), hard shell clam (*Perilypta puerpera*), kuku (*Modiolus agrietus*) and drevula (*Polinices flemingianus*). Women often form groups and hire a boat to take them to the barrier reef. They often leave at high tide and return at the next high tide. The boat fare usually costs FJD 5.00 per person per trip. If the women cannot afford the boat fare, then they will walk out at low tide. Using a hook and line, they usually catch finfish such as yellow-tailed emperor (*Lethrinus mahsena*), perch (*Therapon jarbua*) and trevally (*Caranx* spp.).

### **Fishing methods and target areas**

Women use different fishing methods. Methods and gear employed by fisherwomen are still very traditional with minimal impact on surrounding habitats. However, overturning stones and uprooting seagrass areas are popular practices while searching for shellfish. These activities can cause potential damage to the substrate and organisms inhabiting the substrate.

Women use their fingers and toes to search in the mud for ark shells (*Anadara antiquata*). Women also look for signs of ark shell siphons at the water's surface on an incoming tide. The women visually spot the half-covered *Anadara* shell gape in clear water at low tide.

Women wade out from the beach towards the seagrass beds at high tide, feeling in the muddy sand with their toes for shells. They fish as far out as they can stand with their heads still above water. As the tide recedes, the women use their fingers.

Nadorian fisherwomen are also involved in other fishing activities and use a variety of fishing methods. Other fishing methods commonly used include the use of a lantern for scoop fishing at night and netting for prawns. By far the most common activity is gleaning for invertebrates.

The fishing equipment used by the women was simple and inexpensive, and included monofilament lines and nets for catching fish. The use of this gear requires little or no technical skills to operate. Likewise, harvesting shellfish requires no form of sea transport and no fishing gear.

Nadorian fisherwomen are expert crab catchers, digging in the mud using bare hands or using a stick and placing the crabs in a basket. Catching crabs requires knowledge and technique in order to avoid fingers from being badly pinched. Most crab catching occurs in mangrove swamps near the village. The women are able to distinguish different crab species by the marks they leave in the mud and sand.

### **Selling marine products**

About 44% of respondents sold marine products once a week. Of these, 25% received a dual income from both paid employment and selling marine products. Women who do not have paid jobs go out fishing everyday and keep their catch frozen until Saturday, when they sell it at the markets in Nausori or Suva.

The marine products sold by women included trochus, prawns, crabs, octopus and inshore finfish species.

### Creel catch analysis

About 90% of the catch from women consisted of invertebrates; the other 10% consisted of vertebrate species such as inshore finfish. Nadorian fisherwomen usually catch between 1 kg and 2 kg per person hour of fishing, with 2 kg per person hour being the most common (48%). A higher catch per unit of effort may be obtained if fishing is carried out in the seagrass areas at the lagoonward edge of the intertidal flats on the outer reefs.

### Summary

We found that women play a very important role in Nadoria's subsistence fishery. Women are increasingly dependent on marine resources for subsistence purposes and for income generation. Seafood is the main component in the diet of most Nadorian households, and subsistence fishing continues to play a very important cultural role.

The sale of marine products contributes to household income. Women's ability to earn income and contribute financially enables them to participate more actively in household decision-making.

Women in Nadoria fish mainly for their own household's consumption. The four most commonly used fishing methods are gleaning, handlining, netting and crabbing. Although the fishing methods are simple, these methods require high level of knowledge and skills. In addition to subsistence fishing, women also sell their excess catch at the local market or trade the catch within the village. Revenue from the sales of fish and marine products are spent on school fees and buying household necessities.

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## Subsistence fishing and fish consumption patterns of the saltwater people of Lau Lagoon, Malaita, Solomon Islands: A case study of Funaafou and Niuleni Islanders

*Toata Molea<sup>1</sup> and Veikila Vuki<sup>2</sup>*

### Introduction

The Solomon Islands lie in the south latitudes 5° S and 12° S, and longitudes 152° E and 170° E. The country consists of six major islands and 900 other smaller islands. Malaita is the second largest island in terms of land area and is the most densely populated. The northern region of Malaita includes the Lau Lagoon and is the most densely populated rural area in the country.

Two artificial islands, Funaafou and Niuleni (New Land), are among 50 artificial islands that constitute the Lau Lagoon off Malaita's northern coast. Unlike Niuleni, which was built primarily by piling reef stones into mounds on the shallow reef flats, Funaafou has a pre-existing natural base made from coral knobs or rocky outcroppings that have been on the reef flat before any people arrived. Early inhabitants constructed the island by walling the submerged rocky knobs with limestone boulders gathered from the reefs at low tide or along the shore of the mainland. At a height of about one metre above the highest high tide mark, the enclosure was filled with earth and the surface level graded with dead coral, rubble and sand.

The movement of the first migrants from mainland Malaita to Lau Lagoon began some 300 to 400 years ago. Among the causes of these out migrations were tribal fighting, headhunting and cannibalism. Migrations to the artificial islands were also directly related to in-fighting among clans and family feuds. It was also believed that people from the mainland wanted to escape from mosquitoes and mosquito-borne diseases such as malaria.

The original inhabitants were foragers who gleaned for small fish, shellfish and seaweed on the reef flats. Their population gradually increased over time. Gleaning was done during both low and high tides after which the gatherers retired back to the mainland. Rafts were built as a form of transportation and later used to carry reef stones and boulders to

build the artificial islands. Life was dependent on the Malaita mainland during this transition period. Animosity, however, grew between the inhabitants of the artificial and mainland Malaitans and many of the original inhabitants of the small islands were killed, forcing them to break their ties with the mainland and settle permanently on these artificial islands.

The early settlers were animists whose beliefs were ingrained in superstitions and as such much of the islanders' fisheries activities were associated with numerous ritualistic practices. However, when Christianity was introduced in the 1900s, many young converts abandoned these practices and followed the new religion. Tensions grew between the island's elders and the converts over the newly introduced teachings of Christianity, which the former believed to be desecrating the ancestral island of Funaafou. As a result, the converts resorted to building the artificial island of Niuleni where they could build a church and escape the pagan practices of Funaafou.

The livelihood of Funaafou and Niuleni Islanders depends heavily on marine resources as many islanders do not own land on the mainland to grow root crops or vegetables. To remedy the situation, the islanders established a "barter" system of trade with the hill people, whereby fish, shell fish and other marine products were exchanged for root crops, vegetables and other garden produce brought by the hill people. This exchange became vitally important for the survival of the islanders of Funaafou and Niuleni. Today, the barter system of trade is still practiced in Lau Lagoon but is becoming less important as staples such as rice, noodles and flour can be obtained from shops.

Fish and other marine resources are important for the islanders of Funaafou and Niuleni, both as a source of daily food as well as items for food exchanged at the local markets. Because of this, fishing skills are crucially important for sustaining life in these environments. Men are expected to be

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**Figure 1.** Northern part of Malaita and the artificial islands (source: Google Earth).

proficient in the different fishing methods and so, fishing has evolved to become the most developed subsistence activity within a household. Akimichi (1978) reported that the Lau people used over 100 fishing techniques, including different types of nets, kite, hook and line, fish poison and spears.

The objectives of this survey were to 1) assess the status of fish in the diet of Funaafou and Niuleni Islanders, and 2) determine the quantity of edible fishery resources harvested from Lau Lagoon. The level of fishing pressure and its impact on the ecology of the reefs was also assessed in relation to the fishing technology currently used. It must be noted, however, that it is beyond the scope of this study to quantify the resources harvested from the whole of Lau Lagoon because there are other neighbouring artificial islands in the group that also have traditional rights of access to the reefs and lagoonal areas. Their fishing activities were not included in this survey.

### Methods

Twenty-four households were surveyed: thirteen from Funaafou and eleven from Niuleni. Interviews were conducted in the Lauan dialect with a senior member of each household interviewed in the evening after the family meal.

The main focus of the survey was threefold. First, the socioeconomic status of each household was considered in order to give an overview of the general economic situation of the islanders. Second, details of fishing activities — including fishing methods,

area of fishing effort, and species caught — were recorded and analysed to determine whether there was a relationship between the economies of each household and the type of fishing method used. Third, an estimate of the quantity of fish (by species), and invertebrates consumed the previous day was also recorded to ascertain whether fish consumption was influenced by the type of fish caught. This study was based on fieldwork conducted in Lau Lagoon between 1996 and 1997.

### Study area

The Lau Lagoon and adjacent area is sometimes referred to as the “North” because of the region’s geographic location on Malaita’s northern end. The islanders are often referred to as “saltwater people” because of their close association with the marine environment. The domain of the saltwater people is generally considered to extend from Suava Bay on the north, to Ata Cove on the northeast. There are around 50 artificial islands in Lau Lagoon. The islands that are built on reef flats are well protected by a natural system of barrier reefs. This study was confined to the artificial islands of Funaafou and Niuleni, which are on the edge of Makwanu Passage.

### Results

#### *Population and household income*

Men made up 51.4% of the 24 surveyed households on Funaafou and Niuleni (women made up 48.6%). The average number of people per household was

six, with 47.2% of surveyed households made up of children and 52.8% adults. The average income per household per week was SBD 95, which mainly came from the sales of finfish, trochus and beche-de-mer. The islanders' income ranged from SBD 10–600 per household per week.<sup>3</sup>

### Fishing households

All of the surveyed households were involved in both subsistence and semi-commercial fishing. Of all the families interviewed, 29% sold marine products such as trochus and beche-de-mer. They also indicated that their main income source came from fish sales. The bulk of the fish caught were exchanged for root crops and vegetables, or were sold to local markets to individual fish buyers to sell at the Auki market (the provincial centre for Malaita) or Honiara fish outlets. Only a small proportion of the fish caught were consumed. Fishers from Lau Lagoon are serviced by the Takwa Fisheries Center, which is about eight kilometers from Funaafou and Niuleni. The center provides ice blocks and cubes to fishers who wish to transport their fish to Auki or Honiara. At the time of the survey, the Takwa Fisheries Center serviced the islands but they no longer do so.

### Fishing methods

Fishing methods vary from family to family. The most common method is gillnetting (drive in), practiced by 25% of the households surveyed, followed by handlining, practiced by 17.8% of the surveyed households. *Oko* is a special hand-held spear fishing technique used to catch rabbitfish. It involves two people pulling the two ends of a rope as they walk along the reef, while fishermen snorkel after the rope spearing rabbitfish. *Oko* was done by 14.3% of all surveyed households. Beach seining and torchlight (flashlight) fishing were each practiced by 10.7% of all surveyed households, while mantis shrimp (*Lysiosquilla maculata*) fishing (*siki*), and other line fishing were each practiced by 7.0% of all surveyed households. Dropline fishing and scuba fishing were each practiced by 3.6% of surveyed households.

Shellfish collecting was mainly done during low tide by women and children. Our surveys revealed that elderly women actively collected shellfish, which provided quick cash to help buy household grocery needs.

### Seafood consumption patterns

On average, 1.54 kg of fish were eaten by each household per day. This represents a calculated

average of 225 g of fish consumed per person per day. The survey further revealed that islanders eat fish seven days a week. In some households, fish was consumed twice a day (at morning and evening meals), while in others, fish was consumed three times a day (at morning, mid-day and evening meals).

Typically, three meals a day are eaten, although meals are not confined to any specific time. Fish consumption did not dominate any of the three meals, with the exception of Friday evening meals and Saturday morning and mid-day meals. At these times, all Niuleni households and more than 50% of Funaafou households consumed fish during these meals. This is because all Niuleni Islanders and some Funaafou Islanders belong to the Seventh-Day Adventist Church, which considers Sabbath, and so no work is carried out on that day. Friday then is "preparation day" and fishing is done for both Friday and Saturday.

Most of the fish consumed were smaller in size than those sold. The survey found that fish retained for home consumption were actually remnants of the catch after the larger and more valuable fish were selected to be sold. High-grade fish often fetch higher prices than ordinary fish in the local markets. All fish species sold to buyers supplying the Honiara market were sold at the same rate. Fish prices fluctuate according to supply and demand in Honiara. The sale price of all grades of fish during the time of the survey was SBD 3.00 per kg. A list of fish species from the Lau Lagoon is presented in Table 1.

A relatively low amount of shellfish consumption was noted because Seventh-Day Adventist beliefs do not allow consumption of shellfish. A few people, despite their beliefs, still consume shellfish and the most frequently consumed shellfish was the flesh of the highly valued trochus shell (*Trochus niloticus*). This was boiled in seawater then tapped against a piece of wood to remove the edible content. The shells are then sold to trochus dealers.

The interviews revealed that shellfish meat was a delicacy and often provided extra protein in the saltwater people's diet (besides fish). Shellfish included giant clams (e.g. *Tridacna gigas*, *T. squamosa*, *T. maxima*, *T. crocea* and *Hippopus hippopus*), turbo shell (*Turbo* sp.) and the gastropod *Lambis lambis*. The sea urchin, *Tripneustes gratilla* (*bibinu*) is also considered a delicacy, and is regularly gleaned by women at low tide for its eggs (just before the monthly spawning periods).

3. All monetary values stated in this paper are in Solomon Island dollars (SBD). In 1996–1997, when the fieldwork was conducted, USD 1.00 was approximately equivalent to SBD 3.80.

**Table 1.** Fish, shellfish and sea anemone species found in Lau Lagoon.

Lau name	Common name	Scientific name
<b>Fish</b>		
Aifatarao	Longsnout flathead	<i>Platycephalus</i> spp.
Bali	Yellowfin parrotfish	<i>Scarus flavipectoralis</i>
Balu	Titan triggerfish	<i>Balistoides viridescens</i>
Bokofu	Crocodile longtom	<i>Tylosurus crocodilus</i>
Bolo	Finelined surgeonfish	<i>Acanthurus grammoptilus</i>
Bubu ni one	Whitebanded triggerfish	<i>Rhinecanthus aculeatus</i>
Dafi	Slender parrotfish	<i>Leptoscarus vaigiensis</i>
E'eno	Honeycomb rockcod	<i>Epinephus</i> spp.
Faau	Anchor tuskfish	<i>Choerodon anchorago</i>
Falata Kwao	Goldlined rabbitfish	<i>Siganus lineatus</i>
Fotobala	Spangled emperor	<i>Lethrinus nebulosa</i>
Gela	Yellowfin tuna	<i>Thunnus albacares</i>
Gougou saru	Floral Maori wrasse	<i>Cheilinus</i> spp.
Hatamela	Thumbprint emperor	<i>Lethrinus harak</i>
Hau Inito	Skipjack	<i>Katsuwonus pelamis</i>
Isiofu	Smooth flutemouth	<i>Fistularia commersonii</i>
Kakaboa	Crescent grunter	<i>Therapon jarbua</i>
Kwaibia	Yellow-stripe goatfish	<i>Mulloides flavolineatus</i>
Maelafu	Raggedtooth parrotfish	<i>Calotomus spinidens</i>
Maeto	Blackstreak surgeonfish	<i>Acanthurus nigricauda</i>
Mara	Bluebarred parrotfish	<i>Scarus ghobban</i>
Modomu	Great trevally	<i>Caranx ignobilis</i>
Moua	Pacific longnose parrotfish	<i>Hipposcarus longiceps</i>
Mu	Rabbitfish	<i>Siganus</i> sp.
Nara kedea	Coral rabbitfish	<i>Siganus corallinus</i>
Niginigi	Dussumier's garfish	<i>Hyporhamphus dussumieri</i>
Ragaraga	Blackspot goatfish	<i>Parupeneus spilurus</i>
Sinu	Cinnabar goatfish	<i>Parupeneus leptacanthus</i>
Suru gou	Yellow-tail emperor	<i>Lethrinus atkinsoni</i>
Takwalao	Orangespine unicornfish	<i>Naso lituratus</i>
Unuunu	Barred garfish	<i>Hemiramphus far</i>
<b>Shellfish and sea anemones</b>		
Bibinu	Sea urchin	<i>Tripneustes gratilla</i>
Kikii	Giant clam	<i>Tridacna</i> spp.
Hae fulione	Sea anemone	<i>Cerianthus</i> spp.
Hae akoako	Sea anemone	<i>Cerianthus</i> spp.
Hae mailade	Sea anemone	<i>Cerianthus</i> spp.
Hae gime	Sea anemone	<i>Actinia</i> spp.
Hae lesu	Sea anemone	<i>Actinia</i> spp.
Karongo	Trochus	<i>Trochus niloticus</i>

Five species of sea anemone (*Cerianthus* spp. and *Actinia* spp.) are frequently collected (Table 1). Local names for the five species are *hae fulione*, *hae akoako*, *hae mailade*, *hae gime* and *hae lesu*. Sea anemones are combined with mangrove seeds (*Bruguiera gymnorrhiza*) to make a *koa ana takomai*, a sea anemone delicacy. Sea anemones were often cooked in hot stones for an hour by placing them in wooden bowls and covering them with swamp taro leaves. Sea anemones were either consumed or sold at the local market.

### Fishing habitats and efforts

Fishing was carried out in the lagoon, barrier reef, on the reef edges and offshore. According to Lau tradition, the lagoon areas, reef flats, reef edges and surge areas are zoned into fishing grounds called *alata*. Each *alata* is associated with specific species of fish, and is targeted during different seasons, tides, currents and weather.

A typical fishing trip lasted about 3.5 hours per day, although fishers remained fishing for as many as 8 hours and as few as 0.5 hours. The number of hours spent fishing depended on the fish catches, and the fisher's skills, and experiences.

### Fishing craft

A smaller number of fibreglass boats powered by outboard motors (15–30 hp) were used mainly for offshore trolling. All fishing craft used during the time of the survey were local dugout canoes. According to the islanders, modern boats are difficult to handle during fishing operations, especially during bad weather; whereas dugout canoes are easy to handle during fishing operations and can be used by a single person. Most dugout canoes were between 10 feet and 15 feet long, and capable of carrying up to two people, with one person sitting at each end and the fishing gear placed in the centre. A fishing trip comprising a father and son was very typical at both Funaafofu and Niuleni.

### Fishing times

Fishing was mainly done during the day, although night fishing was done if family members had to attend to other commitments during the day. Some fishing techniques were often associated with certain nocturnal fish species, for example, moonlit trolling for soldierfish (*Myripristis* spp.). Fishing is often done only at night when the soldier fish come out to feed.

The survey revealed that 73% of all fishing was done during the day, 19% at night and 8% done at "other times". Other times refers to fishing only at dusk or dawn for specific species of fish. For example, fishing

for trevally is usually done at dusk because schools of trevally (carangids) hunt for herring (*Herklotsichthys* spp.) and purse-eyed scad (*Selar* spp.) as they return to deeper waters at night. Trevally fishing also takes place at dawn when schools of herrings and scads are often seen in shallow waters. Dawn and dusk fishing is very specific and can be as short as a couple of minutes; fishers must be skilful and alert in order to catch trevallies before they return to deeper water.

### Discussion

Household surveys revealed that fish formed the major component of the diet of the saltwater people of Lau Lagoon. The average daily fish consumption per household was 1.54 kg per day. This represents a daily fish consumption of 225g per person per day, or about 90 kg per person per year. The Solomon Islands national average in 1990 was 56 kg per person per year, which indicates that the Lauans consume almost double the national average. Our surveys also showed that fish consumed at the household level constituted a small proportion of the day's catch because the larger fish were sold at market outlets.

It was evident that some households did not have food gardens on Malaita. Fish were used to exchange for food crops and other agricultural produce from the mainland hill people. Some fish were also sold for cash. Fish is not only an important protein source for the islanders, but also for cash and for trading to obtain root crops.

The islanders' main source of regular income comes primarily from fishing, either by selling fish at local markets or to dealers who re-sell the fish at the Honiara market. At the local markets, marine products were either sold cooked or raw, and specifically by women.

For the Honiara market, fish were sold to dealers who packed the fish in crushed ice inside fibreglass coolers. The coolers were transported to Honiara in order to re-sell the fish at a higher price. At the time of the survey, there were at least five individuals who were engaged in buying fish from local fishermen. Interviews with local residents revealed that the number of fish buyers for the Honiara market had increased because of the high demand for fresh fish. There were additional people who did this on a part-time basis. Sometimes, fish buyers from Honiara left their ice-filled containers with different groups of fishermen and came back and collected them in several days when they were full. Women and children were involved in cleaning and processing the fish before they were transported to Honiara. Ice was purchased at Takwa government station.

A relatively low amount of shellfish consumption was recorded during the survey. The main reason for this was that almost all inhabitants of Niuleni, and a smaller proportion of Funaafou Islanders, are members of the Seventh-Day Adventist church. Members of this church believe that all marine invertebrates and fish without scales are unclean and so must not be eaten.

Fishing activity and the amount of fish caught depend also on tidal patterns in Lau Lagoon. Fishers stated that fishing operations were planned according to tides. If they planned well, fishing operations could be undertaken continuously during the day for different fish species, using different fishing techniques and gear.

The islanders of the artificial islands also associate lunar phases with the feeding habits of different fish species. Fishers revealed that certain fish only come out to feed during the new moon phase. A good example is the herbivorous long-finned drummer fish, *Kyphosus vaigiensis*, called *unasi* in the Lauan dialect. These fish aggregate to feed during the new moon phase at high tide, and the islanders catch them during that time.

Fishing has shifted from a traditional communal activity, to more of a family or individual enterprise. Several factors account for this. Fishing

gear that was not readily available in the past to families or individuals is now readily accessible through government fisheries centres in rural areas or through a commercial shop in Honiara. Modern fishing gear is also preferred because it is easy to handle and user-friendly. An individual fisher can go fishing alone without the help of others in the village, unlike some traditional fishing gear where the whole community must be mobilised. Modern fishing gear is also affordable and can be purchased using cash instead of custom money.

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## Poverty in paradise?

### Issues in poverty and development in Fijian fishing villages

*Susan Zann<sup>1</sup> and Leon Zann*

#### Introduction

Small Pacific Island countries (PICs) such as Fiji have long been considered “tropical paradises” by westerners. Extreme poverty and starvation are not considered critical issues in the region. The United Nations Pacific Human Development Report (1999) considered that PICs do not experience extreme poverty, or “it is not visible”. The Pacific Plan (PIFS 2006) emphasises national and regional economic development, governance and security, rather than more basic human development of Pacific Island people.

Development, however, is more than national economic growth. Development is about people, and expanding their choices, freedom and dignity. It involves their well-being, income, education, water, sanitation and other health-related issues that can impact on their standard of living, and cause deprivations that result in human poverty (Bello 2004).

Income has been used as the major indicator of poverty by the United Nations Development Program and the World Bank. The international benchmark for “extreme” poverty is set at under USD 1.00 per person per day, and “moderate” poverty under USD 2.00 per day (Sachs 2005).<sup>2</sup> Definitions of poverty by the World Bank are given below (Kegley and Wittkopf 2004).

Poverty is more than just a lack of money. United Nations Human Development Indicators of poverty include income and expenditure, diet, education, health care, water, sanitation and transport (UNDP 1999).

In the past, rural communities in Fiji could obtain a certain standard of living through traditional family networks and a subsistence economy that is based on marine and terrestrial resources. Fiji was a dynamic economic society whose culture was based on a subsistence existence. Fijian traditional values were based on beliefs and practices that focused on meeting the basic needs by maintaining social cohesion within the communal setting. The Fijian way of life was not individualistic; people depended on each other for survival and the accumulation of wealth was a foreign concept. The equitable distribution of goods and services was encouraged as a reciprocal practice. Land was the economic base and the source of well-being (Finau et al. 2003).

This is rapidly changing as traditional Fijian values such as subsistence and communalism are being eroded by modernisation, and replaced by commercialism and individualism. Development has resulted in a mass exodus of rural populations to the main towns and cities, resulting in large squatter settlements. Rural communities are also suffering from this exodus, with dwindling populations unable to provide for their families due to depleted marine and terrestrial resources, and an increasing cost of living and transport (UNDP 1999; Khan and Barr 2003).

Economic surveys in Fiji indicate that over 50% of the population lives on less than FJD 25.00 a week, and cannot meet their basic needs. However, in communities where subsistence activities are the major means of sustenance, it is difficult to measure the standard indicators. The Fiji Poverty Report (Gov-

<b>Extreme poverty</b>	Living on less than USD 1.00 a day. People in absolute poverty can not meet their basic needs and are chronically hungry, lack safe drinking water and sanitation, and have no access to basic health and education. It is estimated that over 1.1 billion people are living in extreme poverty and the majority of these are in Sub-Saharan Africa and Southeast Asia.
<b>Moderate poverty</b>	Living on USD 2.00 a day and just able to meet basic needs.
<b>Relative poverty</b>	Household income is below the national income level.

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2. The rate of exchange at the time of writing was USD 1.00 = FJD 1.69.

ernment of Fiji and UNDP 1997) noted the need to measure poverty more appropriately, to include factors such as poverty of opportunity, access to health, education and a higher standard of living.

This study was undertaken to assess the extent of poverty in Fijian villages using the more appropriate UNDP indicators. The following discussion summarises the major findings of a survey undertaken in three villages near the urban centres of Nausori and Suva to examine issues of poverty and human development, and consider interactions between subsistence and cash economies.

## Methods

Household member and informant questionnaires were developed to specifically address the United Nations Human Development Indicators on poverty (Table 1). The questionnaires included background details on demography, household budgets, diet and foodstuffs, fishing and house construction. The households' own values and perceptions of poverty and development were also assessed through a self-rated question on their standard of living.

Key informants such as village elders, leaders, *turaga-ni koro* (village "mayors"), chiefs, school teachers, church leaders and others who might have access to

general information were asked more open-ended questions on income, expenditure, diet, education, health care, water, sanitation and transport.

Other sources of information came from the UNDP Human Development Reports, the Asian Development Bank (ADB), Fiji Bureau of Statistics and the national census of Fiji in 1996. The questionnaires and discussions were conducted orally in Fijian (Bauan) by the authors and research assistants who came from that area.

## Study sites

Three villages in the districts of Bau and Nakelo in the Province of Tailevu on the island of Viti Levu were selected: Dravo, Naisogovau and Namuka. These lie on the Waidamudamu River on the fertile lower Rewa River delta. They are around 5–10 km by road from the major town of Nasouri, and 20–25 km from Suva, where employment, health and education facilities are available.

### Dravo

(population 203, 32 households, 37% surveyed)

Dravo is a small rural village about 5 km inland from Bau Waters. It is reached by a dirt road off the main road to Bau Landing. Nausori is 10 km away

**Table 1.** Household questionnaire.

Questions	Content
1.	Total number of dependents in household
2.	Number of families in household
3.	Sources of income
4.	Source of income from someone who lives elsewhere
5.	Household expenditure of items such as food, electricity and transport
6.	If household expenditure covers cost of living
7.	Daily diet (breakfast, lunch and dinner)
8.	Consumption of fish and meat, fishing activity
9.	Was fish caught, bought, given and by whom
10.	Number of people attending school, university and vocational
11.	Household expenditure on school fees
12.	Do school fees impact on access
13.	Health problems and deaths in last five years
14.	Type of health service in village
15.	Distance to nearest healthcare service/hospital
16.	Cost of transport to access healthcare service
17.	Does cost of transport affect access to health care service?
18.	Access to water
19.	Access to flushed toilet
20.	Self rating of standard of living
21.	Type of house structure/dwelling
22.	Number of rooms, appliances and power source
23.	Does household own a boat or car?

and is accessible by bus, taxi, carrier and boat. The village has a village church, meeting hall, piped water, flush toilets, telephones and grid electricity. There are no services such as cooperatives, healthcare centres or schools.

### **Naisogovau**

(population 125, 21 households, 57% surveyed)

Naisogovau is a rural village, about 4 km inland from the coast and about 1 km from Dravo. It is accessible by bus, taxi, carrier and boat. It has a church, cooperative, grid electricity, piped water and flush toilets. There is no healthcare centre or school.

### **Namuka**

(population 312, 45 households, 26% surveyed)

Namuka is a larger village, about 5 km from the coast. It is close to Nausori airport and the larger river settlement of Wainibokasi. It has a church, healthcare centre, primary school and cooperative.

## **Results and discussion**

### **Population and demographics**

A total of 36 households were surveyed out of a total household population of 98 in the three study sites. The average number of families per household was 1.3, with a mean household size of 6.5 people, and a maximum of 15. The demographics of the villages varied. For example, Dravo had a larger number of

people aged 0–5 and 70+ years than Naisogovau and Namuka. No males in Naisogovau were over the age of 70, and no females in Namuka were over the age of 70.

### **Cash economy**

The average daily income per person per day was FJD 1.49, or FJD 550 per year. Broken down by village, this comes to Dravo FJD 2.27 per day, Naisogovau FJD 0.43 per day, and Namuka FJD 1.76 per day (Table 2). Naisogovau had the highest number of people working, yet the lowest average income. A possible reason for this is that the average wage for people is low. For example, a security guard with a family of 7 had an income of FJD 40.00 a week. Major items of household expenditure were by order: foodstuffs and water, school fees, church tithes and transport. Church tithes were high, from FJD 50.00 to FJD 250.00 per household per year. Village fees and functions (*solu*) averaged FJD 60.00 per year.

### **Subsistence economy**

Even though the villages were relatively close to urban centres, a majority of households (55%) retained a primarily subsistence existence, relying on fishing and gardening (Dravo 83%, Naisogovau 50% and Namuka 33%). However, a varying proportion of their production was sold at the local urban markets for cash for manufactured foods, clothes and other necessities. Some households sold almost all their fish catch for cash and consumed little fish in their diets.

**Table 2.** Summary of household income and expenditure

Village	Average daily income per person	Main source of income in village	Main expenditure	% people who felt income did not cover living costs	Income from household activities	Level of poverty based on UN scale
Dravo	FJD 2.27 USD 1.35	16.6% employed; 83.4% have subsistence income	food, water, school fees, church tithe and <i>solu</i>	91.6%	<i>sasa</i> brooms, fishing coconuts, crops	moderate poverty
Naisogovau	FJD 0.73 USD 0.43	50% employed elsewhere; 50% have subsistence income	food, water, school fees, church tithe and <i>solu</i>	100%	fishing, <i>sasa</i> brooms, coconuts, crops	extreme poverty
Namuka	FJD 1.76 USD 1.04	33.3% work elsewhere; 66.7% have a subsistence income	food, water, electricity, school fees, church tithe, and <i>solu</i>	100%	<i>sasa</i> brooms coconuts, crops	moderate poverty

## Diet

The main foodstuffs consumed were polished rice, *dahl* (split pea soup), cassava and fish (Table 3). An average of 44% of households consumed fish each day (Dravo 58%, Naisogovau 41% and Namuka 33%).

This study found the diet of most households to be poor and lacking nutritional value. Cassava, sugary tea, flour, biscuits and rice — the main food items — are the major cause of diabetes and malnutrition.

## Importance of fishing

The three villages lie on the banks of the Waidamudamu River. They are varying distances from the ocean, and the importance of fishing and the major types of fish varied. Fish was the major source of protein, and a major source of income. Fishing was important in downstream Naisogovau (58% of households fished regularly) and Dravo (25% fishing regularly), and was least important in upstream Namuka (1% fishing).

The fishers of Naisogovau sold the majority of their fish in order to supplement their cash incomes, whereas fishers in Dravo consumed most of the fish they caught. The main source of income at Naisogovau was from small shrimps (*moci*). The main method for catching fish was by net, and hook and line. The main fish caught in Dravo was tilapia. The river had been dammed near the village, and tilapia were introduced in recent years.

## Education

Only Namuka had a primary school. Children from the other villages must walk several kilometres to the nearest schools each day. Secondary school stu-

dents have to travel by bus to Nausori. Around 25% of the population in Naisogovau attend primary schools compared with 10.5% in Dravo.

While all younger children regularly attended a free primary school, attendance levels in secondary schools was much lower. Some 16% of older children at Namuka, and 25% each at Dravo and Naisogovau, did not attend any secondary school.

Education is a basic human development indicator. The main reason given for non-attendance at secondary schools and higher education was the cost of school fees and transport. While UNDP identifies a number of constraints to education in PICs (e.g. need for more teachers, promotion of national and cultural identities, and vocational training to bolster economic growth in tourism and fisheries), it does not present a strategy to address the low attendance at secondary schools because of school fees and transport costs in subsistence communities.

## Health care

Around 30% of households had members suffering from a serious illness (e.g. diabetes, heart disease, cancer, stroke). Traditional or herbal medicines were more commonly used than western medicines in all villages.

Access to healthcare services varied. Dravo has a resident nurse. The nearest healthcare centre is at Mokani, about 5 km away. This has a dispensary and free medication, if available. Namuka has a dispensary and clinic.

Health and access to mainstream healthcare services are also important UN human development in-

**Table 3.** Diet and fish consumption.

Village	Main diet the day before survey	% who ate seafood day before survey	Type of seafood eaten (and where caught)	% fishers in the village	Origin of seafood	Fishing method
Dravo	fish, cassava, sugar tea, dhal, rice	58.3%	tilapia; <i>Lethrinus mahsena (sabutu)</i> (river and sea)	25%	caught, bought, given	hook and line, nets
Naisogovau	fish, cassava, tea, rice, taro leaves	41%	<i>Hemirhamphus far (busa)</i> ; <i>Leiognathus equulus (cebe)</i> ; shrimps ( <i>moci</i> ) (river and sea)	58%	caught, given	hook and line, nets
Namuka	fish, cassava, tea, dhal, rice, roti, sausages	33%	mangrove crab <i>Scylla serrata</i> (river)	1%	bought	

dicators. Although relatively good medical services are available in nearby Nausori or Suva, most people (95%) said that the high cost of transport was the main reason they could not access hospitals for serious complaints.

### **Other services: Transport, water, electricity and sanitation**

The villages were well connected by gravel and sealed roads to Nausori and Suva. All had bus services to Nausori and Suva, as well as taxis and local carriers. The cost of bus fare was around FJD 0.75 one-way to Nausori, and FJD 2.00 one-way to Suva. Despite the good connections and relatively inexpensive services, one of the biggest issues was cost of transport, which affected access to health and education services for subsistence and low income households.

Access to electricity, water and sanitation are important development indicators. All villages had grid electricity, piped and reticulated water from the main water supply of the Public Works Department. In more developed Namuka, 83% of households were connected to water, and 33% had flush toilets. In Dravo, 67% of households were connected to water, but only 8% had flush toilets. Those without running water or electricity had been disconnected due to unpaid bills. Thus, while all villages had access to a Public Works Department supply, many households were not connected because they could not afford the services.

### **Housing**

Traditional, single room huts (*bures*) made from bush materials were present only in Dravo (16% of dwellings). These did not have electricity or water connections. Other dwellings were constructed with walls of galvanised iron, timber or concrete block, with iron roofs. Many of the iron and timber houses/huts comprised a single room and limited furniture. Cement-block houses were larger and generally had three rooms. Material possessions varied with the level of income of each household. Most of the cement houses had some furniture and TV, DVD, radio, washing machine and other appliances. None of the surveyed households owned a car or motorboat.

### **Well-being and standard of living**

The indicators above suggest that the general standard of living in the villages was low. When asked to rate their own living standards, an average of 52% of those surveyed rated theirs as “poor” or “very poor” (Dravo 42%, Naisogovau 75% and Namuka 41%). The remainder rated themselves as “good/very good”. While the basic indicators of human

development of “wellbeing” and standard of living are rather relative criteria, the above results indicate that these are limited — by western standards — in the villages investigated.

### **General discussion**

Although the United Nations Pacific Human Development Report (1999) considered that PICs are not subject to extreme poverty, “or it is not visible”, it is apparent that extreme poverty does exist in communities in Fiji, and is visible. Two of the three villages surveyed in this study had average household incomes in the “extreme poverty” category (i.e. USD 1.0 per person a day), and one village was marginally better (“moderate poverty” category).

Extreme poverty also exists in Fiji’s urban areas despite greater employment opportunities and better services. For example, in a squatter settlement at Jittu Estate in Suva most families live on less than FJD 25.00 per week (Skjolseth 2003). The number of people living in poverty could be as high as 60% in some urban areas in Fiji (Khan and Barr in Skjolseth 2003).

Surveys in more isolated Fijian fishing villages also found that incomes were low. For example, in Macuata in Vanua Levu, Veitayaki et al. (2002) found the average monthly income per household was FJD 650.00, or FJD 3.60 per person a day (“moderate” poverty). The living standard of most households surveyed was considered low, and many households had large debts for fishing equipment, which provided their main source of income. Education levels were low and most household members did not proceed past primary school. Employment opportunities were very scarce and fishing, which requires no formal education, was the only means of earning an income.

Although there was no evidence of starvation, diets were considered poor because of excessive starch. Easily grown, starchy cassava and copious amounts of sugary tea have largely replaced more nutritious taro and yams in everyday village diets. Diabetes, one of the most serious health issues in Fiji and other PICs, is largely a consequence of development. Diabetes and hypertension can considerably restrict a person’s activities, and reduce their longevity, quality of life, productivity and even their ability to work (UNDP 1999).

In the past, the accumulation of income and wealth were foreign concepts in Fijian society and the equitable distribution of goods and services was a customary and reciprocal practice. The land was the economic base, the source of well-being, and identified who people were and their history (Finau et. al 2003).

These times are changing as Fiji and other PICs strive to meet demands of economic development. This often places an untenable burden on Fijian traditional values and practices that focused on meeting the basic needs by maintaining social cohesion within a communal setting. As UNDP notes “Pacific Island societies are not as equitable as they sometimes are portrayed to be, and in some ways these inequities are deepening... for individual poverty exists in the region and some people and households are singularly disadvantaged and impoverished” (UNDP 1999:5).

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**Figure 1.** Fishing for tilapia.

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**Figure 2.** Local house being renovated in Dravo.

## The “culture of silence” and fisheries management

*Aliti Vunisea<sup>1</sup>*

In Pacific Island countries, fisheries managers continue to grapple with implementing fisheries management initiatives at the community level, while also trying to ensure that existing sources of food and income are not compromised or lost. When implementing any form of management, managers must, for example, address issues relating to the most appropriate locations to place “no-take zones” (as opposed to people’s preferences for where they want the no-take zones to be), decisions on temporary and permanent closures and how to implement these closures (given people’s culture and customs), decisions on fishing gear and techniques to use and those to be banned (given the impact of certain technology on resources), seasonal fishing practices, and community traditions and customs.

In the Pacific, most decisions are arrived at through communal consensus; however, community agreement does not necessarily mean that all members of the community have had their views heard. The “culture of silence” — where people usually do not speak unless spoken to or asked a question, where people respect the views of elders and do not contradict what has been agreed to — is rife in many Pacific Island cultures. This culture of silence means the views of certain community members are not heard, and this usually includes the views of women and young people. Even when women and young people participate in discussions, culture dictates what they say and limits their comments to what is appropriate and not offensive to leaders and elders. This culture of not speaking out, not asking questions, not questioning decisions made by community elders and leaders, sometimes culminates in conflicts between resource users and resource owners during later phases of a fisheries development project. In many cases, there is no conflict, but women and young people who fish daily for food and income may be affected and even badly inconvenienced. They may have to walk greater distances to fishing grounds, resort to other fisheries, or look for alternative food sources because of their once accessible source of income and food is no longer available to them. The culture of silence, which has unwritten rules of only speaking when spoken to or if asked, and not going against decisions made by elders and community leaders, is a Pacific Islander custom that continues to limit the full participation of women and young people in decision-making processes, including those relating to fisheries.

Women and young men, who are generally the ones who fish daily and sell seafood, are usually not included in decision-making processes. During community meetings in Samoa for example, untitled men must sit outside meeting houses, which means the views and perspectives of the majority of fishermen in a village are not heard. In other cases, a representative of young people and women may be sent on their behalf to community meetings, but this representative is then responsible for participating in discussions, answering questions, and negotiating for these groups. The result is that sometimes there is discontent with decisions that have been made. In most cases, the most vulnerable in these situations include those that are poor in terms of resource ownership and access, those least involved in any planning or decision-making processes, and those who stand to gain the least from any form of management or development in the community. Not including these community members could result in the exacerbation of poverty and the widening of gaps between the “haves” and “have nots” within the community.

The Pacific Plan<sup>2</sup> and the Millennium Development Goals for Pacific Island countries<sup>3</sup> both highlight the need to eradicate poverty (or hardship), which is prevalent in many rural and urban areas in the Pacific. Poverty as defined in financial terms (typically using an income threshold) is found in many situations where households lack a steady income source, whether from salaries or remittances. But poverty defined as such usually does not take into account people’s ability to access resources, and their ability to sustain themselves without a cash income, a situation that is very common in Pacific Island countries. For most Pacific communities, “poverty of opportunity”, referring to the ability of people to maximize (or at least fully access) opportunities such as education, is the most common form of poverty. Whichever definition of poverty is used, the fact remains that management that results in long-term benefits and a sustainable resource base for people, can result in immediate restrictions in access to reef or mangrove areas for fishing. These considerations should be paramount when implementing or designing fisheries management measures at the community level. Concerns regarding the impacts of implementing management initiatives usually do not reach community leaders and external partners because of

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 2. See <http://www.pacificplan.org/tiki-page.php?pageName=HomePage>  
 3. See [http://www.spc.int/mdgs/MDGReport/Reg\\_report.htm](http://www.spc.int/mdgs/MDGReport/Reg_report.htm)

the culture of silence, or acceptance of decisions without opposition.

In their efforts to implement fisheries management measures, managers must adhere to required project outputs and objectives, and timelines as dictated by donors. As a result, the development and implementation of management measures at the community level is sometimes done without a thorough understanding of: 1) the usefulness of the initiative, 2) how the initiative impacts all sectors of the community, 3) which community members will lose out on their usual fishing grounds, and 4) which resource can no longer be accessed.

As an example, during survey work carried out for SPC's PROCFish project<sup>4</sup> in the Solomon Islands, the author observed incidences where management was sometimes in conflict with people's needs. In most community-based initiatives, areas identified and agreed to as no-take zones are usually the areas closest to a village's fishing grounds (i.e. the most accessible fishing areas); these are usually areas that women and children can easily access by foot, and areas where adults teach young children fishing techniques. Closing these areas effectively closes off opportunities for passing on fisheries knowledge and skills to younger people, deprives women of the more accessible fishing areas, and possibly deprives some families of their basic food and income source.

The most vulnerable people in communities are usually the most "silent" and disadvantaged when management initiatives are implemented. Women and young people are in many cases not part of the management planning processes, but are usually the most affected when fishing bans are implemented. In some areas of the Solomon Islands where nearby fishing areas have been established as no-take zones, many other areas could have been chosen, including mangrove areas that were not accessible because of crocodiles, or outer reefs that were not accessible because of the lack of powered boats and fuel. No-take zones are often established close to villages where monitoring for poachers or infringements is easier; however, at times, this undermines the real need to keep such areas free for daily food needs, especially for the poorer members of the community who do not own boats, or women who are single heads of households with children they must feed.

Decisions at the community level are usually accepted without question or accepted with questions mulled over during long kava drinking or betelnut chewing sessions. These concerns hardly reach those making the decisions and/or the external partners involved in a fisheries project. Community

pride sometimes supersedes people's own realities; so in trying not to upset the community, people may agree to go along with a project even though families and certain community members may lose out. Strong respect and reverence for culture also plays a crucial role in people not speaking against or questioning decisions, and again illustrates how the culture of silence is embedded in the decision-making process in many Pacific Island communities.

Most fisheries management projects are assessed and evaluated using parameters determined by external partners, which primarily measure biological success. Involving people at the community level is usually viewed as community participation and compliance with regulations that are already in place. Very few attempts are made to assess individual or household benefits or the possible social implications from projects. The needs and aspirations of the community are usually not recorded or taken into account in project analysis and reporting. In these cases, poor, disadvantaged "silent" community members must rely on their skills to exploit other niches in order to maintain their food and income needs.

Where fisheries resources provide the basis for both subsistence and economic livelihoods, how should efforts and skills be re-directed to other resources or alternative forms of income generation in order to ensure the long-term sustainability of available fisheries resources? In many cases, external partners drive the process, with management being the major focus of work. Continuation of fisheries development is, in most cases, left to develop or expand on an ad hoc basis with communities left to plan for harvests and selling of exploited species.

With the major emphasis on resource management, fisheries managers should ask themselves: Are we doing enough to ensure sustainable economic livelihoods? Are we ensuring sufficient resource distribution to maintain internal and external financial needs of households? As the Pacific moves further into the information age, the culture of silence can begin to be broken down through the use of visual aids and other communication media. Cultural barriers can also be broken down through rigorous education and awareness work in communities and rural areas. Advanced education tools and the different available forms of media should be used to promote awareness.

The culture of silence remains a limiting factor in any attempt to fully maximise alternative potentials at the village level because those that could provide alternatives or offer solutions are usually those that do not have a voice in the community.

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4. The Pacific Regional Oceanic and Coastal Fisheries (PROCFish) project is funded by the European Development Fund (EDF) and implemented by the Reef Fisheries Observatory and the Oceanic Fisheries Programme of the Secretariat of the Pacific Community (SPC). PROCFish is designed to promote improved management of Pacific Island reef and oceanic fishery resources through a focus on applied research and environmental and socioeconomic surveys and analyses.

## Successful community engagement in resource management efforts on Ailuk Atoll, Republic of the Marshall Islands

*Silvia Pinca<sup>1</sup> and Frankie Harriss<sup>2</sup>*

### **Ailuk education, training and monitoring project**

Many factors contribute to the successful engagement of communities in resource management, including the coordination of efforts and activities of external partners and local communities. On Ailuk Atoll, in the Republic of the Marshall Islands (RMI), a project designed to delegate responsibility for coastal resource management to local communities and government councils, and help them manage fishing and other activities related to marine resources was carried out in 2004. The project involved monitoring Ailuk Atoll's coral reefs and fisheries through underwater surveys, and educating and training the community about marine resources.

Cooperation between researchers, educators and staff of the Marshall Islands Marine Resources Authority (MIMRA) inspired community members to take responsibility for managing their marine resources. A MIMRA representative, acting as an extension agent to the whole community, played a crucial role in linking the local people to external partners. Local community participation and commitment was supported through the strong leadership of Ailuk's mayor.

The Ailuk community has established several management strategies with some still to be implemented. Their case is exemplary of what community-based management can achieve in small island states in the Pacific. This project clearly illustrates the importance of having scientific information to support discussions and convince resource owners and users of proposed management initiatives and available alternatives.

For many Pacific Island countries, an ecosystem approach to coastal resource management has become an important focus of policy-making. Fishery management plans are policies to control the amount of catches and establish marine reserves. In the past few years, RMI has invested human resources in

implementing new fishery management plans in selected atolls. Ailuk is one of the first sites where such efforts have been accomplished, with the ecosystem approach to management principles practically implemented.

### **Fieldwork**

The starting point of this project was the collection of scientific and socioeconomic information on resources status and use. This process was initiated and carried out by a locally based non-governmental organization called the Natural Resources Assessment Surveys (NRAS) in collaboration with the College of the Marshall Islands (CMI), MIMRA, and the local community. Before the work was actually carried out in the community, the group through MIMRA, worked closely with the community on education and awareness raising issues relating to the marine environment and resource use.

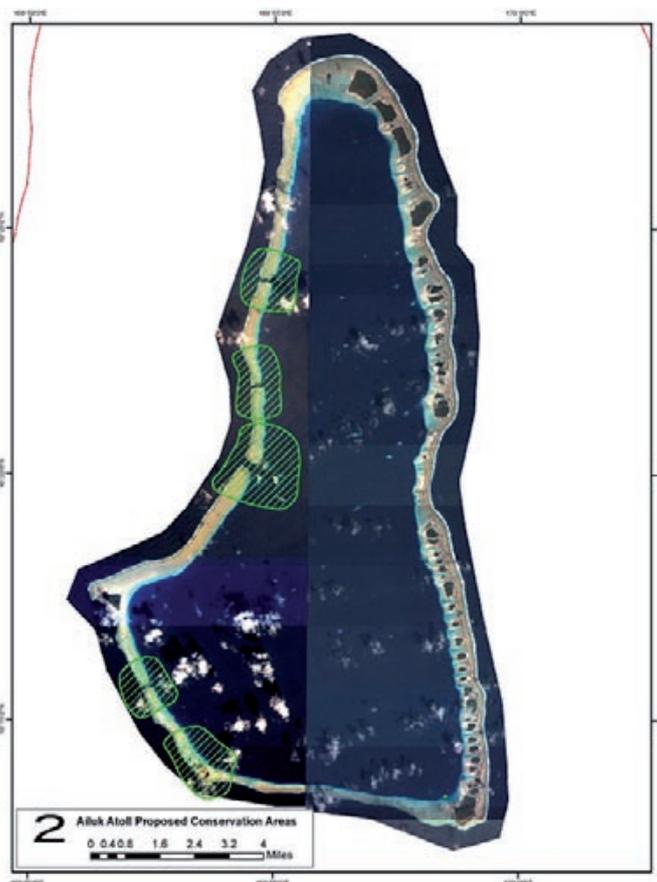
In June and July of 2006, NRAS trained CMI students in underwater survey techniques so that they could gather scientific information on finfish and invertebrates in Ailuk. The survey team, comprising scientists and trainees, collected information on the status, abundance, diversity and biomass of commercial fish and invertebrates, corals and seaweeds. Fieldwork lasted about two weeks with researchers staying aboard a survey vessel. There was close communication with the community with training and awareness work going on simultaneously. A MIMRA fisheries officer regularly liaised with the community and the external partners. At the end of the survey, preliminary findings were discussed with community members at village meetings. Most of the scientists undertaking this work participated on a voluntary basis and were brought in by NRAS.

### **Results**

In September 2006, the final report from the survey was released to both MIMRA and the local community. This report was used as a baseline for the

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**Figure 1.**  
No-fishing areas  
approved for Ailuk Atoll.



proposed fishery management plan for Ailuk. The report contained information on the available abundance and distribution of various finfish and invertebrate species, and included coral distribution and health. A major focus of the report included the planning of resource use and preservation areas. It also incorporated recommendations on the location of eight “no-fishing” areas to constitute a network of sites encompassing 20% of the lagoon’s surface area, with priority on three particularly rich pass systems (Fig. 1).

As a result of the recommendations made, the community decided to establish five integral conservation sites while awaiting the preparation of the fisheries management plan. Other immediate management strategies put into place included restrictions on collecting Napoleon wrasses, sharks, manta rays, lobsters, sea turtles and cetaceans throughout the atoll, not only for conservation purposes, but also to preserve the value of these species for the benefit of future tourism efforts.

The report suggested options for alternative livelihood activities for the local community. Recommendations were proposed for developing small-scale coral farming and improving women’s handicraft businesses for production handmade products for export. Because the Ailuk community was so pro-

gressive in its thinking, and dedicated to sustainable development, further projects were undertaken and including the establishment of a community fisheries committee, a group comprising representatives from local government and all major groups within the community, including traditional leaders, women’s groups, fishermen, people from the main populated islands, and youth groups. The group is called the Ailuk Ook Fisheries Committee (OFC, Fig. 2).



**Figure 2.** Ailuk Ook Fishery Committee.

## Follow-up activities

After the survey work, a series of activities followed. The first follow-up project focused primarily on conservation and sustainable income-earning alternatives to fishing, and was mainly funded by the Australian Regional Natural Heritage program. This follow-up project included a series of capacity building, educational and management activities developed in Ailuk in 2007, through the cooperation of the University of Tasmania (UTAS), the Marine and Environmental Research Institute of Pohnpei (MERIP), the Point Defiance Zoo and Aquarium (Washington State, USA), and the RMI-based Waan Aelon in Majel (WAM, Canoe of the Marshall Islands), a non-profit youth-based canoe and house building organization. Activities included:

- A coral farming training project carried out by MERIP (Fig. 3) to test the option of farming hard and soft corals for sale to the aquarium market as one of the possible alternative income generating initiatives to fishing;
- A training on sea level rise and its impact on coastal areas. This was undertaken by a team from UTAS, working with community members and conducting workshops on natural ways and procedures to reduce the amount of erosion occurring along the shorelines through the use of mangrove re-plantation. A mangrove population assessment was also carried out with assistance from the local community to name and identify

local species and also choose the best sites for re-planting the most suitable plants for remediation of the lamented erosion problem on the main island (Fig. 4);

- Construction of an educational awareness and information center under the guidance of WAM (Fig. 5). This community building houses printed and video educational materials for consultation and workshops, and provides office space for the fisheries management officer as well as a large open area for meetings.

From their scientific surveys, the team collected a wide range of photos and video clips of various marine species in Ailuk, and these are also included in the educational materials available at the center. As a response to the conservation resolutions taken by the community, Seacology — a nonprofit organization that funds the preservation of environments and cultures of islands throughout the globe — released a grant to Ailuk. The grant was offered as a reward to the community for their commitment in the establishment and management of no-take areas for a minimum period of 10 years. The Ook Fishery Committee decided to invest this funding in the reconstruction of the small airport terminal, and of bungalows for receiving tourists or guests.

The above initiatives — which included the conservation, management, and identification of no-take zones, identification of alternative sources of livelihoods, education and awareness, general capac-



**Figure 3.**

Trainees working on setting up a coral farming pilot experiment.



**Figure 4.**

Mayor Cradle Alfred and Dr Joanna Ellison identifying mangrove species in Ailuk.

ity building, and construction of an education and awareness center — strongly work on the principles of the ecosystem approach to management, linking all stakeholders in this project.

Resource assessment, management and planning efforts have never been received in such a positive manner in the RMI as in Ailuk. Three key points can be identified as contributing to the success of the whole project.

1. The commitment and participation from the community. The full involvement and cooperation between researchers, educators and MIMRA staff inspired the community to take responsibility for managing their marine resources.

The link between fishermen, youth, women and researchers was made possible through the full involvement of the MIMRA representative, acting as an extension agent to the whole community. Throughout all stages of the project, he coordinated community meetings where all phases of the project were explained, and awareness and information on resource management was delivered. The team used scientific information and data (displayed through visual aids, photos, and video clips), to deliver messages on fisheries stocks and abundance to the community. Representatives of senior community members, fishermen, women and youth were present at meetings and always asked relevant questions about the local fauna and about changes to the marine environment.

Through participation at such meetings the community achieved full ownership of the project and better understood the process of community-based management of resources. This was the most important factor in the effective management of Ailuk's marine resources.

2. A feeling of connection to the natural environment was another crucial factor that made the project a success. In Ailuk, a tradition of close association to natural resources and of their sustainable use is still alive and this is evident by the fact that this remains the last atoll in RMI where traditional sailing outrigger canoes are the only means of transportation and fishing (Fig. 6).
3. An interesting characteristic of such an engaged community is the full involvement of the local government in all activities. Ailuk's mayor, Cradle Alfred (Fig. 4), a well-educated woman, has a passion for nature and a strong commitment to the preservation of resources for the benefit of future generations. She was the crucial architect of all project activities and their success. With her talents, she was able to fully engage all her people in the achievements of their goals. She had the full support of her close family in managing community issues. Such dedication of the family to community interests is a tradition in the Marshall Islands, and in such a small community as Ailuk (less than 500 inhabitants), it is very important for the people to be able to rely on good leaders.



**Figure 5.**  
The Educational Awareness and Information Center.



**Figure 6.**  
One of the many outrigger canoes used for fishing and transport of copra, pandanus and people.

As part of this management process, the Secretariat of the Pacific Community (SPC) was asked to complement the 2006 assessments by specifically quantifying the available commercial species. SPC underwater surveys were accompanied by socio-economic assessments (e.g. population statistics, use of resources, economic conditions, and income generating activities other than fishing). This further assisted the community of Ailuk and the government in designing the best resource management solutions.

This case of community-based/ecosystem approach to management and conservation of marine resources and biodiversity in Ailuk can be regarded as a positive example for Micronesia and other Pacific Island countries. Having the local community play an integral role in developing and forming an effective fisheries management plan has given them ownership and a more vested interest in its successful implementation. Moreover, cooperation among nonprofit organizations, government agencies and educational institutions resulted in this being a winning combination for achieving these results.

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**Figure 7.**  
Ailuk school children watching underwater pictures on the newly donated community laptop computer.

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