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Editor's note

Welcome to the 20th issue of the *Women in Fisheries Bulletin*, which highlights gender roles in coastal fisheries, women's fishing activities in urban and rural communities, and gender issues in development.

In Cheryl Anderson's article "Gendered dimensions of disaster risk management, natural resource management, and climate change adaptation in the Pacific", she describes the need to understand gender issues in Pacific Island societies. She presents arguments for the need to include gender analysis in risk reductions and climate change adaptations, and argues that there are still gaps and opportunities for making programmes more gender responsive so that Pacific Island communities can be resilient to climate change and disaster risks.

In his paper on "Searching for clues in the lagoon: Is marine gathering a reflection of our evolutionary past?" Thomas Malm discusses contemporary marine gathering in Tonga and Oceania. He describes marine gathering as skills that use several methods. He also discusses how marine gathering provides food for families and recreational activities for those women involved.

In the next article, Jese Verebalavu reviews Fijian women's involvement in fisheries business. She briefly describes Fijian women's economic activities and assesses women's contribution to the fisheries sector.

There are two reports from the Hawaiian Islands in this issue. In "Reef fish stocks and fishing impacts in the Hawaiian Islands", 89 coral reef sites were surveyed to assess fishing impacts. The status of Oahu's fish stock populations indicate that reef fish populations are heavily depleted. There were variations in responses of target and non-target fish to increasing population densities. In the article "Impacts of west Hawaii marine protected areas on yellow tang stocks and fishery sustainability", the authors emphasise the importance of yellow tang to the aquarium fishery. Their survey data indicate that protected areas will help sustain adult stocks of yellow tang over large areas of coastline.

In the article "New sourcebook can help create more gender-sensitive projects", Meryl Williams describes the "Gender in agriculture sourcebook" and its relevance to fisheries and aquaculture. The sourcebook has a special module that addresses gender issues in fisheries and aquaculture.

There are also two articles in this issue from *Yemaya* on seafood processing. In "Women in seafood processing", Gopal et al. conducted a study in Gujarat, India, on the seafood processing industry. There are high demands from importing countries such as the European Union for seafood processing industries to meet international standards. This has raised standards and the quality of seafood processed has improved markedly. In contrast, the working conditions for women have not changed dramatically because of weak bargaining power. In the article, "Solar power empowers", Veeraraghav reports that solar-powered fish driers are being used by fisherwomen's groups in Tamil Nadu, India. This method of drying fish uses the sun (a renewable energy source) and has revolutionised seafood processing. It is also a hygienic way of processing food and it is easier to use with less human resources.

I welcome any feedback on the articles in this issue and encourage you to submit articles about women and community fishing issues from your country or region.

Veikila Vuki

Cover picture: Harvesting seaweed in the Solomon Iskands. © SPC.

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.

PIMRIS

Pacific Islands Marine Resources Information System

Gendered dimensions of disaster risk management, natural resource management, and climate change adaptation in the Pacific

Cheryl L. Anderson[1]

Introduction

Disasters and climate change result in numerous impacts on people, their communities, and their environments. The Pacific Islands region is one place where such changes are visible along coastlines and in marine and terrestrial ecosystems, and where they impact on the availability of water and food. The livelihoods of Pacific Islanders depend on natural island ecosystems; therefore, in order to reduce negative impacts on them, it is essential to involve people from multiple sectors, including communities, civil society and governments, who have a range of scientific and indigenous approaches that can be used to reduce risks and build resilient communities.

An understanding of the gendered dimensions[2] of disaster risk reduction, climate change adaptation, and natural resource management will help illuminate social and cultural vulnerability, because gender ultimately informs the ways in which society works and in which decisions are made. In the Pacific, policies, programmes and initiatives that rely on donor funding have been directed to focus on mainstreaming gender or have employed a gender focal point to represent organisations in regional and international discussions of gender. In order to think further about ways to address gender as it pertains to these issues, it is important to understand the context of gender and the issues in the Pacific Islands.

Under the overarching frameworks of sustainable development and human security, the fields of disaster risk management and climate change adaptation have engaged in increasingly parallel tracks for planning and programming. In the Pacific, the cross-cutting themes of gender and traditional ecological knowledge are important perspectives for understanding the socioeconomic dimensions of disaster, environmental degradation, and climate changes. Explorations of gender dimensions of disaster and climate impacts provide a deeper understanding of these impacts, which enables the identification of solutions that may alleviate them.

Intersection of disaster risk management, climate change adaptation, and natural resource management

Disasters are events based on the interaction of a natural hazard and a human population (and their built and natural environments), whereby the ability to cope with the results of the interaction has severe impacts on human settlements. National and local governments define disasters where they are unable to cope with death, injuries and damage without external assistance.

Environmental degradation, increased structural development, overuse of resources, poor land use, and overpopulation increase vulnerability to hazards, and thereby contribute to disasters. When a disaster threatens a community that is at increased risk from hazards, that community is less likely to be able to recover from the catastrophe. The more sustainable the development, the more resilient the community will be from threats.

Because the economies and small communities of Pacific Island countries are highly dependent on natural resources, they are more vulnerable to the impacts of climate change and natural hazards. While distinctions are often made between strategies provided by the disaster risk management community to address the current risk of hazards and weather variability, and the strategies adopted

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2. Gendered dimensions refer to social and cultural characteristics of masculinity and femininity that result in different roles and responsibilities for men and women in society, divisions of labour in the formal and informal economic sectors, and unequal access to information and resources. These gendered aspects affect responses to disasters, preparation for disasters, and planning to reduce disaster risk. Similar differences are experienced in climate risk and environmental management. These gendered dimensions are part of fisheries management, such that men usually fish for pelagic species and women are involved in nearshore gleaning, that women may be more responsible for gathering the fish used for subsistence, and that shifts in gender roles over time demonstrate that women are more involved in post-harvest processing. Similarly, gender affects each of the areas discussed here and brings forth different socioeconomic and cultural dimensions.

by the climate change community in adapting to the future risk of climate change, the reality is that the nature of risk and its root causes are converging rapidly. In the Pacific, where resources are limited and communities are unlikely to differentiate between current risk and future risk, there is much impetus for adopting a "no regrets" approach to multi-hazard planning and risk reduction, involving the collaboration of the risk management and climate change communities.

In addition, there is increasing evidence that successful adaptation and coping capacity relies on measures that address the livelihood activities of poor and vulnerable communities. This not only requires an understanding of how livelihoods are conducted and sustained by men and women, it requires a strong appreciation of how climate change will impact on available natural resources and the different roles that men and women play in managing these natural resources (IISD 2003).

There have already been some concerted efforts to explore the gendered dimensions of disaster risk management in the Pacific. In 2002, the South Pacific Disaster Reduction Programme published "Gender, Households, Community and Disaster Management: Case Studies from the Pacific Islands", which showed that men and women work in different sectors and areas of society (SPDRP 2002). This study revealed that efforts to reduce risks must approach the people working in specific socioeconomic sectors to be most effective. In 2004, the University of Hawaii and the East-West Center hosted a workshop on "Gender Equality and Disaster Risk Reduction" that issued a call to action for the disaster risk reduction community on dealing with gender issues in disasters (Anderson and Enarson 2004). Similarly, in the climate change arena, the World Wildlife Fund (WWF) has developed a Climate Witness Programme that explores the knowledge held by men and women in Pacific Island communities about the impacts that climate changes is having on their fragile ecosystems. Regionally, there are also a number of community-based projects addressing disaster risks and climate change adaptation, which have successfully integrated gender considerations.

Disaster trends

The Center for Research on the Epidemiology of Disasters (CRED)[3] defines disaster as "a situation or event which overwhelms local capacity, necessitating a request to a national or international level for external assistance; an unforeseen and often sudden event that causes great damage, destruction, and human suffering" (Scheuren et al. 2008:3). CRED developed a database of global disasters, which are characterised by the following criteria: 1) 10 or more people reported killed; 2) 100 people reported affected; 3) declaration of a state of emergency; and 4) call for international assistance.

Reviews of disaster data collected by CRED demonstrate an upward trend in occurrence of natural disasters worldwide. "The upward trend is mainly driven by the increase in the number of hydro-meteorological disasters" (Scheuren et al. 2008:16). With more than USD 74.9 billion in economic damages, the economic impact of natural disasters remained high in 2007. Once again, with over USD 29 billion in reported damages, meteorological disasters were the costliest group of disasters (Scheuren et al. 2008:12). The years with highest recorded incidents of hydro-meteorological disaster correspond with climate extremes in the El Niño-Southern Oscillation (ENSO) climate cycle. Hydro-meteorological disasters will be even more prevalent with anticipated changes in climate, where scientists project increased occurrence of extreme climate events (IPCC 2007:107). This indicates that the future will see constant increases in the numbers of disasters.

Climate change effects in small islands

The summary for policy-makers of the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC AR4) stressed the following areas of concern for small islands in regard to climate change:

- Small islands, whether located in the tropics or higher latitudes, have characteristics that make them especially vulnerable to the effects of climate change, sea level rise and extreme events.
- Deterioration in coastal conditions, for example through erosion of beaches and coral bleaching, is expected to affect local resources (e.g. fisheries), and reduce the value of these destinations for tourism.
- Sea level rise is expected to exacerbate inundation, storm surge, erosion and other coastal hazards, thus threatening vital infrastructure, settlements and facilities that support the livelihood of island communities.
- Climate change is projected by the mid-century to reduce water resources in many small islands (e.g. in the Caribbean and Pacific), to the point

3. The Center for Research on the Epidemiology of Disasters (CRED) is located in the Université Catholique de Louvain, Ecole de Sante Publique in Brussels, Belgium. CRED has developed a database of worldwide disasters or emergency events database used by the Office of Foreign Disaster Assistance, US Agency for International Development, the International Strategy for Disaster Reduction, and other organizations, such as the World Health Organization, the International Federation of Red Cross and Red Crescent Societies, and the European Union Humanitarian Office. CRED's website is located at: http://www.emdat.be/Database/terms.html.

where they become insufficient to meet demand during low rainfall periods.
- With higher temperatures, increased invasion by non-native species is expected to occur, particularly on middle and high-latitude islands.

In reviewing IPCC findings, several of these should be considered in the risk reduction framework with regard to sustainable development and overall human security. Although quite general, the first bullet point focuses on the geographic characteristics that increase risk. The deterioration in coastal conditions may occur from a number of impacts in addition to climate change or hazard events when combined with other issues, such as shoreline development and polluted runoff, but each element reduces ecosystem health. Coral reefs, dune systems, and beaches can protect coastal communities from storm surge inundation, emphasising the importance of sustaining a healthy ecosystem. Non-native species may further threaten ecosystems and their role in maintaining island health and sustainability. The healthier the environment, the better protection will be for infrastructure, settlements and facilities. With seasonal to interannual variability, many islands experience severe water deficits, and are unable to meet the needs of the population. This situation is likely to worsen, and will then threaten health, livelihoods, and overall security. The lack of potable water resources will create uninhabitable conditions.

In the Small Islands chapter of the IPCC, and in IPCC working group discussions on climate impacts, issues of gender and traditional environmental knowledge have been discussed as areas that should be acknowledged in risk reduction and adaptation approaches because these cross-cutting issues offer knowledge and information that may not have been considered in conventional forms of planning and management (Mimura et al. 2007).

Understanding gender in the Pacific

> Gender and gender relations refer to the socially (rather than biologically) determined characteristics of men's and women's positions in society. Thus, a gender analysis examines both women and men and the social, economic and cultural forces that shape their relative positions, and the relations between them (SPDRP 2002:8).

Gender is part of the social, political and cultural fabric of any society and explains relationships related to masculinity and femininity. In analysis, gender becomes a category to identify and evaluate women's and men's activities. Gender is usually not the only unit of analysis, as it can be combined with age, race, ethnicity, class, and other population characteristics. Attitudes toward gender are not static, but change over time, enabling us to work toward gender equality.

Gender does not operate the same way in all of the Pacific Islands. It is embedded in complex island social systems that enabled centuries of survival. Historically and culturally, there are a number of matrilineal societies in the Pacific Islands. For example, in Yap State in the Federated States of Micronesia, nine of the inhabited atolls still use matrilineal systems to transfer land rights, even though Wa`ab (Yap proper) and Ulithi Atoll use patriarchal systems. Palau and the Marshall Islands also once had matrilineal systems. In a society with little land mass, control over the land equates with power (Lingenfelter 1975). Within these social systems, each person had a role in the community that enabled the community to function. The role may be designated by gender in some situations — men learned to build thatch houses and women would weave the thatch — or by family heritage in others — traditional healing methods or canoe building skills were passed on by lineage. These communal roles ensured that the society functioned well.

In many Polynesian Islands, such as Samoa, American Samoa, New Zealand and Hawai'i, women once retained ownership of land, but many of these holdings were dissolved during colonisation processes that used legal mechanisms and constitutional arrangements to systematically eliminate women's rights and secure property in men's names (Merry 2000; Silva 2004; Smith 1999). In Hawai'i, missionaries applied legal pressure to prevent a woman from divorcing her husband, and if she did, for whatever reason, the man retained possession of the property, which further encouraged abuse of native Hawaiian women as foreign men became wealthy property owners (Merry 2000).

Despite the loss of land and power that accompanied colonisation, many women retained a "matriarch" status at the household and community levels. At the household level or in rural communities, it is easier to discern gender roles. In some communities, men take care of building and maintenance, while women clean and take care of children, but these stereotypes do not exist uniformly. In some islands, women may not be involved in community fishing activities and may be more involved in land-based activities, such as gardening. As livelihoods shift from subsistence to cash economies and from rural to urbanised settings, these roles have transitioned. It has become increasingly important to understand the details of household and community operations because these are the areas that will be stressed — from disasters, climate changes or environmental degradation.

Arguments for including gender analysis in risk reduction and adaptation

Any type of disaster or extreme change will impact a population, sometimes in ways that have not been considered. Because gender analysis helps to reveal everyday problems and social vulnerabilities, it can be used to determine where increased stresses would threaten a socioeconomic system and can help identify interventions or plans to reduce the impacts of the threat. It does not seem intuitive that there will be much difference to men or women from the impact of a hurricane or flood because it would seem as if everyone is equally exposed to the risk. However, statistics demonstrate that women and children are 14 times more likely to die than men during a disaster (Araujo et al. 2007).

The more inequitable the society in terms of access to resources, economic advantage, social rights and environmental justice, the more vulnerable that women are during disasters (Neumayer and Plümper 2007). Similarly, Oxfam found that in the aftermath of the 2004 South Asia tsunami, one woman survived for every three men (Oxfam 2005). The socioeconomic positions of women can make them more vulnerable to disasters. Nonetheless, women's knowledge and social practices could be used to build resilience should women receive more information. For example, in the remote islands of Yap, women's knowledge of the island hydrology enabled them to find potable water and build new shallow wells during an ENSO-related drought (Anderson 2002:25).

Because climate change has resulted in rapid environmental changes, many of the familiar and exercised responses by local and indigenous communities may not be able to cope with the change without intervention. Although considerable uncertainty exists, the IPCC AR4 discusses the likelihood of increased climate extremes and disasters in the Pacific Islands. During the 1997–1998 ENSO event in the Pacific Islands, there were variations in the experiences of different islands (Hamnett et al. 1999). Several islands experienced a severe tropical cyclone as the last rainfall before an extreme dry period. The drought resulted in ecosystem and agricultural loss, impacts to economies, health threats and wildfires. When the rain returned, it caused flooding, erosion and landslides. With these compounding hazards, it took many islands years to recover. The potential for this type of cycle to repeat has increased with climate change, and this may severely stretch the survival capacities of a community to address challenges. This is why, however, it is important to understand the capacities of women, men, girls and boys in addressing their risks by each specific location.

Indicators in conducting risk assessments

As discussed previously, gender analysis helps to reveal the socioeconomic situation of a given place. The more indicators that are examined through this lens, the fuller the picture that begins to develop about a location. The following represents a sample of the type of indicators that should be considered:

- **Population statistics**. Demographic records including migration.
- **Poverty**. This concept varies as much as islands vary. Most islands do not have the scale of production that is required for calculating gross domestic product. People who still engage in subsistence activities may not need cash and by some standards may be considered "poor," but may eat a healthier diet and have title to their own land, which are strong factors in building resilience to natural hazards. This may be more important to look at in urban areas.
- **Human development**. Under the human development indicators list (UNDP 2007), the islands listed under "high development" include Tonga; "medium development" include Samoa, Fiji, Vanuatu, Solomon Islands and Papua New Guinea; and "low development" include: none. Climate change has been included as a new area for review in human development.
- **Gender development index (GDI)**. Within the human development index (HDI), GDI captures inequality in achievement between women and men. The three indicators include life expectancy at birth, adult literacy, and education enrollment.
- **Land tenure**. Land rights and land tenure are important determinants in rights of women and men, access to resources, and livelihood sustainability.
- **Labour statistics**. Formal employment records and gendered divisions of labour show sectors that may have more participation by men or women. Sorting by wage rates and income reveals the levels of work most impacted.

Global efforts and initiatives

Efforts to integrate these areas draw support from international and regional initiatives. In order to maximise precious and limited resources in the Pacific Islands region, it is important to assess the range of opportunities, and determine a strategy for collaboration in building resilience to the impacts of climate and disaster risks in communities, civil society and governments.

In the most recent international initiatives and reports, climate issues are integrally linked with disaster risk reduction. The most significant document related to climate change, the IPCC AR4

completed in 2007, includes information about expected changes in small islands that are similar to the vulnerable conditions identified in disaster risk reduction programmes. In many ways, approaches using sustainable development frameworks have been identified as an approach for disaster risk reduction and adaptation to climate change.

Hyogo Framework for Action, Words into Action, and the Global Platform on Disaster Risk Reduction

The Hyogo Framework for Action (HFA) and the subsequent document that tried to provide recommendations to implement the HFA also promoted the sustainable development framework that considers a comprehensive risk analysis.

States and other stakeholders participating at the World Conference on Disaster Reduction resolved to pursue the following expected outcomes for the next 10 years:

> "The substantial reduction of disaster losses, in lives and in the social, economic and environmental assets of communities and countries" (UNISDR 2005:3).
>
> The more effective integration of disaster risk considerations into sustainable development policies, planning and programming at all levels, with a special emphasis on disaster prevention, mitigation, preparedness and vulnerability reduction (UNISDR 2005:3).
>
> Disaster risk reduction is a cross-cutting issue in the context of sustainable development and therefore an important element for the achievement of internationally agreed on development goals, including those contained in the Millennium Declaration. In addition, every effort should be made to use humanitarian assistance in such a way that risks and future vulnerabilities will be lessened as much as possible (UNISDR 2005:5).

In 2005, there were some discussions of climate risks in the context of better integrating environmental considerations into risk reduction measures. By June 2007, when the Global Platform on Disaster Risk Reduction convened to review the actions from HFA and to ensure that they are implemented, the issue of climate change was featured as part of the high level dialogue. Consistently, the message focuses on developing a framework of sustainability that encompasses disaster risk reduction, climate change adaptation, environmental management, and development, with the inclusion and attention to issues of poverty, gender and other socioeconomic and cultural concerns.

> A gender perspective should be integrated into all disaster risk management policies, plans and decision-making processes, including those related to risk assessment, early warning, information management, and education and training (UNISDR 2005:4).
>
> Cultural diversity, age, and vulnerable groups should be taken into account when planning for disaster risk reduction, as appropriate (UNISDR 2005:4).

In the context of risk reduction, it is well recognised in the international community that gender issues are critical to understanding and developing appropriate risk reduction measures. As a socially-constructed concept, gender can illuminate the relationships in society. A gender perspective in disasters helps to understand the everyday relationships and societal issues that may be exacerbated in disasters. A gender perspective will also enable the identification of strategies to enable response, recovery, preparedness, and mitigation that may be rooted in societal coping mechanisms and strengths.

The Gender and Disaster Network, established in 1998, has been working for a decade to bring awareness to the issue (GDN 2009). The website provides a Gender and Disaster Sourcebook that was prepared with an international team to look at resources and information available that contribute to understanding how to use a gender perspective in risk reduction (Enarson et al. 2006).

National disaster risk reduction plans

As part of the HFA, national governments are encouraged to develop disaster risk reduction plans. In the Pacific, the Pacific Islands Applied Geoscience Commission prepared guidelines, "A Framework for Action 2005–2015", endorsed by Pacific leaders (SOPAC 2005). The framework's vision places it not only the context of sustainable development, but adds the human security dimension in the following vision statement:

> Safer, more resilient Pacific island nations and communities to disasters, so that Pacific peoples may achieve sustainable livelihoods and lead free and worthwhile lives (SOPAC 2005:6).

The guidelines are divided into six theme areas for risk reduction, including governance, knowledge, risk analysis and evaluation, planning, early warning systems, and reduction of underlying risk

factors. These processes overlap with planning undertaken for climate change adaptation planning. Under key national activities, the framework specifies that governments will "integrate traditional knowledge into information management systems" (SOPAC 2005:13). The framework reiterates the principles of using traditional and local knowledge in all theme areas.

Unlike the guiding international documents, the Pacific Islands framework does not mention gender specifically. It does discuss social, economic and environmental considerations, and stresses community-based approaches. Each of these areas has a gender component that could be explored. The traditional and local knowledge used in most island systems is gendered.

National adaptation programmes of action

In order to address adaptation to climate change, the least developed Pacific Island countries have been encouraged to develop national adaptation programmes. The climate change framework, approved in 2005, maintains timing consistent with planning to meet the Millennium Development Goals and the Johannesburg Plan of Implementation to reach sustainable development. Timing further coincides with the disaster risk reduction framework previously discussed as part of the HFA.

The national adaptation programmes stress developing similar types of information to understand climate change, such as understanding social, economic and environmental vulnerability. It further specifies that plans should "integrate economic, scientific and traditional knowledge" in developing capacity and resilience (SPREP 2005:7). Again, gender is not specifically mentioned, but is still embedded in the focus of the Millennium Development Goals and the integration of Pacific Islands' traditional knowledge.

Areas of sustainable development and human security

There are numerous sectors and areas of society that will be impacted by climate change, disasters and environmental degradation. Under the overarching frameworks of sustainable development and human security, some of the areas that may be important for consideration include:

- water resources,
- energy,
- coastal and marine resources,
- forestry resources,
- agriculture,
- public and environmental health,
- critical facilities and infrastructure,
- economy, and
- government and governance.

Each of these areas can be considered from a gender perspective. It is important to know who works in these sectors and in the secondary services that support them. It is important to understand the gendered dimensions of representation in each of these areas. This will help to better target resources to think about issues of integrating knowledge and effectively planning in these areas for the impacts from climate change.

Conclusions

Dealing effectively with climate change requires the integration of best practices in many sectors. With attention to the people most impacted by disaster, it becomes clear that mitigating disasters requires attention to poverty reduction, governance, capacity building, and social equity and justice. Thus, the areas of human security and sustainable development become the overarching frameworks for disaster risk reduction measures.

In spite of these great initiatives there are still gaps and opportunities in the region for making programming more gender responsive by developing a collective and comprehensive understanding of how gender informs both the vulnerabilities and capacities of Pacific Island communities to cope with climate- and disaster-related risks. Such an understanding will need to give particular attention to the livelihoods of men and women in the Pacific, and the way the roles they hold in their communities inform their participation in and knowledge of natural resource management. The resilience of Pacific Island communities to the impacts of climate change and natural hazards depends on a number of factors, such as natural resource management, agriculture, marine resources and traditional knowledge.

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Searching for clues in the lagoon: Is marine gathering a reflection of our evolutionary past?

Thomas Malm[1]

Introduction

"I had never before seen children growing up in a state of nature and I made full use of the opportunity," wrote James Norman Hall about his visit to one of the Tuamotu (or Paumotu) Islands 90 years ago.

> In the afternoons we went swimming in the lagoon. There I saw them at their best and happiest, in an element as necessary and familiar to them as it is to their parents. It is always a pleasure to watch children at play in the water, but those Paumotuan youngsters with their natural grace at swimming and diving put one under an enchantment. Many of the boys had water glasses and small spears of their own and went far from shore, catching fish. They lay face down on the surface of the water, swimming easily, with a great economy of motion, turning their heads now and then for breath of air; and when they saw their prey they dived after it as skilfully as their fathers do and with nearly as much success. Seen against the bright floor of the lagoon, with swarms of brilliantly colored fish scattering before them, they seemed doubtfully human, the children of some forsaken merman rather than creatures who have need for air to breathe and solid earth to stand on (Hall, in Hall and Nordhoff 1921:31–32).

Hall wrote this at a time when life in the atolls almost entirely depended on the traditional use of local resources and when the men of the Tuamotu Islands had become legendary for their ability to dive for pearl oysters. He was not a researcher, but his delightful depiction is nevertheless a valuable piece of documentation of a life-style, which already at that time was in a process of change — nowadays, all pearl oysters and their pearls are cultivated. Like so many other travel writers of his era, Hall was fascinated by what the *boys* and *men* did in the water, paddling canoes, fishing, and diving. That the *women* also participated significantly in exploiting marine resources was not generally recognised until towards the end of the 20th century (e.g. see Malm 1999; Matthews 1995).

Nowadays, many researchers and most fisheries departments in Oceania are well aware of the fact that women's marine gathering is of importance in local communities and involves expertise well worth studying. The overall aim usually stated in such studies, as in my own (Malm 1999, 2007a-b, 2009), has been to challenge the prejudiced view of "picking shellfish" being something uninteresting or culturally insignificant. We can, for example, gain insights about the use of artefacts found by archaeologists or conditions for sustainable development, and of course information for discussing gender issues in the past and present.

In this article I wish to add a new dimension by suggesting that such studies can also be valuable for the debate about whether our ancestors, during one period in the biological evolution of our species, spent a considerable part of their time in an aquatic environment. Some of the speculation made by proponents of the so-called "aquatic ape hypothesis" could benefit from observations of what is still being done in Oceania's coastal waters. Of course, no people can be regarded as some kind of "living fossil", but it could be argued that certain aspects of Oceanian lifestyle provide us with a mirror of what a semi-aquatic lifestyle *might* have meant in the remote evolutionary past of our species. If there is doubt about whether organisms that were gathered in the nearshore marine environment were a significant resource (as food and raw-material), or whether our bodies are well suited for aquatic activities, then the best thing we can do is to study people who spend a considerable amount of time in the water searching for food. Due to its warm climate, reef-sheltered lagoons, high marine biodiversity, and often markedly sea-oriented lifestyle, the islands of Oceania would be among the best places for beginning such a quest.

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The gathering hypothesis

Rather than trapping, hunting or fishing with implements, gathering was the most ancient type of subsistence activity. Whereas gathering combined behavioural elements that must have existed in our non-human ancestors, the technique of bringing the obtained food from where it was found to another place where it was to be consumed and shared was a departure from the ape's way of picking and eating food on the spot with each weaned animal foraging for itself. Hunting, therefore, rather than a leading force, probably emerged later in human evolution from a technological and social base in gathering (Zihlman 1981:93–95; cf. Ardrey 1976).

In her "gathering hypothesis", Tanner (1987, 1994) argues that the implication of female chimpanzees using tools far more often than males do is that only those early hominids that were most nutritionally stressed — such as females who were pregnant, nursing or sharing with offspring — had need for gathering technology. According to her, females were very likely the first to use modified organic tools and unmodified stone tools for obtaining, carrying and opening plant materials, whereas the males either were engaged in plant foraging or small-animal predation without tools. She writes:

> Early gathering — characterized by invention of tools, development of skills, cognitive mapping of where to find desired plants and in what seasons, an understanding of which skill and tool was useful for obtaining which type of plant (for example, a fruit or nut high in a tree required different efforts and tools than an underground root), together with transmission of this knowledge to the next generation — helps us to comprehend how a series of incremental changes could forge the beginning of larger brains than among apes. Most significant, it helps us to understand how learning and cultural transmission came to be central to the way in which the human line developed (Tanner 1994:132).

This would have meant that males as well as females learned about gathering while being carried around by their mothers as they were searching for food. Zihlman (1981:96–97) suggests that a primary ingredient of the early hominid's success in the *savannah* environment was the complementary nurturing roles of both sexes, a flexibility of behaviour of both males and females for opportunistically utilizing the full range of food sources so that the males also contributed to the gene pool by bringing food for nurturing the young, thereby investing in their kin (although not necessarily their own offspring). As we shall see, however, it is possible that a lot of the early gathering took place in *aquatic* environments.

Aquatic foraging in hominids

Hominid, or pre-human, fossils of the genus *Australopithecus* as well as early species of our own genus, *Homo,* have been found in places that once were the sites of rivers or lakes. For example, "Lucy," the most well known fossilised remains of an *Australopithecus afarensis,* were found among crab claws as well as crocodile and turtle eggs in former nearshore deposits (Verhaegen 1991:75). Of course, the hominids could have gone there for some reason other than gathering, and then drowned or were attacked by predators, finally to become fossilised in the sediments, but they might also have been foraging while wading or swimming.

It has been suggested that a number of modern humans' characteristics evolved in an evolutionary past where wading and swimming were important (for recent summaries of the evidence, see Gräslund 2005; Morgan 2008). Some examples are upright stance, reduced fur, the layer of subcutaneous fat (adipose tissue), fine hand-grasping ability (which could have been an adaptation for finding shells in muddy water), sheltered nostrils, voluntary breath control, the morphology of our kidneys, the number of erythrocytes per blood volume, and the diving reflex (described below). Such features may indicate that we are descendants of a primate that spent a considerable amount of its time searching for food in aquatic environments, perhaps even diving for it, during one phase in our evolution.

Exactly when or where this happened is a matter of debate. Some have suggested around 6 million years ago, when climatic changes in east Africa caused forests to retreat and savannahs and deserts to expand, a period from which we do not yet have (with absolute certainty) any fossils of a permanently bipedal hominid. Ellis (1991) writes that the African Rift Valley, including the Red Sea, might have provided a suitable combination of sea level and habitat changes for a group of apes to become geographically isolated in marine wetlands long enough to become more aquatically adapted through evolution, and that their adaptations later on might have been functional in allowing early hominids to enter the savannah ecosystem and outcompete other primates there. Thus, coastal areas and the savannah would *both* have their place in human evolution.

Others believe that this part of our evolution occurred 2 million years ago, or even later (and long after permanent bipedal walking had evolved), when sea levels were lower and *Homo* populations

had left Africa and spread along South Asian coasts (later to return to Africa). There they would have foraged in the sea, where invertebrates and other animals were rich in the omega-3 essential fatty acids known as DHA (docosahexaeonic acid) that provide excess energy and nutrients that are important for brain growth. From coastal habitats, the more aquatically adapted hominids could have spread along lakes and rivers farther inland (Broadhurst et al. 2002; Parkington 2006; Verhaegen and Munro 2002).

Semi-aquatic adaptations in animals

Before dismissing these scenarios as unreasonable, one ought to remember that a number of animal species have become adapted to an aquatic or semi-aquatic life after having lived on land in a remote past.

The marine iguanas (*Amblyrchynchus cristatus*) of the Galapagos Islands, for instance, are descendants of more terrestrial lizards (such as the green iguana, *Iguana iguana*) that probably were good at swimming but spent most of their time in trees and "rafted" on a tree that drifted over the sea from mainland South America. These lizards have become adapted to a semi-aquatic life on rocky seashores from where they climb down into the intertidal region or dive to do what could be described as marine grazing.

The ancestor of whales is believed to have been an antelope-like mammal that waded in India's wetlands some 30 million years ago (Thewissen et al. 2007). Compared to that, a wading ape becoming more and more, but certainly not fully, adapted to a life in shallow seas or possibly rivers and lakes, after some hundred thousand or perhaps a million years or more, is by no means biologically implausible (cf. Ellis 1991; Richards 1987:203–204).

Apes have been observed wading in the wild when they need to, and some even forage in water. Western lowland gorillas (*Gorilla g. gorilla*) routinely wade into swamps in forest clearings, where they feed on aquatic herbs, and bonobos or pygmy chimpanzees (*Pan paniscus*) have been known to feed on aquatic plants for months at a time, repeatedly immersing themselves in water up to the shoulders during the process, and some appear to catch shrimp during bipedal wading (Kuliukas 2001:10–13).

The ability of contemporary primates to find food in water might reflect a behaviour that existed among our common ancestors. Perhaps some of these became foragers in lakes, rivers or coastal waters without becoming fully aquatic but what (at the most) ought to be conceived of as *semi*-aquatic hominids.

Evidence from studies on diving

In Oceania, it is seldom customary for women to do any deep diving. Diving for shells, sea cucumbers, black coral and with spear or spearguns for fish or octopi are tasks for men. Until quite recently, they have usually been carried out without any costly scuba equipment — only with goggles or a mask and sometimes a snorkel and flippers — within a depth of 15 metres. From Charles Stuart Ramsay's (1938:ch. 29) classic tale *Tin Can Island*, which is about Niuafo'ou, one of Tonga's northernmost islands, we learn about how men placed three or four fish traps baited with seaweed some 15 meters apart at a depth of 6–10 metres and that there were fishermen who were able to examine them — and pick out the fish, attaching them to a spear, a line or putting them in a basket — all in one dive without going up for air.

In her study of the effects of temperature and training on the human diving response, animal physiologist Erika Schagatay (1996) has found that facial receptors are involved in triggering a reflex in which there is a redistribution of the circulating blood by selective vasoconstriction and a lowering of the pulse rate. Diving bradycardia (reduction of the heart rate from baseline) can be trained, like apnea (breath-holding), and is thus an important part of the training of divers such as those among the Suku Laut, sea nomads of Indonesia who can hold their breath for up to four minutes and dive to a depth of 30 metres or more.

According to another study of sea nomads, Moken children in the Bay of Bengal have underwater vision twice as good as that of European children, achieved by heavy accommodation and concurrent pupil constriction underwater, a skill that can be trained but is found in marine animals such as seals and dolphins (Gislén 2003). Interestingly enough, well-trained Moken divers are able to block their nostrils by using their upper lips (Matsumoto 2009). Pearl-shell divers in the Tuamotu Islands also appear to have been able to do this (Williams 1962:513,521).

Basing her conclusion on the evidence of studies of the Suku Laut in particular, Schagatay (1996, Part IV:253) states that such studies "demonstrate that a semi-aquatic way of life is within the range of present-day human physiological adaptation."

The aquatic ape hypothesis

If human physiological adaptation makes a semi-aquatic way of life possible, we may ask ourselves if our species was even more aquatic in an evolutionary past. It is here worth considering the "aquatic ape hypothesis," which is an unfortunate misnomer because it really is (and always has been) about a *semi*-aquatic hominid.

This hypothesis was launched in 1960 by a prominent marine biologist, Sir Alister Hardy, who suggested that a branch of apes, at one time in the evolutionary history of mankind, "was forced by competition from life in the trees to feed on the seashores and to hunt for food, shell fish, sea-urchins, etc., in the shallow waters off the coast." The term "aquatic ape" was coined a few years later by Desmond Morris (1967). The hypothesis was then popularized by Elaine Morgan in a number of books (e.g. 1982, 1990, 1998, 2008) and later developed by other researchers. Hardy summarised his idea about how apes became aquatic in the following way:

> I suppose that they were forced into the water just as we have seen happen in so many other groups of terrestrial animals. I am imagining this happening in the warmer parts of the world, in the tropical seas where Man could stand being in the water for relatively long periods, that is, several hours at a stretch. I imagine him wading, at first perhaps still crouching, almost on all fours, groping about in the water, digging for shell fish, but becoming gradually more adept at swimming. Then, in time, I see him becoming more and more of an aquatic animal going farther out from the shore; I see him diving for shell fish, prising out worms, burrowing crabs and bivalves from the sands at the bottom of shallow seas, and breaking open sea-urchins, and then, with increasing skill, capturing fish with his hands (Hardy 1960).

All of this may sound like pure fiction, but what Hardy wrote here is a fairly accurate description of what one can see in the lagoons and on the reefs of countless islands in Southeast Asia and Oceania. Although various aspects of the hypothesis have been criticised (e.g. Lowenstein and Zihlman 1980; Langdon 1997; Wind 1991), enough data have, according to others, piled up in recent years to give good reasons to take the hypothesis about human evolution in waterside habitats seriously and not just dismissing it with a comment that it is far-fetched. For example, some years ago two biological anthropologists wrote: "we insist that the AAH [aquatic ape hypothesis] take its place in the battery of possible functional scenarios for hominid divergence" (Groves and Cameron 2004:400).

In the absence of fossil data, what we can do in order to substantiate or discard such a hypothesis is to make comparisons of adaptations that we can study in our own and other still-existing species. Put simply, anatomical and physiological adaptations that work well in an aquatic environment are there as a result of an evolutionary process and then put to use because of cultural reasons that allow for a training of, for instance, the diving response. Whether such adaptations evolved in semi-aquatic conditions cannot be answered here, but it is an intriguing question that needs to be asked.

The case of *fāngota*

The cyclical tidal process in Tonga, where I have studied marine gathering, is so noticeable that the size of many islands could be said to depend entirely on whether it is high or low tide. In many places, lagoons are shallow enough walk or wade out to the reef during low tide, a period of six hours that can be spent searching for food. (For people from colder parts of the world, who find it difficult to imagine that one can spend several hours in the water around these islands, I might add that for myself, being a typical fair-skinned Scandinavian, the problem is not the temperature of the water or the air, but rather the burning sun.)

If it is low tide after a dark night, one is likely to see more gatherers than otherwise, because many of the desired animals may then still be out of their hiding places and be easy to find. There are two low and two high tides per 24 hours, falling about 50 minutes later every day. Sometimes the low tide is in the morning and the next one late in the evening. At other times it may be low tide around the middle of the day. The result is that for many Tongans, meal times vary with the tides.

Marine gathering, called *fāngota* in Tongan, is carried out by women and children who gather seaweed and invertebrates, do some simple spearing, and use certain trapping methods in the lagoon and on the reef. They may also participate in some types of group fishing when needed. Men fish with spears, hooks, nets and other traps. It is not common for men to gather any seafood by hand, except when they dive. Thus, when both groups exploit resources in the same zone, men generally engage in activities that involve the use of tools, while women and children use methods that are perceived as more simple and less demanding. By far, the most common of all types of marine exploitation carried out by women is marine gathering by hand or with a knife or simple spear. Anything edible that is found may be taken, including fish that hide among seaweed or in shallow pools where they can be picked up, speared or hit with a knife or stone.

When women and children go gathering in the lagoon, they usually do bring much equipment with them: a knife, a container, and if they plan to prise up rocks they bring a wooden stick or a metal bar. They may also bring along some coconut meat. The ideal is to be able to *fakamata*: spotting the protruding eyes or mouths of fish and invertebrates that bury themselves in the sand. If the desired

organisms cannot be sighted because the water is too rippled, a special technique, *fakatofu* (to make calm), is used. Coconut meat is chewed and spit out in a circle close to where one is standing, so that the surface becomes temporarily calm enough to provide a clear view.

Many molluscs, clams in particular, are actually gathered without having been previously seen. It is common to see gatherers not only move their hands over the bottom in order to feel a protruding shell, but they also search through the bottom with their feet, especially in seagrass where shells cannot be seen. This is called *moe, moe'i,* or *molomolo.* To try to find a shell with the hands is called *fāfā,* to catch or pick by hand is called *ala*. To dig for invertebrates that are hidden in the sand or mud by the beach at low tide is called *tā.*

In my studies on marine gathering in Tonga, I have documented how more than 230 folk taxa of seaweeds and marine invertebrates have been used for some 50 different purposes (Malm 1999, 2007a). From older children and women, younger children learn much at an early age: the names of seaweeds and animals that can be eaten, how to obtain and eat them, and which ones to avoid. There are households in Tonga where over 10 kilograms of shellfish is gathered each week to be eaten (e.g. Kunatuba and Uwate 1983), and for many people it is also an important source of income, especially as seafood and shellcrafts. Thus, in Tonga *fāngota* is important for survival as well as being a leisure activity.

Swimming before walking

Well worth mentioning here is, also, that by following the others while going *fāngota,* Tongans become acquainted with the sea in their earliest childhood. When I asked my informants how they learned to swim, they often looked at me in surprise and asked what I meant or simply answered "I have always been swimming" or "I just did it." Swimming seemed to be so natural for them that they did not see it as resulting from a particular learning process. McKern (n.d.:681) states that Tongans "not infrequently … learned to swim at the same time they were learning to walk." This may have sounded strange at the time he wrote it (in the 1920s), and I cannot claim having seen anything like that in Tonga, although I have seen women carrying infants in one arm while gathering in the lagoon, but his statement may very well be correct. Today it is well-known that infants that have been exposed to water enjoy swimming and even hold their breath while putting their head under water, and "baby-swimming" is now encouraged in many Western countries. For a comparison, it can be noted that the children among the Suku Laut of Indonesia, as stated by Schagatay (1996,Part IV:252), swim *before* they can walk and, from the age of six, even contribute to the economy by diving.

Every time I went to a beach for a picnic with my Tongan friends, the first thing that the children did was to run down to the water with their clothes on, without any one seeming to worry much about them going there without any adult to accompany them. Accidents do happen in Tonga as anywhere else, but the water is usually warm and some older children are usually around. Like all other Polynesians, Tongan children are above all socialised by playing in mixed age-groups. A lagoon is a marvellous playground where they learn important things at the same time as they have fun, and swimming is an excellent example. In school they may be given further instructions about how to make the proper limb movements, but to most Polynesians learning how to swim seems to be as natural as learning how to walk or talk properly. The extent to which they continue to practice swimming as they grow up varies, however. As a result of laws originally imposed by missionaries, women always wear clothes (e.g. long skirts) in the sea, making it difficult for them to swim. Most women gather by just walking, sitting or lying down in shallow water. One finds more experienced swimmers among men, not least because diving and harpooning are men's asks.

Conclusions

Contemporary marine gathering in Tonga and elsewhere in Oceania involves far more than just bending down to pick up shells. A number of methods are used for spotting and finding animals, and for poisoning, catching or picking them up. Marine gathering also fills several functions: obtaining food for oneself and relatives and friends, meeting others in or by the lagoon, simply relaxing and having some fun — for example, in learning how to swim — and earning money by selling seafood and shellcrafts. It is not only an important aspect of food provision but also of social life in the islands. Similar patterns of subsistence are found among many hunters and gatherers in terrestrial as well as aquatic search for food.

It has been argued that by studying how organisms of a marine environment are gathered and used by people who have a sea-oriented lifestyle, light can be thrown on human adaptation in a cultural as well as biological sense. Such studies cannot prove anything about our evolutionary past, but I do argue that they can be valuable for generating or discussing hypotheses about evolution, such as whether our own species might have passed through parts of its evolution in waterside habitats.

Before we know more about when and where our hominid ancestors *might* have made a transition from a terrestrial to more aquatic search for food, we ought to be very careful about stating that it just meant wading close to the beach, and that they could not have spent a considerable amount of time in the water or that they would not have been able to find food of much nutritional value. Such an environment would not in any way demand less intelligence for survival than a life in terrestrial habitats. The fatty acids of molluscs and other near-shore animals might even have been important for evolving larger brains in hominids.

A water-oriented hominid lifestyle could very well have had a lot in common with what we still can see people doing in coastal areas of the tropics, where the water is warm and there is considerable biodiversity. Tongan marine gathering often takes place in areas as wide and varied as many land areas where people (or apes) gather their food. As for the occasional argument that predators such as sharks or crocodiles would have made semi-aquatic foraging unthinkable, it might suffice to say that a lot of the wading and diving that people actually do in the marine environment of Oceania or (with hand-held nets) in the rivers of Papua New Guinea is then also impossible.

In the long run, as our knowledge of human evolution proceeds, a "semi-aquatic ape hypothesis" may prove to be untenable. If it does, marine gathering still needs to be studied for ethno-archaeological purposes, among other reasons, because it has certainly been important in many societies from early pre-historic times, not only in Oceania. If at least some aspects of the hypothesis should be found to deserve further consideration, marine gathering is not only a matter of producing food and raw materials — it might then reflect the very activity that made us human.

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Women in artisanal and commercial fisheries in Fiji

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Introduction

Women in Fiji have changed from performing daily domestic responsibilities to being involved in a more integrated role, venturing into areas such as politics, religion, business and education. This changing role of women is becoming important within Fiji's fisheries sector.

Worldwide, women contribute in multiple ways to the production and marketing of fish. Most of these contributions are under-reported or are not reported at all. Some general research is being undertaken by the Secretariat of the Pacific Community on the role Pacific women play within fisheries. In the Pacific, women are great fishers and suppliers of fish on a small scale, yet the economic contribution of Pacific fisherwomen to their households, communities, and nations are rarely investigated.

In Fiji, some women are employed by fishing companies (e.g. Pacific Fishing Company Limited, Voko, and Fiji Fish), mostly performing tasks below management level. Women form the core of the industrial fisheries labour force through their involvement in post-harvest or processing activities (Vunisea 1996). Women's contribution is also significant within Fiji's artisanal fishery sector, which is evident by the number of women selling seafood at the Suva, Lautoka and Nausori municipal markets from Thursday to Saturday every week. The increasing participation of women selling marine products has also given rise to the sale of non-fish products, harvested both from the sea and from freshwater areas.

Despite women's contributions, their participation in the artisanal fishing sector is hardly acknowledged (Vunisea 1996), yet their increasing participation in fisheries cannot be disputed. Further research is required to highlight the economic contribution of women at all levels of fisheries in Fiji.

The focus of the research this article is based on is:

- Women in fishing companies (Voko and Fiji Fish)
  The research examined the participation of women in the two fishing companies, including their contribution to the labour market, wages, and their economic impacts on households, villages, and communities.

- Women in artisanal fisheries
  The research was conducted on Viti Levu (see Fig. 1) and targeted women from the villages who sell their products at the Lautoka, Suva and Nausori municipal markets. An in-depth analysis was conducted on the economic impacts of artisanal fisheries on fisherwomen, households, villages and communities.

Methodology

Questionnaires were used to interview women involved in both artisanal and industrial fisheries. Women in artisanal fisheries were interviewed at the Lautoka, Nausori and Suva municipal markets, while artisanal fisherwomen from Namena were interviewed within the village. Women were randomly selected to be interviewed, but there was a fair representation of women selling marine and freshwater resources. Informal discussions were also conducted.

At Fiji Fish and Voko fish companies, only women who involved in fish processing were interviewed. All 10 women involved in fish processing at Fiji Fish were interviewed, whereas the fish company Voko determined which of their female workers would be interviewed.

In total, 25 artisanal fisherwomen were interviewed: five in Lautoka, eight in Nausori, and twelve in Suva.

Women in artisanal fisheries

Women in Fiji are becoming increasingly involved in artisanal fisheries. According to this study's research findings, artisanal fisherwomen in Fiji can be divided into three categories:

- Category 1: Full-time artisanal fisherwomen
- Category 2: Seasonal artisanal fisherwomen
- Category 3: Casual artisanal fisherwomen

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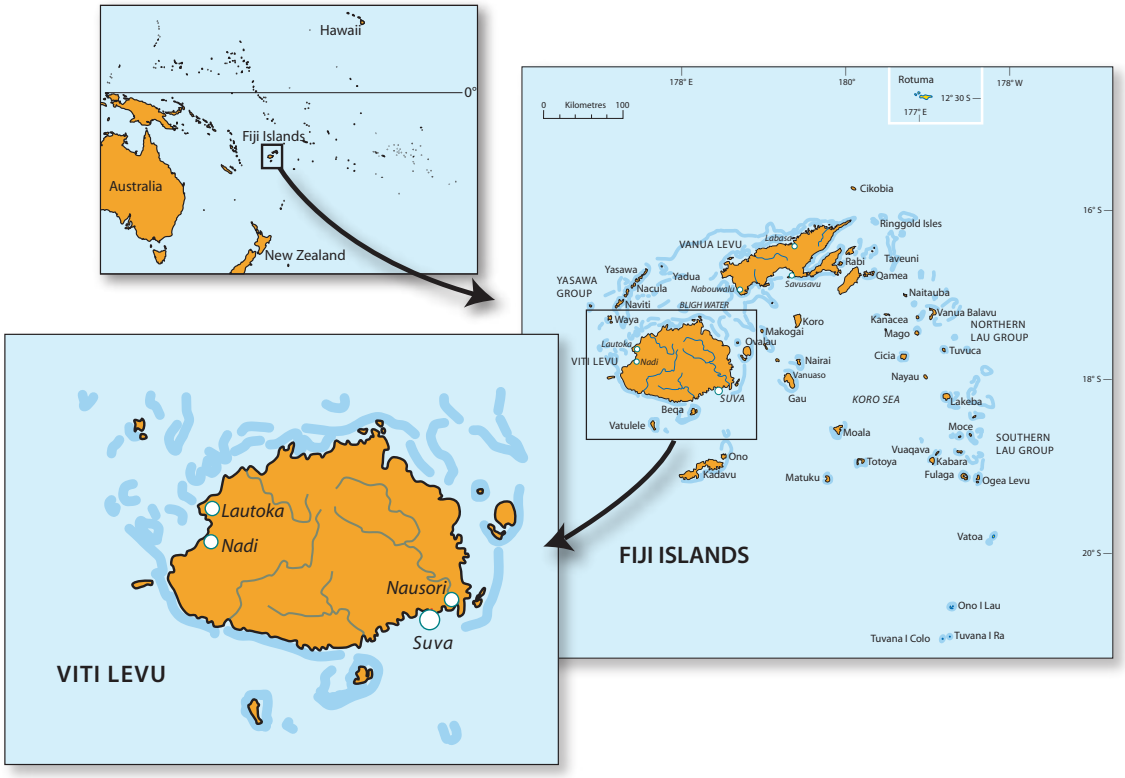

Figure 1. Viti Levu, Fiji Islands

In particular, fisherwomen in Category 1 can further be divided into sub-categories:

- Sub-category 1: Producer and seller
- Sub-category 2: Producer, buyer and seller
- Sub-category 3: Buyer and seller

Category 1: Full-time artisanal fisherwomen

Fisherwomen in this category are full-time sellers at any of the three municipal markets. Every week, selling starts on Thursdays or Fridays. This activity has been going on for more than 10 years. Selling does not occur the whole week due to market demand.

In this category, fisherwomen are either producers and sellers, or producers, buyers and sellers, or buyers and sellers. Those who belong to sub-category 1 only sell resources that they harvest from their villages. In sub-category 2, fisherwomen sell resources that they either catch themselves or buy from other women, such as seaweed. In sub-category 3, fisherwomen are only involved in buying and selling resources.

Category 2: Seasonal artisanal fisherwomen

Fisherwomen in this category only sell resources that are seasonal, such as land crabs, octopus and seaweed. As long as those resources are in season women sell them at the market. Sometimes these women become suppliers to category 1 fisherwomen.

Category 3: Casual artisanal fisherwomen

Fisherwomen in this category only sell resources if they have a need to raise funds (e.g. for a village function, church activity, school activity, or family obligation). Selling is usually done for one day when the fisherwomen need money urgently for any of these activities that has just suddenly being organized within a very short time. Moreover, the quantity of resources the fisherwomen sell to meet such an obligation is usually determined by the return cost of transport to the market, amount of fund required and a little extra money for shopping.

Social status and activity of artisanal of the fisherwomen interviewed

Of the 25 fisherwomen who were interviewed, 21 (84%) were married, 3 (12%) were not married, and only 1 (4%) was a widow. With the exception of three single women, 22 had children. The oldest artisanal fisherwoman was 65 and the youngest was 25. The number of years that women have been engaged in this business ranges from 2–20 years. The education level attained by fisherwomen ranges from class eight to some university education (at the University of the South Pacific).

About 96% of fisherwomen spend three to four days a week fishing in the sea or in rivers, while only 4% spend this time buying and selling seafood. Resources harvested for the market include seaweed, fish, shellfish, octopus and freshwater mussels. The preparation of marine and freshwater products for the market is a family activity for all women. Family members assist in cleaning and packaging products.

Women selling at the Suva market usually begin their trade on Thursday or Friday, spending nights with their relatives in Suva. Women often give some of their marine products to relatives in appreciation of being provided with an accommodation.

Sometimes, women from the Lautoka market sell their products at the Suva market due to the higher demand there. Most fisherwomen travel to their market on trucks. Anyone whose produce has been sold before Saturday returns home on a bus or minibus.

Economic activity of artisanal fisherwomen

Selling marine and fresh water resources at the market is a weekly activity for 84% of women, and a fortnightly activity for 12% cent. Selling marine and fresh water resources is a year-round activity for about 90% of women. Of the 90%, 80% belong to sub-category 2 (producer, buyer and seller). Based on the amount of time devoted to collecting, preparing, packing and selling marine and fresh water resources, artisanal fisherwomen in this category are considered as selling marine and fresh water resources as a full-time economic activity. Only 2% belong to sub-category 3 (buyer and seller) and 8% belong to sub-category 1 (producer and seller).

Seasonal artisanal fisherwomen are producers only, selling marine resources (especially land crabs) only when they are in season. Casual artisanal fisherwomen only sell marine or fresh water resources to meet an urgent need of money for the family. Both groups of artisanal fisherwomen recognise the significance of their economic activity for their families and other obligations.

Women's choice of market at which to sell their products is mainly based on the market's competitiveness and transport costs. The selection of the particular spot to sell their products is associated with a range of factors, from attracting many buyers, favourite spot, available spot and competition with other marine product sellers. All full-time artisanal fisherwomen base the price of their products on what is decided by the market itself because they are all selling similar types of marine and freshwater products. Sellers determine the price of seasonal resources such as land crabs and octopus.

Artisanal fishing is the main source of income for 76% of women. In one week, 24% of women earned between FJD 40 and FJD 50, 36% earned between FJD 50 and FJD 100, 12% earned between FJD 100 and FJD 150, 4% earned between FJD 150 and FJD 200, and 24% earned more than FJD 200. Although artisanal fishing is the main income source for most women, only 28% have a weekly family budget and 44% have a savings account. However, the amount of money that each woman deposited into her savings account during the course of a week could not be determined. After deducting the costs for all household items listed in Table 3, the net income generated weekly by fisherwomen is as follows: between FJD 10 and FJD 20 (for 40% of women), between FJD 20 and FJD 50 (for 32% of women), and more than FJD 100 (for 28% of women). Table 3 illustrates the distribution of artisanal fisherwomen's weekly income.

Table 1. Artisanal fisherwomen's weekly income distribution

Costs	Income distribution	Percentage of artisanal fisherwomen
Transport to market	< FJD 5	36
	FJD 5 – FJD 10	48
	FJD 10 – FJD 20	4
	> FJD 20 – FJD 35	4
	> FJD 35 – FJD 50	8
Food (meals at market)	< FJD 5	52
	FJD 5 – FJD 10	48
Market cost	< FJD 5	84
	FJD 5 – FJD 10	16
Family groceries	No contribution	4
	FJD 5 – FJD 10	8
	FJD 10 – FJD 20	48
	FJD 20 – FJD 30	24
	FJD 30 – FJD 50	8
	FJD 50 – FJD 100	8

Contributions towards the church also constitute a major item of the weekly of fisherwomen's income distribution. In one week, 56% of fisherwomen contributed between FJD 10 to FJD 20 towards their church. School funds also comprise a major portion of the fisherwomen's income (76% of women contribute monthly to their children's school). Electricity is a monthly household item paid for by 92% of fisherwomen for their respective households.

General status of artisanal fisherwomen

Table 2 shows the types of assistance artisanal fisherwomen most demand to improve the standard of their business.

Table 2. Assistance to artisanal fisherwomen

Type of assistance required	Percentage of fisherwomen seeking assistance
Finance	40
Business management	36
Basic accounting	12
Budgeting	8
Product preservation and packaging	8
Market condition	8
No assistance	44

About 56% of fisherwomen require some form of assistance as shown in Table 2. These women have an understanding of the significance of sustainable development in relation to their economic activity, and contribute to the daily food supply for their families. To increase the income earned from marine and fresh water resources, 44% of women said they intended to diversify their products in the future. About 8% of women said they plan to stop selling when their children start working, and 48% did not have any future plan about their business.

Women in industrial fisheries

Fiji Fish and Voko

There are clear differences between these two fishing companies with regard to their operations. Fiji Fish concentrates on fish exports whereas Voko focuses on canned fish. Due to the nature of their operations, more women are employed at Voko than Fiji Fish. Altogether, 21 women were interviewed.

Social status of women in industrial fisheries

Among women employed at both fishing companies, 81% were married, 9.5% were single, and 9.5% were divorced. Most women (69%) were supporting their working spouses as income earners for their families, and 31% were the main providers for their families. Seven employees from Fiji Fish attained a high school education, and one had only a primary education. All Voko employees had a high school education, and one even had a tertiary education.

In total, 57% of women had children, and 50% of these children were attending school. Some of the children were attending either the Fiji Institute of Technology or the University of the South Pacific. A portion of the income earned by female industrial fishing employees goes towards their children's education.

Employment status varies, from 38% for full-time employees to 62% for casual workers. More than 50% of women joined the fishing companies with previous work experience unrelated to fisheries. Promotion has only been given to 29% of female employees in the last five years. Most women have been working at the fishing companies for about five years and 19% for more than ten years.

Most female employees feel that they are playing an important role within the fishing companies that they work for. Similarly, they are satisfied with their working conditions. In anticipation of a job change, 39% stated they were contemplating changing their job in the future. These women are also involved in community work, with 61% contributing to some community activities while 39% do not participate in any community work.

Economic status of women in industrial fisheries

All female employees receive a weekly net income, with 62% earning between FJD 50 to FJD 100, 29% earning between FJD 100 and FJD 200, and 29% earning more than FJD 200. These women earn more than their weekly net income if they work overtime. The companies also pay the women's superannuation funds to the Fiji National Provident Fund.

The spending of female employees' weekly net income can be divided between weekly and monthly expenses. Table 3 shows the weekly distribution of income on groceries, bus fare and church. These are the main items to which women incur costs within a given week. Only 19 women were included in this analysis because two were just recently employed.

Table 3. Women's weekly income distribution

Items	Income distribution	Percentage of female employees
Groceries	< FJD 50	42.1
	FJD 50 – FJD 100	52.6
	FJD 100 – FJD 150	5.3
Bus fare	0 (walk to work)	31.6
	< FJD 10	21.1
	FJD 10 or >	47.3
Church	no contribution	47.3
	< FJD 10	42.1
	FJD 10 or >	10.6

In a week, most women's income is spent on household groceries.

Table 4 outlines the monthly income distribution of female employees from the two fishing companies. The table reflects the importance of women's financial contribution to their households.

Table 4. Women's monthly income distribution

Items	Income distribution	Percentage of female employees
House rent	Own house	10.5
	No contribution	73.7
	FJD 50 – FJD 150	10.5
	FJD 150 – FJD 250	5.3
Electricity	No electricity supply	10.5
	No contribution	31.6
	FJD 10 – FJD 50	57.9
	FJD 50 – FJD 100	0
Water	No contribution	36.8
	< FJD 10	26.4
	FJD 10 – FJD 50	36.8
Hire purchase	< FJD 10	0
	FJD 10 – FJD 50	10.5
	FJD 50 – FJD 100	0
Saving	No saving	26.3
	Saving	73.7
Insurance	No insurance	78.9
	Insurance	21.1

Most female employees have coverage through their company's insurance scheme but do not have their own individual insurance policies.

Of the 69% of female employees whose husbands also work, only one woman has another income source. About 14% of women who have other income sources, have unemployed spouses.

Conclusion

Even though artisanal fisherwomen have never been educated about basic business management, they have learned a lot about it first hand over the years by selling at the markets. They have also gained knowledge about the importance of keeping their resources as clean and hygienic as possible for the market. Hygiene is illustrated in the type of preservation and packaging of their resources.

Income generated from artisanal fisherwomen, small business owners, and female employees of the two fishing companies has a multiplier effect on their families and communities. The contribution of women in industrial fisheries has a huge impact on the individual fishing companies and nation as a whole. In both fishing companies, more than 50% of all employees are women. A significant contribution of the income generated by women in both artisanal and industrial fisheries goes towards their children's education (e.g. primary school, high school and tertiary level).

This research has noted that women's involvement in fisheries in Fiji, although under-reported, is having a significant socioeconomic contribution towards their households, community and nation as a whole.

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1. Primary production: gathering fresh marine resources for the market
2. Primary production: the harvest
3. Secondary production: selling mud crabs at the market
4. Secondary production: selling processed marine resources at the market
(all images: Jese Verebalavu).

Reef fish stocks and fishing impacts in the Hawaiian Islands

Based on: Williams I.D., Walsh W.J., Schroeder R.E., Friedlander A.M., Richards B.L. and Stamoulis K.A. 2008. Assessing the importance of fishing impacts on Hawaiian coral reef fish assemblages along regional-scale human population gradients. Environmental Conservation 35(3):261–272.

During 2005 and 2006, staff of National Oceanic and Atmospheric Administration (NOAA) and of the Department of Land and Natural Resources, Division of Aquatic Resources (DLNR-DAR) participated in survey cruises to assess the status of coral reef ecosystems across the Main Hawaiian Islands (MHI). Survey sites were widely distributed throughout the MHI and included not only accessible and heavily populated places such as windward Oahu, but also remote and less developed places such as Niihau. The resulting data allow us to draw conclusions about the status of reef fish stocks in the MHI and to assess some of the factors driving differences among study locations.

Survey sites and study locations

Across the MHI, 89 comparable coral reef sites were surveyed in 2005–2006 (hard bottom habitats 8 to 18 m deep). At each site, divers recorded coral and seaweed cover and counted fish in replicate transects using the same methods throughout.

The 89 survey sites were grouped into 18 locations (see Fig. 1), with each location being either an island (e.g. Lanai, Molokai) or, where there were enough replicate sites to sub-divide further, a part of an island with broadly similar exposure, human population density and shoreline structure. For example, Maui sites were grouped into four locations: 'Leeward Maui' (leeward coastline with high human population density), 'South Maui' (exposed reefs with low human population density), 'NE Maui' (exposed rocky reefs with high shoreline cliffs), and 'Maui-Hana' (moderate to low human population density on SE of Maui island).

Human population density (the number of people living within 15 km of survey sites) varied between 39 at the Volcano region of the Big Island and 94 in Niihau, to 45,251 at Hilo and 66,504 in Windward Oahu. Therefore, the most populated regions had around one thousand times as many people as the least populated.

Relationships between fish stocks and human population density

There were large differences in fish assemblages among the MHI study locations. Biomass at locations with most fish (Volcano, NE Maui, South Big Island, all of which had ~80 g m^{-2}) was approximately 4–5 times that at the locations with least fish (the Oahu locations and Kauai, where biomass was between 16 and 20 g m^{-2}).

Among locations with accessible shorelines, fish biomass dramatically declined as local human population increased (see Fig. 2). While that is strong evidence that humans adversely impact reef fish populations, it is important to note that people can and do impact reef fish in multiple ways. Humans affect fish directly by fishing, but also indirectly by

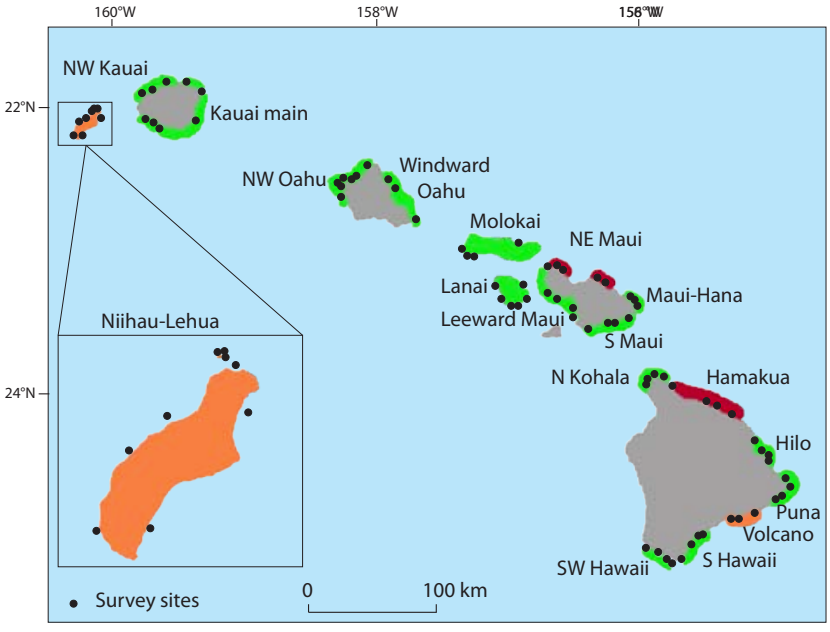

Figure 1. 2005–2006 survey sites and study locations. Locations in red are where lack of road access and high cliffs means that shorelines were relatively 'inaccessible'. Locations in orange had very low human population density.

damaging habitat or environmental quality (e.g. through pollution, sedimentation, or physical destruction of nearshore habitat). Better understanding of the relative importance of those different types of factors was one goal of this study.

One indication that fishing may be particularly important was that locations with inaccessible shorelines (Hamakua and NE Maui) had above average human population density, but also had among the healthiest fish stocks of all study locations (see Fig. 2). That indicates that reef fish can be abundant near moderate to large human populations (and the urbanization and shoreline development that comes with that), if it is difficult to access and therefore fish nearshore waters.

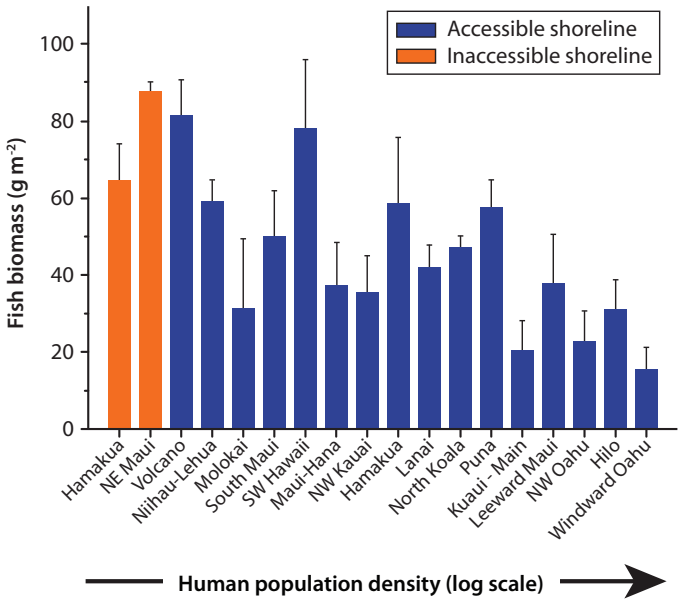

Figure 2. Fish biomass at MHI study locations; locations ordered by human population density

Assessing the importance of fishing impacts by comparing trends among heavily targeted and less desired fish

Although a wide variety of coral reef fish are taken by fishers, some species are much more heavily targeted than others, and some species, even if not prime fishery targets, are particularly vulnerable to fishing impacts (large-bodied and slow growing species generally being most susceptible, especially if they are not naturally abundant species). Therefore, if fishing is the principal factor in fish biomass declines along human population gradients, human impacts should be most evident among the heavily targeted and vulnerable groups, whereas lightly targeted groups should be much less affected.

In contrast, because both target and non-target fish are dependent on good habitat and environmental quality, if biomass declines are symptomatic of habitat or environmental degradation at the more populated and developed areas, the impacts on fish communities should affect both heavily and less targeted species.

Human impacts on target and non-target groups

Target and non-target fish responded very differently to increasing human population density:

- Biomass of target fish declined as local human population increased (see Fig. 3A). Downward biomass trends were clearest for large parrotfish, red fish (soldierfish, bigeyes and large squirrelfish), and apex predators (jacks, jobfish). Weakest effects were for large wrasses but even for those, highest biomass was at the two most remote locations (Volcano and Niihau) and lowest biomass was at heavily populated locations in Oahu.
- In contrast, there was no clear relationships between human population density and total non-target fish biomass (see Fig. 3B), or for any of the lightly-fished groups considered (e.g. small wrasse, hawkfish, benthic triggerfish, benthic damselfish, butterflyfish).

It seems unlikely that habitat or other environmental degradation would selectively and consistently affect target groups but have no evident effect on non-target groups across the same set of survey locations. Therefore, the real and substantial declines in target fish biomass along human population gradients must have been driven by some factor specific to targeted species — most likely increased fishing pressure as human population density increases.

It is important to recognize some limitations of this study and analysis. In particular, these results should not be interpreted as evidence that onshore development and land alteration have had no impact on coral reef habitat or environmental quality in Hawaii. It is very possible, and in fact seems self-evident, that habitat and environmental degradation have contributed to reef fish decline in some of the most populated and developed parts of the state such as south Oahu and parts of West Maui. However, most of the locations surveyed for this study had population densities that were 1/20 or less of that at Oahu and West Maui. It may be the case that severe habitat and environmental impacts are largely restricted to locations at the extreme

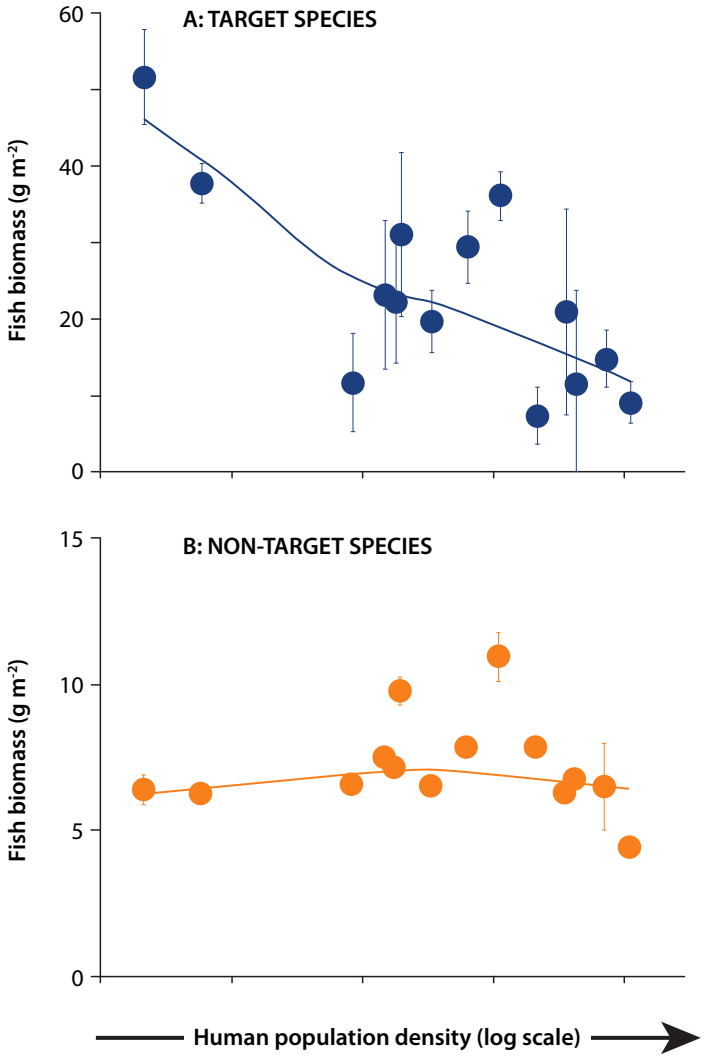

Figure 3. Trends in biomass of target and non-target species along human population gradients at locations with accessible shorelines.

end of the human population scale in Hawaii, and therefore that habitat and environmental impacts were too localized to be detected by this kind of region-wide analysis. Therefore, over the state as a whole, it seems likely that fishing is the prime driver of declining fish biomass as human population density increases, and that the impacts of habitat and other environmental degradation at heavily populated places will be additional stressors on top of the already significant impacts of intensive fishing there.

Status of Oahu reef fish populations

Oahu constitutes less than 10% of the landmass of the MHI, but has over 70% of the population of the State. It is therefore inevitable that human development pressures on the nearshore environments are likely to be greatest around Oahu, but nevertheless, the differences in reef fish biomass between Oahu reefs and the healthier reefs in some other parts of the state were dramatic. In comparison to the remote and inaccessible reefs of Volcano, Niihau, NE Maui, and Hamakua, Oahu reefs had around 1/30 the biomass of large parrotfish, 1/3 the biomass of surgeonfish, 1/10 the biomass of apex predators; and around 1/6 the biomass of goatfish. The dearth of large parrotfish is particularly troubling as those are believed to play a key role in preventing reefs from becoming overgrown by seaweeds. In fact, the severe depletion of large parrotfish on shallow Oahu reefs may be a large part of the reason why invasive seaweeds have taken over so many Oahu reefs in recent years. In addition, biomass of large individuals of target species on Oahu reefs was only 2% of that at the remote and inaccessible reefs. Those are likely to be key breeding fish.

Conclusions

The partnership between NOAA and DLNR-DAR enabled the largest-scale assessment of MHI reef fish stocks to date. The resulting data provides clear evidence that target fish are depleted around accessible and populated parts of the state, and strongly indicate that fishing is the main driver of reef fish declines in most parts of the state. Because the study assessed large-scale patterns in reef fish populations across the MHI, the results will tend to under-represent significant but localized human impacts on habitat and environmental condition, which are likely to be important at heavily urbanized places. Preventing severe habitat degradation from occurring remains vital because once habitats are substantially degraded, recovery is likely to be slow and difficult. In contrast, if fish populations are depleted but habitat quality is still good, relatively rapid recovery is possible if fishing pressure can be reduced sufficiently. Finally, although Oahu reef fish populations are severely depleted, there are also large relatively remote and inaccessible places in the MHI where fish stocks remain in good condition and where prime target fish are still commonly encountered.

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Impacts of west Hawaii marine protected areas on yellow tang stocks and fishery sustainability – *The West Hawaii Fish Replenishment Area Network*

Extracted from: Williams I.D., Walsh W.J., Claisse J.T., Tissot B.N. and Stamoulis K.A. 2009. Impacts of a Hawaiian marine protected area network on the abundance and fishery sustainability of the yellow tang, *Zebrasoma flavescens*. Biological Conservation 142(5):1066–1073.

The West Hawaii Regional Fisheries Management Area was created in 1998 by Act 306. Act 306 also mandated the designation of a minimum of 30% of west Hawaii coastal waters as 'Fish Replenishment Areas' (FRAs) where aquarium collecting would be prohibited. A community group, the West Hawaii Fisheries Council, developed the plan for a network of 9 FRAs (see Fig. 1), which became effective on December 31st 1999. The FRAs encompass 27.8% of the West Hawaii coastline, bringing the total area closed to aquarium collecting, including already existing reserves, to 35.2% of the coastline.

Fish monitoring and the West Hawaii Aquarium Project

In order to study the impacts of the FRA network, and of continuing aquarium fishing in the areas which remained open to collectors, the Department of Land and Natural Resources, Division of Aquatic Resources (DLNR-DAR) and partners at the University of Hawaii at Hilo and Washington State University Vancouver initiated the 'West Hawaii Aquarium Project' (WHAP). As part of WHAP, 23 permanent monitoring sites were established (see Fig. 1): 9 in areas which were designated to become FRAs, but which were still open to fishing when monitoring began; 9 in areas which remained open to collectors throughout; and 5 in pre-existing reserves. Fish at each of those sites have been surveyed 4–6 times every year since 1999. The WHAP monitoring program therefore has data from the 'FRA' sites before and after the FRAs were established, and allows trends at those sites to be compared with trends at sites where management status did not change (i.e. older reserves, and open areas). It is therefore possible to draw very powerful and statistically robust conclusions about the impacts of the FRA network on fish stocks.

The importance of yellow tang to the west Hawaii aquarium fishery

The west Hawaii aquarium fishery is very largely focused on small surgeonfish. Just five species made up 95% by number and >93% by value of fish catches reported by west Hawaii collectors in fiscal years 2006–2008. Of those, the yellow tang, *Zebrasoma flavescens*, is by some distance the most important single species, constituting 82% of the total catch and 78% of the value of the fishery over that time period.

As yellow tang are so important, and because young juveniles fish are the prime targets of the fishery, the long-term health of the west Hawaii aquarium fishery very heavily depends on the continued supply of new generations of yellow tang to local reefs, which in turn means that maintaining healthy breeding stocks is essential to the long-term sustainability of the fishery.

Catch trends and fishery participation

Catch and value of yellow tang landings have been on an upward trend since 1976, when DLNR began collecting data on the fishery. West Hawaii

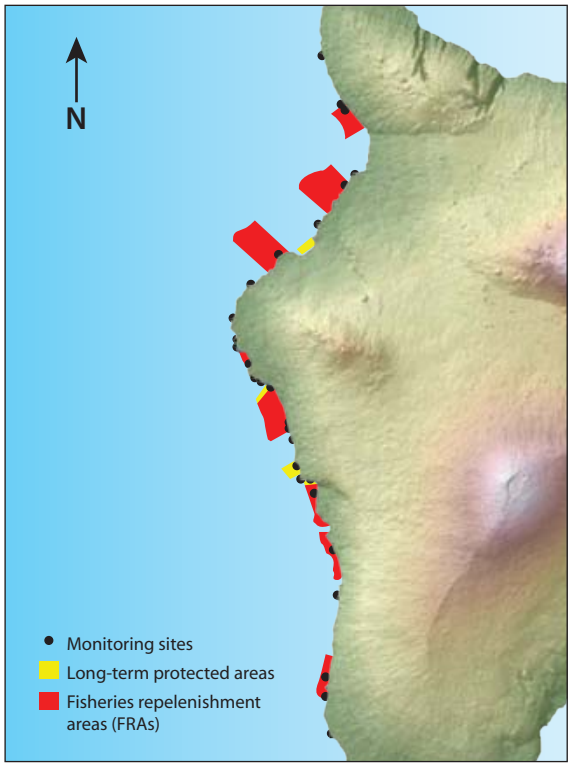

Figure 1. West Hawaii aquarium closure areas and monitoring sites

reported catch increased from around 10,000 yr^{-1} between 1976 and 1985 to 280,000 yr^{-1} or more since 2004 (see Fig. 2). Inflation-adjusted value of landings has dramatically increased too — from around USD 40,000 yr^{-1} prior to 1985 to an average of more than USD 1,000,000 yr^{-1} since 2005.

Causes of increased catches include: more participants in the fishery; the concentration of effort on small surgeonfish, particularly yellow tang, and away from other groups such as butterflyfish; and the use of more intensive fishing methods. Overall, since the FRAs were established:

- The number of west Hawaii collecting permits increased from 36 to 72. Many permit holders report little or no catch, but the number of 'active fishers' (those catching >1,000 yellow tang yr^{-1}) more than doubled: from 16 in 1999 to 37 in 2007.
- Yellow tang catch has increased by 72% and inflation adjusted dollar value by 170% (average of last 5 years [2004–2008] compared to last five years prior to closure of FRAs: [1995–1999]).

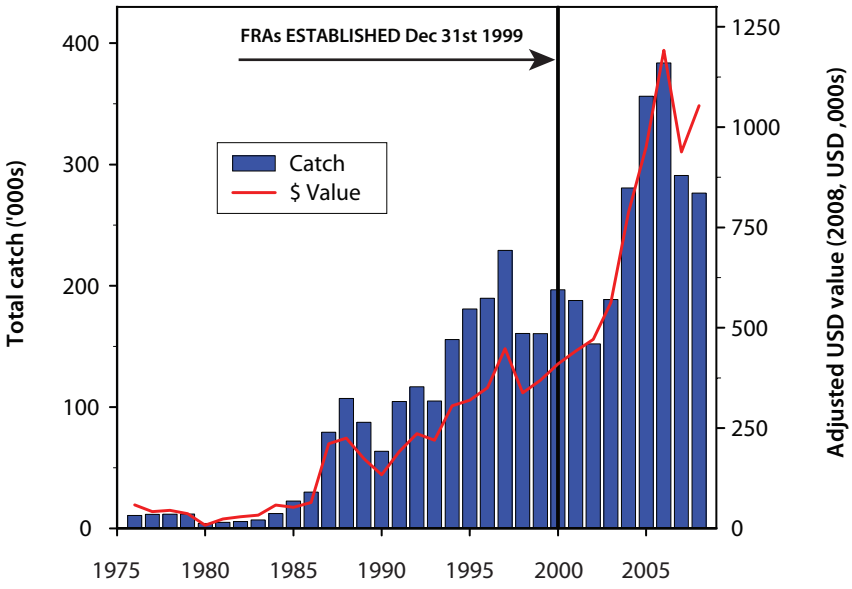

Figure 2. Catch and value (in USD) of yellow tang from west Hawaii. USD values are inflation-adjusted to 2008 using Honolulu consumer price index from www.hawaii.gov

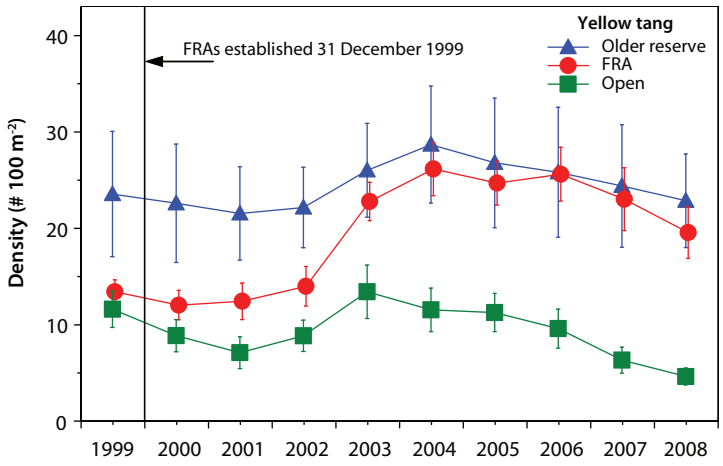

Figure 3. Mean density of yellow tang at west Hawaii monitoring sites from 1999 to 2008. Error bars are ± standard error. Excludes recently settled fish

Yellow tang abundance trends at monitoring sites

Monitoring sites are located in the mid-depth high coral cover zone, which is the main habitat for juvenile yellow tang (the life-stage targeted by the fishery), and is consequently the most heavily-fished reef zone. Sites are therefore ideally situated to detect fishing and protection effects.

In 1999, before the FRAs were implemented, there was no difference in yellow tang density between 'open' sites and sites which were due to become FRAs (see Fig. 3). Both had about half the abundance of the established 'older reserves' (blue triangles). By 2003, and in all subsequent years, densities in FRAs had increased to levels similar to those in the older reserves (see Fig. 3). Monitoring data therefore provides unequivocal evidence of population recovery within FRAs.

Densities at open sites remained about the same between 1999 and 2006 at around 10 per 100 m^2, but have declined steadily since, to < 5 per 100 m^2 in

2008. In addition to the decline in total abundance at open sites, there is other evidence that fishing impacts have increased in recent years. As described earlier, the fishery targets small juveniles — the preferred size being around 5 to 10 cm. In 2004, density of that size class in reserves was around three times that in open areas, but by 2008 fish of that size were nearly seven times as abundant in reserves.

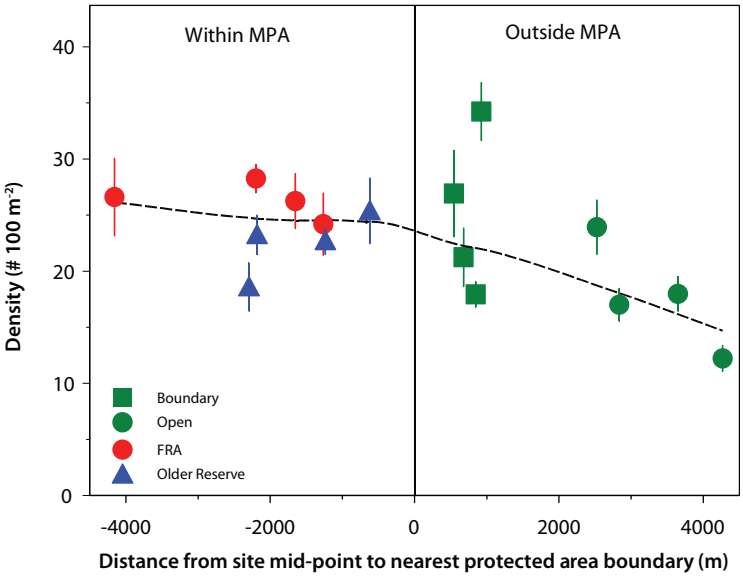

Figure 4. Abundance of adult yellow tang in and out of reserves. High abundance in 'boundary' sites (open sites <1 km from nearest reserve) is indicative of 'spillover' of adult from reserves

As the prime-target sized fish are mostly young juveniles (generally around 2 yr old or younger), it will take a number of years before increased fishing impacts are reflected at the population level. However, there are already indications that fewer yellow tang in open areas are surviving through to reach sexual maturity (at approximately 5–6 yr old). Prior to 2006, FRAs had less than twice as many large juveniles/sub-adults as open areas, but they had more than four times as many in 2008.

Effects on breeding stocks and fishery sustainability

The fishing/reserve impacts described above are striking, but of greater significance to the role the FRAs have in enhancing or sustaining west Hawaii populations and the fishery, which depends on those, are effects of the reserve network on yellow tang breeding stocks. Therefore, to supplement long-term monitoring of juvenile habitats, DAR initiated a series of surveys of the shallow reef habitats utilized by adult yellow tang. The first set of those was completed in 2006.

Adult densities were highest within reserves and in 'boundary' areas (open areas adjacent to reserves), and lowest in open areas far from reserves (see Fig. 4). High densities in boundary areas are evidence of 'spillover' (outward movement from reserves into surrounding open areas) and indicate that reserves supplement adult stocks not only within their own boundaries, but also in open areas up to a kilometer or more away. Thus, the 35% of the coastline in reserves sustains yellow tang breeding stocks in about 50% of the coastline.

Although reserves are already important source areas for adult yellow tang (2006 densities were 48% higher in FRAs, and 41% higher in boundary areas than in open areas far from boundaries), the reduced supply of new adults from open areas following recent increases in effort and catch (above) mean that they are likely to become much more important in that regard in coming years.

Conclusions – The importance of west Hawaii reserves

The West Hawaii reserve system has been shown to have a number of benefits above and beyond impacts on yellow tang. Those include greater numbers of other targeted species, reduced conflict between collectors, commercial ocean recreation operations, and community members, and greater numbers of attractive and conspicuous fish in reef areas, which are readily accessible to commercial and recreational divers and snorkelers. In addition, survey data provides clear evidence that the West Hawaii Protected Areas Network, by sustaining adult stocks over large areas of the coastline, helps to ensure the long-term sustainability of yellow tang stocks in west Hawaii and of the fishery which depends heavily on this species. Increased fishing effort and catches in recent years demonstrate scope for severe overexploitation in the absence of reserves, and suggest that additional management, including perhaps limits on participation as well as specific additional protection of breeding stocks may be necessary to optimize future fishery benefits.

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Women in seafood processing

by Nikita Gopal, V. Geethalakshmi , G.R. Unnithan, L.N. Murthy and P. Jeyanthi

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Source: adapted from *Yemaya* No.30: March 2009

A study carried out in Gujarat, India found that changes in the infrastructure of seafood processing plants (post globalisation) have not significantly changed the status of women working in the industry.

India's seafood processing industry is almost entirely export-oriented, and is spread across all of the country's maritime states. In total, 0.6 million metric tonnes, valued at USD1.8 billion was exported during 2006–2007. With increasing consumer awareness about food quality, the demands of importing countries for safe and good quality products has also increased. This has led to considerable Infrastructure improvements within the sector, with plants upgrading to meet European Union (EU) and other international standards. Because women dominate the seafood-processing sector, the impact that these Improvements have had on women should be assessed. Has the improvement in quality standards had any effect on the working conditions of women? A study was undertaken in processing plants in Veraval, Gujarat to explore this. The state's share in total exports was 30.7% in terms of quantity and 15.1% in terms of value in 2006–2007. In Gujarat, 22 of the 64 processing units are EU-approved.

The distribution of workforce indicates that the participation of women is mostly confined to the floor level in unskilled work. Their participation in other higher categories that involve decision-making is negligible. At the floor level, the male to female ratio in the processing sector is 1:1.74, with the ratio being higher for the contract or temporary category where, for every man, two women are employed. Men also dominate supervisory categories. At the managerial level, the participation of women is just 4%. Women are employed in the quality control sector, mainly as technologists.

The quantity of work in the seafood industry is directly related to the availability of raw material and tends to be seasonal. In Gujarat, the peak period is from September to April and the lean season from June to August. Women who work in this sector come from poor socioeconomic backgrounds where the average per capita monthly income of families is Rs1,483 (about USD 30). Income for the family was the main reason cited for women taking this employment. Women's share in the family income was, on average, 42.5%.

Studies in various other labour-intensive export-oriented sectors, such as apparel and textiles, have shown that there is a distinct preference for young, unmarried women at the floor level. A similar trend was observed in the seafood processing industry: this study revealed that the average age of female workers was around 25, and that 63.3% of respondents were below 25 years of age.

About 65% of respondents had some level of schooling but many were dropouts. Out of the total respondents, 64.1% of the women in processing units and 57.1% of those in the pre-processing units, were single. This was despite the fact that almost all pre-processing workers belonged to the same locality where the units were located. The majority of the workforce was without marital and child-rearing responsibilities. The average number of years of work experience was 2.6 for processing workers and 3.8 years for pre-processing workers, substantiating the fact that women find it difficult to continue this work after marriage.

The dependence of the seafood processing industry on large numbers of temporary female labour is one way to reduce the production costs and increase export competitiveness. Increasing casualisation of the workforce in export-oriented units as a result of trade globalisation and increased global competition has been reported in studies in other developing countries as well. These studies reveal that women are a generally low-paid and compliant workforce that helps these sectors to become highly competitive in the export market. The supply of this workforce is highly elastic and can be replaced continuously. The present study also reinforces this, indicating that 88.4% of female workers were either contract or temporary workers. Women who were permanent labour had an average of eight years of experience. However, experience gained has not contributed to career advancement and most women continue to do the same work they have been doing for years.

Although the dependence on contract workers is high, the responsibility of the industry towards them is only partial because the main responsibility rests with the contractor or person who recruits them for the job. An important issue is that of social security benefits. The responsibility to provide social security benefits, such as the Provident Fund and the Employees' State Insurance Scheme, are

mandatory on the part of the employer only in the case of regular employees. In the case of contract labour, the industry has no such responsibility — a fact confirmed by the present study. This has been one of the major effects of the casualisation in the sector. There is also no job security and no assurance of work for the next season.

Migrant women's labour has been an integral part of the seafood processing sector. The present study observed that 46.1% of respondents were migrants, with almost two-thirds of migrants from the state of Kerala. There is a small but perceptible change from a few years ago when almost the entire migrant labour force was from Kerala. Now, workers from Tamil Nadu and other states are also seeking employment in the seafood processing sector. Among migrants, 90% are contract or temporary workers.

Migration is a serious issue, especially in the unorganised labour sector, because the women employed in these sectors can be subject to various forms and levels of exploitation. The generally exploited status of migrant workers in the seafood industry has been an area of study in many countries, especially Asia. Migrant workers in India are protected under the "Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979". The Act applies to any establishment or contractor which/who employs five or more inter-state workers and ensures minimum wages, equality, health care, proper accommodation, protective clothing, displacement allowance at the time of recruitment, and journey allowance, and prevents gender discrimination. A court verdict in 1998, specifically for women in the seafood processing sector, also ensures several statutory benefits.

The recruitment of migrant workers is usually done by contractors or agents who have a link with the processing units. According to the Act, all contractors must have valid licenses and must ensure that women receive the benefits assured under the Act. Contractors recruit women after wage negotiations, and the ultimate responsibility of the worker rests with the contractor and not with the industry. The wage is also generally routed through the contractor. In the present study, it was observed that women received the allowances during journey as well as for displacement. However, the extent of allowance actually received by women could not be ascertained. Since most migrant workers come under the temporary worker category they received no other social security benefits, although they were provided a medical check up before the start of the season, which is mandatory for EU-approved units. Accommodation in the form of dormitories within the factory premises, housing six people per room, are provided with minimum facilities such as bedding and space for keeping personal belongings.

The average monthly wage received by female workers at the floor level in the processing sector is Rs 2594 (about USD 52), and in the pre-processing sector it was Rs2525 (about USD 50). The wages conform to the minimum wages prescribed for the fisheries and seafood industry in Gujarat under the Minimum Wages Act, 1948. However, an interesting point to note is that the wage is just the minimum that the Act prescribes. No gender-based wage differential was observed in this sector. One reason could be that men and women are not engaged in comparable jobs. Women are engaged in processing activities while men are assigned jobs in supervisory and higher categories. Low-end jobs for men include loading and unloading, packing and transportation, which are considered "heavy jobs" that women cannot do. Therefore, the segregation in the job place seems to be the main reason for the absence of a wage differential.

About 99% of respondents felt that the work environment has improved significantly with the changes taking place in export-oriented seafood processing units. The improvement in working conditions has been a direct result of the quality compliance requirements of importing countries, which has forced the sector to make such improvements.

Annual health check ups for women at the floor level is mandatory for EU-approved units. These are arranged by employers as per quality assurance requirements, with the health card to be maintained by the employer. All respondents confirmed the health check up before the start of the season, after which 58.7% of respondents underwent a check up every month, while the rest underwent a check up once every two or three months.

The majority of the labour force reported poor job satisfaction but continued to work because of family compulsions because their income is a major income sourcefor the family.

Although the income that women earn is a significant contributor to family incomes, women themselves have no role in deciding about family expenditures. Either the father or husband decides on such matters within the family. According to the United Nations, the quality of employment and conditions of work includes regularity of employment, social protection, working hours, intensity of work, and possibility of career advancement or skill upgrading. Laws are already in place to protect women from exploitation and ensure fair wages and social security. A proactive implementation strategy can ensure that the benefits are actually passed on to female workers, including contracting labourers. Employment in the sector *per se* has not led to any true empowerment of women or to their ensured gender equality. Women have weak bargaining power and find it difficult to counter producers' attempts to depress wages.

New sourcebook can help create more gender-sensitive projects

by Meryl J. Williams

The idea of making fisheries and aquaculture more equitable is appealing, but the challenge is how to go about it. Help is at hand in the form of the new "Gender in Agriculture Sourcebook", which provides a wealth of tried and tested ideas from around the world. The book is arranged in logical modules and supported by thematic notes and examples of innovative activities. This mammoth publication (790 pages) is produced by the world's three largest inter-governmental agencies working in rural development: the World Bank, Food and Agriculture Organization and International Fund for Agricultural Development. The book combines these agencies' experiences and the on-the-ground experience, and draws together research findings from more than 100 experts.

The book contains a special fisheries and aquaculture module, which I expand on below. Additionally, the modules on land policy and administration, agricultural markets, agricultural water management, agricultural innovation and education, agricultural labour, natural resources management, disaster and post-conflict management, and monitoring and evaluation all contain material specifically on fisheries and aquaculture or are indirectly relevant. Further, because many Pacific Island men, women and children involved in fisheries and aquaculture are also farmers and gardeners, most of the modules are relevant. In short, fisheries and aquaculture are surprisingly well covered in an agricultural publication.

The Fisheries and Aquaculture module targets investments that could help people during livelihood changes as fish production and marketing systems change. The module contains a brief overview of sectors from a gender perspective, taking a value chain approach and describing gender roles in fisheries and aquaculture around the world and on different operational scales. Gender analysis in planning is discussed, and a sound sequenced approach is recommended. This approach starts with an understanding of the livelihood changes happening locally at the community, household and individual level, and seeks to understand the gender issues involved. Next, gender roles, relations and access to resources and power need to be analysed and understood. Finally, initiatives should be directed to overcoming the changes that are making people more vulnerable.

What I like about this approach is that it attempts to get at the core of the problems and solutions, without losing sight of gender dimensions. It does not go in with preconceived ideas — for example, by giving women more opportunities and more work to do — as so many "gender" initiatives do.

Much of the module focuses on fleshing out "how to" ideas for four types of interventions: 1) forming community level gender-responsive institutions, 2) creating gender-responsive advisory services, 3) forming associations to protect livelihoods of fishers, processors and traders, and 4) creating alternative livelihoods to take the pressure off fisheries. Each of these interventions is then illustrated by a thematic note and activity examples.

With respect to creating community level gender-responsive institutions, no Pacific Island examples are given in Thematic Note 1 of the Fisheries and Aquaculture module, but the experiences and special gender work of Innovative Activity Profile 1 — the Indonesian Coral Reef Rehabilitation and Management Program, Phase II — is relevant to those concerned with coral reef management. The project has succeeded in getting more women involved in key visible positions (from community to national levels) within the project, and has begun to demonstrate that all people can contribute to development.

In creating gender-responsive advisory services, Thematic Note 2 of the Fisheries and Aquaculture module focuses mainly on aquaculture examples from Asia but the points made are applicable elsewhere. Much assistance and training is gender-blind and tends to be directed at men and delivered by male trainers. Simply by taking a more family-oriented approach, and by accommodating different learning needs and styles of men and women, greater total family benefits can be achieved.

Marginalised fishers, processors and marketers can better protect themselves during times of change by banding together. Pacific examples are not given in Thematic Note 3 but this principle works at all levels of society. Indeed, part of the work of the Pacific Islands Forum Fisheries Agency and the fisheries programmes at the Secretariat of the Pacific Community are Pacific regional collective efforts to protect the interests of fishers and countries. The practice of collective action to achieve specific fisheries outcomes needs to be considered more frequently in the Pacific, at both community and national levels, looking not just at fishers but female and male processors and traders as well.

Thematic Note 4 on alternative livelihoods particularly highlights the fact that in the Pacific, both genders are involved in fishing, although men and women may focus on different types of fishing.

In other regions, women are mainly involved in service and post-harvest activities of the value chain. Alternative women's livelihoods developed through SPC programmes are highlighted.

More generally, fish are recognised throughout the book as an important component of nutrition, as an important agricultural product; and that fisheries and aquaculture are important sectors for livelihoods for women and men. Thus, several of the modules have case studies and examples on fish, fisheries and aquaculture. Text boxes address post-harvest roles in Ghana's fisheries and women in aquaculture in Bangladesh. Fishing also receives recognition in the Mainstreaming in Agricultural Water Management module.

In the module on Agricultural Markets, reference is made to efforts by the Secretariat of the Pacific Community and UN agencies to build capacity in assessing the gender and social impacts of new trade agreements.

A little disappointingly, the Natural Resources Management module does not specifically address fisheries, although the "Gender in Fisheries and Agriculture" module gives the case of gender in coral reef management. The Crisis module uses several fisheries and aquaculture examples. In Peru, for example, fishermen were given information to prepare them for El Niño events, but women did not receive this information,and thus were unprepared for the impact on family budgets. Women in Bangladesh helped cope with flood season by fishing in addition to growing vegetables. In the Agricultural Labor module, the variety of women and men's labour in fisheries and aquaculture activities are well covered.

The Gender in Agriculture Sourcebook can be downloaded for free, in total, or by module, from http://worldbank.org/genderinag

Developers of the Sourcebook intend to update and supplement the first version, so readers can sign-up to be notified of updates.

Solar power empowers

Solar-powered fish driers are now being used by some fisherwomen's groups in Tamil Nadu, India

by T.M. Veeraraghav

Source: adapted from *Yemaya* No.21: March 2006

In the fishing villages of Chennai, India, a solar-powered fish drier has revolutionised seafood processing and is providing women with a means to earn an Income. The fish drier was first used in a project in tsunami-hit Cuddalore District and is now being successfully used in Chennai .

Karuvaduor dried fish is a delicacy that 7O-year-old Thangapapa has been making all her life. She buys fish and puts them on top of the sand to dry them. It takes a full day of sun, sometimes two days, for the fish to dry out. This technique, however, is unhygienic. "If we put [the fish]… outside, then we …have to have five people guarding the fish. Crows and dogs will eat the fish. Now, we just have to put it in the drier and in four hours it's done. It's cleaner and more hygienic," says Thangappa. She says she can make double the amount of karuvadu in the same amount of time using the solar drier. She's now part of a self-help group, which bought the drier (with the help of an NGO) for Rs 250,000 (about USD 5,000). The solar fish drier has attracted more women in this fishing colony to join Thangapapa.

Janani, another fisherwoman, says: "I was unemployed earlier. Now with this machine, I have also started helping out. This means a source of income for me and we now want to put this fish in packets and sell them."

The company that makes the drier, along with some NGOs, are planning to install more such driers in the city's fishing colonies.

Original text: English

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