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WOMEN IN FISHERIES
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Editor
Veikila Curu Vuki
Oceania Environment Consultants
PO Box 5214
UOG Station
Mangilao
Guam 96913
Email: vuki61@yahoo.co.uk

Production
Fisheries Information Section,
SPC, BP D5, 98848 Noumea Cedex
New Caledonia
Fax: +687 263818
Email: cfpinfo@spc.int
www.spc.int/coastfish

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Editor's note

Welcome to the 24th 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 the article "Gender information in Asia Pacific-FishWatch: Preparing tuna species profiles", Meryl Williams highlights the active role of the Asian Fisheries Society in hosting gender and fisheries events and publishing symposia proceedings in the past two decades. Williams describes the Asia Pacific-FishWatch project on the skipjack tuna profile, and presents an overview of the process and challenges. In the article "From women in fisheries to gender and fisheries" Williams et al. document the chronology of events in relation to women in development, gender issues and challenges. The evolution of "women in fisheries" and the active involvement of the Asian Fisheries Society in moving more towards "gender and fisheries" are also highlighted.

In the paper "Overcoming gender inequalities in fish supply chains to inform policy and action", Meryl Williams documents panel sessions and papers presented at the International Institute of Fisheries Economics and Trade in Dar Es Salaam, Tanzania in 2012. The report presents insights from presenters, panelists and conference contributors during the conference.

In "Improving gender equity in aquaculture education and training: 30 years of experiences in the pond dynamics/aquaculture, aquaculture, and AquaFish Collaborative Research Support Programs (CRSP)", Egna et al. describe AquaFish CRSP's role in aquaculture and fisheries. The programme has successfully integrated gender by including women as beneficiaries of its research and outreach programmes. In their paper "Improvement of women's livelihoods, income and nutrition through Carp-SIS-Prawn polyculture in Terai, Nepal", Rai et al. write that many poor Nepalese women and children suffer malnutrition caused by a lack of vitamins and minerals in their diet. Through this programme, female farmers and their families consumed and sold the surplus of carps and prawns. The programme also provided avenues to introduce new farming methods and these resulted in the improvement of income, food and nutritional standards of women and members of their household.

Two papers were obtained from Yemaya with permission to re-publish in the *Women in Fisheries Bulletin*. In the paper "For a better tomorrow", Barbara Clabots indicates through a case study in the Philippines how women benefit from participating in the management of marine protected areas. Likewise, in the paper "Shifting livelihoods", Phililе Mbatha

wrote about the rapid changes in the fisheries of South Africa and Mozambique and how the communities there are adapting to coastal resource use. The article highlights the distinctive gendered nature of their livelihood, and notes how gender roles are shifting and how women are adapting to the changing environment.

Three papers from the Pacific present information about traditional fishing, the roles of men and women, and fisheries management. All of these papers are from Melanesia. In the paper on Ahamb Island in Vanuatu, Obed and Vuki discuss the different traditional fishing methods, division of labour and fisheries management of the communities. The modification of traditional fishing gear and the implications of the introduction of modern gear are also highlighted. In the paper on Gao District in the Solomon Islands, Basily and Vuki provide a description of traditional fishing methods, traditional fisheries, and the different roles of men and women. The traditional fishing methods in Gao include gleaning, river fishing, bow and arrow fishing, mangrove crab tracking, turtle fishing, reef fishing, netting and bonito fishing. Dakuidreketi and Vuki describe the freshwater fishing, fisheries management and the roles of men and women in Tonia Village, Viti Vevu, Fiji. Fishing methods in Tonia ranged from pole-and-line to net fishing.

Finally, in the paper "Women have nothing to do with fish, or do they?", Anouk Ride notes that women are not represented in major traditional decision-making processes or village governance processes but they have an important role in leading national and local nongovernmental organisations. They are also successful in running businesses.

I welcome any feedback on these articles and encourage you to submit articles on gender and fisheries issues from your country or your region for the next issue of this bulletin.

Veikila Curu Vuki

Cover picture: *Women at a fish market in Kiribati. Photo by Johann Bell, 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) 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

Gender information in AsiaPacific-FishWatch: Preparing tuna species profiles

M.J. Williams[1]

Over the last two decades, the Asian Fisheries Society[2] has stood out among mainstream fisheries and aquaculture professional societies by hosting women and/or gender and fisheries events and publishing symposia proceedings (Williams et al. 2012). Therefore, when the Society began developing an online system profiling Asia-Pacific key fisheries and aquaculture species — AsiaPacific-FishWatch[3] — it determined that the social dimension of the value chains, including gender, should be addressed in the species profiles. The first full pilot species has now been completed — skipjack tuna (*Katsuwonus pelamis*[4]) — and the preparation of the species profile reveals some of the challenges of social and gender information.

I should clarify that AsiaPacific-FishWatch is designed to explain about Asia-Pacific fish products eaten locally and in major world markets. The region supplies not only much of its own fish but also much of that for other countries, particularly in Europe and North America. The information is aimed at informing the public about the production, conservation and social angles of fish. Its original model was the USA FishWatch[5] system, but the design has been amended to suit our region.

The project will cover key species in Asia and the western and central Pacific regions, with an initial priority on edible species from aquaculture and fisheries. We estimate that the top 100 species or groups cover about two-thirds of world fish production. Thanks to support from the International Seafood Sustainability Foundation we have made a start with the four main canned tuna species: skipjack (*Katsuwonus pelamis*), yellowfin (*Thunnus albacares*), bigeye (*Thunnus obesus*) and albacore (*Thunnus alalunga*). These are all species of major interest to the Pacific Islands region.

Skipjack, the pilot species, is a "political species", being of major economic and food importance to Pacific Island countries. Therefore, the AsiaPacific-FishWatch profile is potentially sensitive. Skipjack is also in the top 10 aquatic species by production in the world and in Asia-Pacific, and the largest amount of production comes from Asia-Pacific, especially the western and central Pacific, including Indonesia and the Philippines. It is fished by national and international fleets, and is traded in a multitude of markets. Two regional fisheries management organisations (the Western and Central Pacific Fisheries Commission and the Indian Ocean Tuna Commission) and national governments manage the stock. Conservationists are very interested in this fishery, especially through campaigns against fish aggregation devices, catches of juveniles, and for pole-and-line certification.

The profile covers: Quick Facts (an overview summary of all information), and detailed pages on Sustainability, Production, Supply Chain and Markets, Environment and Climate, and Biology, plus full references and links, and attribution and recognition of contributors and reviewers. We also have good graphics, thanks to the openness of contributors to share their work (including the photos accompanying this article). Indeed, the graphics are potentially a useful resource in their own right because all materials are fully authenticated by experts and outrank, for example, photos of skipjack on Wikimedia Commons.

In terms of what information is available for skipjack, we have good sources on fish stock assessments, biology, biogeography, and climate links, thanks to the work of Pacific scientists, especially those at the Secretariat of the Pacific Community. When it comes to social, economic,

[1] 17 Agnew Street, Aspley, Queensland, 4034, Australia. Email: meryljwilliams@gmail.com
[2] See: www.asianfisheriessociety.org
[3] See: www.asiapacfish.org
[4] See: www.asiapacfish.org/index.php/species/item/5-skipjack-tuna
[5] See: www.fishwatch.gov
[6] See: http://iss-foundation.org/

labour, and post-harvest aspects, the information is sparse and many reports are negative (e.g. on cases of maltreatment of fishing crew as reported to the International Labour Organization). Because these are the areas where gender is a factor, the available gender-related information is minimal (see: http://www.asiapacfish.org/index.php/species/item/5-skipjack-tuna#supply-chains) and supported by few studies and statistics.

Who has information and what information is available are linked. With regard to tuna species, information mainly resides with regional agencies and their scientific advisors and regular consultants, and is thus concerned more with the resource and its environment. This information is regularly assessed by review bodies advising on fisheries resource management. Other information, such as on social aspects, is more likely to be compiled by occasional special studies, often through the same agencies, with the work by the regional DEVFISH and SciCOFish projects being good examples (Tuara Demmke 2006; Tuara and Passfield 2011). Key certification schemes (e.g. the Marine Stewardship Council) do not require social responsibility criteria although the new Aquaculture Stewardship Council does include social responsibility within enterprises (to a degree). United Nations social and legal agencies, and welfare non-governmental organisations, however, are showing more interest in these topics.

Vendor at the Honiara (Solomon Islands) fish market selling "salt fish" or tuna stored in brine on board a purse-seine vessel. Salt fish is an important supply of relatively cheap fish in certain Pacific ports and includes small and other low-value (e.g. damaged), tuna and bycatch. Photo by Johann Bell, SPC.

Roadside vendor of skipjack tuna in Kiribati. Photo by Johann Bell, SPC.

Questions remain. How can the region's universities be persuaded to undertake more social science research in fisheries and aquaculture? How can development assistance agencies be persuaded to support more such research and development? Should certification and sustainability programmes be more conscious of social dimensions? My conclusion is that national, regional and international efforts — including conservation efforts — to understand the region's pre-eminent fisheries and their long-term sustainability are unbalanced with regard to knowing the people who work in and rely on the value chains that feed the world. Skipjack tuna provides just the first example of this imbalance.

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From women in fisheries to gender and fisheries

M.J. Williams[1], S.B. Williams[2] and P.S. Choo[1]

Source: *M.J. Williams, N.-H. Chao-Liao, P.S. Choo, K. Matics, M.C. Nandeesha, M. Shariff, I. Siason, E. Tech and J.M.C. Wong (eds). 2002. p. 13–18. Global Symposium on Women in Fisheries. Sixth Asian Fisheries Forum, 29 November 2001, Kaohsiung, Taiwan.*

Introduction

Women's issues loomed large on social and political agendas in the 1960s, and entered the development agenda in the late 1960s and 1970s when several international aid agencies recognised that the failure of many of their developmental projects was due to the exclusion of women in the design and implementation of projects. Even though women play important roles and contribute significantly to the impact and sustainability of development projects, their contribution to society was often undervalued and unappreciated. Earlier initiatives emphasised women in the development context, of which, women in fisheries is a particular case because initially, the immediate goal was to ensure women's involvement and their integration into development programmes from which they were denied active participation in the past (Ostergaard 1992).

Since the 1975 United Nations World Conference on Women held in Mexico City, a series of international conferences and events has helped sustain the focus on women's involvement (see Table 1). In the fisheries sector of development, the first major event was the Global Workshop on Aquaculture, held in 1987, almost eight years before the Workshop on Women in Fisheries in the Asia-Pacific region, which was organised as a prelude to the Fourth World Conference on Women.

Development agencies, however, recognised that targeting women as special beneficiaries could be counterproductive or at least insufficient to improve their contributions to and benefits from development. An intermediate step in development thinking was, therefore, to consider the changes needed in the development agenda to better incorporate women and, thus, the focus switched to "women and development". This change in focus, however, was found to be too narrow and programmes emphasising women and development ran the risk of alienating men, and simplifying the complex roles of men and women in the community. From about 1995, programmes began recognising that success in development depends on the community and the interrelationship between all of the people in it, not just on women or men, which gave rise to "gender" programmes rather than "women's programs" (Levy 1996).

Gender, which is constructed socially, is defined as the relationship between men and women. Biological characteristics are not significant. Gender roles of women and men are defined by society, and vary among different societies and cultures, classes and ages, and may change through history. Development activities can only be made sustainable by changing overall structural factors such as rules and practices of a household, community, market and state, which sustain women's subordinate roles in society.

Table 1. Chronology of events related to women in development.

Date	Event
1975	United Nations World Conference on Women (Mexico)
1975–1985	United Nations Decade for Women
1980	Second World Conference on Women (Denmark)
1985	Third World Conference to Review and Appraise the Achievements of the United Nations Decade for Women (Kenya)
1987	United Nations Food and Agriculture Organization Global Workshop on Women in Aquaculture (Italy)
1995	Workshop on Women in Fisheries in the Asia-Pacific region (Philippines)
1995	Fourth World Conference on Women (People's Republic of China)
2000	Beijing +5: Women 2000 — Gender, Equality, Development and Peace for the 21st Century — Special Session of the General Assembly (United States of America)

[1] ICLARM — The World Fish Center, Malaysia; in 2001.
[2] Obafemi Awolowo University, Nigeria; in 2001.

This paper documents the sequence of events beginning with the involvement of the Asian Fisheries Society (AFS) in the Women in Fisheries programme to the move towards Gender and Fisheries (GAF) initiatives. Some gender issues besetting the fisheries (including aquaculture) sector — and the challenges to uplift the status of women in line with the blueprint from the Beijing Platform for Action — are also discussed.

The evolution of Women in Fisheries symposia

In 1994, the Partnerships for Development in Kampuchea held a very successful "National Symposium on WIF in Cambodia" (Nandeesha and Heng 1994). A "Regional Seminar on WIF in Indo-China Countries" followed this in 1996 (Nandeesha and Honglomong 1997). The Indo-China regional seminar called for urgent attention to be directed at gender issues in the fisheries sector, and suggested that the issues be followed up at the full Asian regional level. Participants in this seminar identified AFS and ICLARM as the most suitable institutions to stimulate this effort. Subsequently, AFS held two very successful symposia: International Symposium on Women in Asian Fisheries in 1998 in Chiang Mai (Williams et al. 2001) and the Global Symposium on Women in Fisheries in 2001 in Kaoshiung. These two symposia attracted many participants, and highlighted the involvement of women in fisheries activities and in many instances the multiple roles of women and their need to contribute to the family income in poverty-stricken households. Although these two symposia were specifically on women's roles, gender issues were often raised by participants. Examples include the social relations among men, women and children in the sapyaw fishery in the Philippines (Sotto et al. 2001) and the HIV/AIDS issue among fishers and the vulnerability of their partners (Huang 2002).

The fisheries sector in developing countries is recognised as one of the most economically depressed sectors in society. The two AFS symposia and their precursors brought home several messages: women (wives or daughters) from fisher households in Southeast Asia, Africa and Latin America actually fish and take part in many other fisheries sector activities and are often depicted as:

- over worked, with their contribution unrecognised, unvalued or under valued;
- poorly paid and exploited by employers;
- illiterate;
- undernourished and sickly, with poor productivity; and
- lack opportunities for skills upgrading and access to training.

Although a substantial number of women are involved in technical professions, the number of women holding managerial posts with decision-making powers is insignificant. Chao and Liao (2001) noted that most women in technical professions in Taiwan have low self-esteem and this probably applied to women elsewhere. Primavera and Bueno (2001) suggested that this perception could reflect social values that hold men superior. In some countries, women do not have the basic rights (e.g. the right to vote, choice of career, and even dress) that many women from developed countries take for granted.

Merely involving women in development programmes without delving into issues of culture and the state will not contribute to sustainable development and will not correct the disparities between the sexes, hence there is a need to consider gender.

Gender and fisheries. The symposia held to date have given general overviews and highlighted some specific women's issues in the fisheries sector. However, they do little more than start to raise awareness of the issues, and barely permit a glance at what might be the key gender issues. The time is ripe for key gender issues to be drawn out; the co-convenors of and participants in the latest symposium believe that this is the logical next step. Even at this point, some gender issues begin to emerge from the papers and discussions. A few are highlighted here.

Poverty. In the fisheries sector, widespread poverty is among the most pressing issues, especially among traditional fishers trying to make a living from the paltry catches of over-exploited waters. Policy changes and better management are called for to change this condition. A range of problems, many pertaining to gender dimensions, accompany the poverty of many fishing families and communities (Binkley 1995; FAO 1995a; Gittinger 1990; Neis 1996; Williams 1996; Williams and Awoyomi 1998).

Division of household labour. Household labor studies have shown that women with dual working roles consistently spend two or three hours a day (every day) more than men doing work-related activities (Levine et al. 2001). Malnourishment and long working hours may have sociological, economic and health implications for women (FAO 1990, 1995b; IFPRI 1995; Tully 1990; Quisumbling et al. 1995).

Health. One of the greatest health challenges confronting the fishers and their families may become HIV / AIDS. Fishers appear to be particularly vulnerable because of their ignorance of the disease and the time spent away from their families. Access to affordable treatment and education on safe sex is,

therefore, imperative for both the fishers and their wives, and the latter must be aware of their rights to protect themselves.

Access to education and other rights

Access to general education is often denied to children, especially girls, from fishing families.

Other issues include violence, recognised as the key factor preventing women from exercising their rights (AusAID 1997), and lack of credit and decision-making opportunities for women. Community-based fisheries management programmes involving the participation of both men and women may be a platform that provides women the opportunities to actively involve themselves in the decision-making process; therefore, these programmes and the gender elements of them should be actively promoted (Jallow 1997; Williams 1997; CGIAR News 2002).

Organisational culture

Gender issues are generally undertaken from a community angle with interventions directed to promote an egalitarian relationship between men and women. To enhance gender equity, gender mainstreaming within the delivery organisations should be applied as well as the use of the gender analysis framework for development projects. At CARE Bangladesh, efforts were made to establish gender equity within the organisation, and to increase staff awareness of gender issues (Debashish et al. 2001). Actions adopted by CARE Bangladesh to improve gender equity include:

- creating a working environment for women that is free from discrimination and harassment;
- increasing the number of women in the workforce, especially in senior positions, to achieve a more equal gender balance;
- providing training and counselling to staff to overcome gender barriers;
- providing advice and assistance for planning, implementation and monitoring of gender sensitive projects; and
- bringing forward new ideas about gender equality. The gender analysis framework is generally used as a tool for collecting and analysing gender disaggregated data at all stages of a project. The use of this tool makes it possible to better understand the gender factor in many development projects, and to develop mechanisms for gender mainstreaming.

Raising awareness and sharing knowledge

One of the first actions needed to redress gender inequities is to increase awareness of gender issues and to dispel perceptions that women are weak and helpless. Sebastian Junger (1998) in his book "The Perfect Storm" recognised Linda Greenlaw as "one of the best sea captains, period, on the East Coast". Greenlaw said of herself: "I never anticipated problems stemming from being female, and never encountered any" (Greenlaw 1999).

The AFS, together with ICLARM-The World Fish Center, plan to give more coverage to gender issues through the ICLARM quarterly magazine NAGA, and to encourage networking through a list server to link interest groups on gender issues. ICLARM-The World Fish Center, which practices gender-sensitive policies, strives to ensure that all programmes have taken into consideration gender issues in the project and programme formulation phase. The World Fish Center will actively develop more projects involving gender, and seek funding for these studies.

Challenges and conclusion

According to Madeline Albright, a former US Secretary of State, the biggest challenge to the 21st century will undoubtedly be the conferment of basic human rights to women, and of all the forces that will shape the world, the movement to recognise and realise the rights of women will be the most powerful (USAID 2000). Use of the GAD approach to solve gender issues will require the adoption of a gender analysis framework that seeks to understand the inequities in the historical, political and cultural situation between men and women and the processes that reinforce these imbalances (Itzin and Newman 1995).

These imbalances remain formidable. The 1995 UNDP Human Development Report on the status of women (UNDP 1995) indicated that:

- 70% of the 1.3 billion people living in poverty are women;
- among the world's 900 million illiterate people, women outnumber men two to one;
- more women than men are malnourished;
- in many poor countries, pregnancy complications are the largest single cause of death among women in their reproductive years;
- women's wages are 30–40% less than for men doing comparable work; and
- women constitute less than one-seventh of administrators and managers in developing countries.

Women hold only 10% of the seats in the world's parliaments and 6% in national cabinets. Sustainable development cannot occur without equal opportunities for women in the economic, social and political spheres (Young 1993). However,

the lack of unbiased gender data on the nature and role of men's and women's contributions, especially from developing countries, may hinder the actions taken to address critical problem areas identified in the Beijing Platform for Action. Research and research organisations have a role to play in guiding the action although to fulfill this role they will need to do the following:

- develop research and gender analysis methodologies;
- collect unbiased, disaggregated gender data;
- help formulate fair policies, programmes and legislation;
- provide training to assist scientists and development specialists in research and programme implementation;
- develop sustainable institutional frameworks for gender mainstreaming;
- sustain continuity in gender-sensitive development research and strategic interventions; and
- increase gender sensitivity in research and policy design and management.

Through the work of the symposia and related activities reported in these and earlier proceedings, a small but growing group of research and development specialists have begun their commitment to follow this path as part of their contribution to sustainable development in the fisheries sector. Most of us are not women's specialists, gender specialists or even social scientists, but through the prompting of our colleagues, especially Dr M.C. Nandeesha, we have begun to realise the demands for gender equality in all dimensions of our fields.

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Overcoming gender inequalities in fish supply chains to inform policy and action

M.J. Williams[1]

"Gender equality thinking should not focus just on the numbers of women and men in fish supply chains", said Gifty Anane-Taabeah (Ghana), the final panelist on Overcoming Gender Inequalities in Fish Supply Chains. The panel and two presentation sessions (Markets and Value Chains for Small Aquaculture Enterprises and Looking at Fish Supply Chains with a Gender Lens) were held on the first day of the 2012 conference of the International Institute of Fisheries Economics and Trade (IIFET) in Dar Es Salaam, Tanzania. Rather, Gifty contended, "the overall aim should be how to empower women and men in supply chains to boost overall productivity".

This report draws on insights from a rich set of papers, panelists' remarks and audience contributions from the three IIFET conference sessions, plus others from the session called Too Big to Ignore: Enhancing Visibility and Possibilities in Small-Scale Fisheries. The three fish supply chain sessions were convened and supported by the AquaFish Collaborative Research Support Program (CRSP), under the leadership of Hillary Egna who co-chaired the sessions with Meryl Williams.

The 2012 conference, the first IIFET conference held in Africa, was also the first to highlight gender in such a substantive way, although occasional studies relating to gender/women were presented in past conferences. "When I think back to when I joined IIFET in 1985, and now I look out at so many African women as new socio-economic role models here at IIFET 2012, I really feel that IIFET has come a long way on addressing gender", said Stella Williams (Nigeria). Yet, she cautioned, much more is needed as technology and economic changes in traditional fisheries have eroded women's role and contributions, which continue to be under-represented in statistics, studies and society. "But", she emphasised, "we should never lose sight of what women can do. Although gender alone is not sufficient in explaining differences between management outcomes in different countries — none of which abides by the Code of Conduct for Responsible Fisheries they have all voted for — we have evidence that women are not only victims of technological and global change, but do seize opportunities to stand their ground and bounce back. Satisfactory societal and conservation outcomes depend critically on greater equity and improved institutions".

The IIFET 2012 gender papers covered global studies and work in West and East Africa and Asia. The contributions came from government policy-makers, academics and government researchers. They also drew on many different streams of scholarship, focusing economic and social analysis of value chains on development in aquaculture and fisheries and on poverty in small-scale fisheries. Gender differences in resource access rights, division of labour, access to capital and credit, measures of empowerment that affect power relations in the value chain and the concentration of power in the hands of certain actors and parts of the value chain were examined for fish products from tilapia and dagaa to groupers and tuna.

Gender and fish value chains

"Women pervade fisheries in their roles as workers in fisheries, markets and processing plants and in non-fishery activities including as mothers who give birth to successors, as caregivers for the family, as connecting agents of social networks, among others and agents who share fisheries culture among the generations", Achini De Silva of Sri Lanka reminded us. She reported on work done alongside the FAO-NORAD global small-scale fisheries value chain project. The study's gender framework analysed 10 country/fishery/aquaculture cases for gender disaggregated activity profiles, access and control profiles, and analyses of factors and trends. Common patterns emerged in the intersection of gender and income/education. Less educated, resource poor women were concentrated in the low value end of the value chains; resource rich males and a limited number of educated, resource rich females occupied the upper end. Access to

[1] 17 Agnew Street, Aspley, Queensland, 4034, Australia. Email: meryljwilliams@gmail.com

resources was key to design the women's role in the fishery value chain. Women are less engaged in modern value chains which have fewer nodes than the traditional complex and lengthier value chains. When women depart from fisheries to go to money earning positions elsewhere, the existence of local fishing cultures and industries is diminished.

Africa

West Africa

"Nigerian women are, and have been from very early times, the backbone of fresh and dry fish marketing. They do vending in rudimentary fish markets as well as carry fish for door to door sale", said Abiodun Oritsejemine Cheke, the Deputy Director in charge of Fish Trade, Federal Department of Fisheries, Nigeria Ministry of Agriculture and Rural Development. Recognising the importance of women's efforts, the Government has helped organise nearly all women vendors into cooperative societies, but a major ongoing constraint is lack of affordable finances for the cooperatives. To overcome this bottleneck, she announced that, through the Federal Ministry of Agriculture and Rural Development and the Central Bank of Nigeria, the Government announced it would extend the Nigeria Incentive-Based Risk sharing system (NIRSAL), presently used for agricultural lending, to the women in the various fish value-chain activities.

Funmilola Agbebi presented the results of a study of people in five fishing communities in Ilaje and Ese- Odo Local Government areas of Ondo State, South Western Nigeria. The study area falls within the oil producing states and all those interviewed were permanent settlers, not new immigrants. Fish value chain activities were the primary or secondary money earning occupations of most of the women. The activities, however, were beset by many problems, from supply, price and infrastructure difficulties, and the families existed at barely above the poverty level in this area, often referred to as the richest part of Nigeria.

In Ondo State, Nigeria, fresh fish marketing is predominately (73%) women's business, Lydia Adeleke found in a study of 45 marketers. The marketers were mainly young and although fresh fish marketing is profitable, it is concentrated and inequitable. The market suffers from several constraints, especially the high cost and variable supply of products, and would benefit from creation of gender-sensitive cooperatives.

East Africa

The Kenyan Government has given national priority to aquaculture development and the sector is starting to develop strongly. Some of the reasons were presented in papers on two studies. In one, Kwamena Quagrainie applied business guru Michael Porter's five forces industry analysis (threat of new competition, threat of substitute products or services, bargaining power of customers or buyers, bargaining power of suppliers and intensity of competitive rivalry) to the tilapia (chiefly *Oreochromis niloticus*) and catfish (*Clarias gariepinus*) aquaculture value chains in Kenya and concluded that women stood to gain most by the opportunities in the fish marketing segment of the value chain. The sale of fish enhances community relations and creates a stable source of income and food, and female participants had greater flexibility and liquidity for their operations. Women had less competitive advantage as input suppliers, fish farmers, or combined input suppliers and farmers.

In Kenya, women are also given opportunities in the public-private partnerships called Aquashops — conveniently located one-stop input supply and extension shops in farming areas. According to studies reported by Sammy Macharia, partnerships between women and between women and men have developed a variety of models and approaches to deliver essential services including linking clearly labeled inputs and products to markets and information technology services.

As a panelist, Nancy Gitonga provided a broad, gender-based overview of the Kenyan fish supply chain, noting that production is dominated by men and, although women are not permitted to go fishing due to cultural taboos, they can own fishing vessels. Kenyan women's strengths are in processing and marketing. Women are considered good fund managers, yet, in the fish sector, women's activities are often viewed through a welfare lens whereas men's are projected as businesses. Policies are needed to elevate the decision-making roles of women and to remove discrimination.

Sebastian Chenyambuga reported that in Morogoro Region, Tanzania, low aquaculture production of Nile tilapia (*O. niloticus*) is done in ponds owned by small-scale farmers. The ponds, which have been used at subsistence scale from at least 1949, are all owned by men, but women work to some extent in all the production phases and dominate the processing of the product for local sale (about 70% of the production).

In 10 fish markets scattered around Zanzibar Island, Sara Fröcklin and co-workers found that gender was a key dimension in fish trade. First, there was a major gap in terms of economic resources. Many of the male traders have been able to start up their enterprise with savings, while a majority of the women used micro-credits and loans as the initial source of funding. Gender inequalities were also found in terms of capital used and income

generated from fish trading activities; male traders earned almost twice as much per day compared to their female counterparts. Second, women travelled long distances to buy and sell fresh and sundried fish, often in the villages, whereas men tended to buy closer to home and sell at higher prices in the main markets, or occasionally within the tourist sector. Third, as a result of low capital, lack of cold storing facilities and limited number of customers, women traded mainly in lower value fish species. Men on the other hand dominated the trade with high-value species such as tuna, king fish, barracuda and sharks. Fouth, none of the female traders were members of any kind of fish trade related association, nor had knowledge about such a thing, whereas about one third of the men were involved. There was an overall wish for a committee, similar to a fisheries committee, targeting fish traders specifically. In conclusion, all traders reported that fish trade has improved their living standards and also benefitted the community. However, most of the female respondents still shared little decision-making power and a majority found it hard to compete with male traders at market spots, particularly in times of declining fish catches and increasing prices.

In Lake Victoria, the small sardine-like cyprinid Rastrinebola argentea and other related species (variously called dagaa in most countries, mukene in Uganda, and omena or the Lake Victoria sardine in Kenya) are now the second most important commercial species, after Nile Perch (*Lates niloticus*). With the growth of aquaculture and other demands for affordable fish, the value chains for this species are undergoing rapid transformation. Much dagaa is now lost by poor handling and post-harvest problems.

The east and central African trade in dagaa, reported Mwanahamis Salehe of Tanzania, has increased since 2006 and grown from two countries (Kenya and Rwanda) to eight countries in 2011, including Cambodia and Malaysia. The majority of exporters are men, but women are 12% of the exporters in Tanzania. Much better processing, business and management skills are required to avoid the nutritional and economic wastage currently undermining the trade.

In Uganda, sun-dried mukene (or dagaa, *R. argentea*) is predominately (80%) used for animal feed, according to Margaret Masette. Boat owners, fishers, processors and traders each operate at a number of scales and different gender disparities were found in the different stages of the value chain, largely related to the labour and capital intensity of the stage. Thus, for example, women dominated in carrying fish from fishers to processors because no capital was required, but workers of both genders operated in the artisanal and the industrial processing stages where more capital was required. Fishers and processors earned the least profit from the value chain, whereas regional traders captured the highest profit rates (70–83%) and the lion's share of the total profit, from making the highest investments.

Asia

Gender-based fish value chain analysis, according to Debabrata Lahiri, requires "understanding women's position in a value chain and what constraints women face means not only looking at the value chain but also at women's intra-household bargaining position and broader social processes". In a study of Indian value chains for Indian major carps, tilapia, hilsha and shrimps, Lahiri found that women do not perform all the functions along the value chain, and where they do take part, their value addition is less than that of their male counterparts due to the lesser amounts of product they handle.

In three coastal regions of Kerala State, India, Shyam Salim studied women's economic, social, political and legal empowerment to create an overall Fisherwomen's Empowerment Index and applied it to women fish retailers, fish vendors, dried fish marketers and value-added fish producers. In terms of overall empowerment, the value added producers were highest and dry fish makers the lowest. The fisherwomen were more empowered than women in the agricultural sector. In terms of empowerment dimensions, political empowerment was highest and legal empowerment lowest.

Gender and climate change in communities dependent on small-scale fisheries

In the IIFET session on small-scale fisheries (Too Big To Ignore), Lasse Lindström and co-workers from Stockholm University presented new studies in East Africa focusing on adaptation and climate change research relevant for helping coastal communities achieve social justice. He echoed the observation by Archbishop Desmond Tutu in the Human Development Report 2008 that "adaptation" is a euphemism for "social injustice". The poor are exposed to the harsh realities of climate change in their everyday lives. Gender issues are usually ignored in both coastal fisheries and climate change. The research presented stressed the need for empirical analyses that are well anchored in the situation on the ground and that consider social and ecological aspects; and address gender issues at the individual level. Additionally, different strategies such as resilience, reworking, and resistance were highlighted as important to analyse and to link to transformative agency or agency requiring collective responsibility for change. The research is taking place in Zanzibar, Tanzania and in Inhaca Island in Mozambique to allow for comparison.

Paul Onyango turned the IIFET 2012 conference theme (Visible Possibilities) on its head and examined poverty in Lake Victoria fishing communities through the lens of "invisible possibilities", which he decomposed into visible absences and invisible presences. Visible absences — what we perceive is missing in peoples' lives that may make them seem poor — often overshadow the view of invisible presences — the characteristics of people that are their values and strengths. Forms of self-respect such as the way women fish traders dress proudly when conducting their businesses, voluntary pooling of assets such as fishing boats by fishermen, sorting out conflicts at the beach level, and many other negotiations are the base of social capital that is never noticed. The challenge for the fishing communities is how to combine and use the invisible assets to create wealth in the community.

Reflections on the gender and value chain presentations

In the IIFET 2012 panel discussion on "Overcoming Inequalities in Fish Supply Chains to Inform Policy and Action", panelist Theodora Hyuha of Uganda highlighted four points. In the first, new technologies, she stressed that "women fish farmers have to learn the new technologies. Yet, when extensionists approach farmers, they usually go to men first and so women are left to learn from second hand information". The second point that emerged from several presentations was that the aquaculture sector in Africa is still often just for subsistence. To develop, finance is needed, but women are often restricted to micro-finance options as they have limited collateral, although they are good creditors.

In Uganda, over 90% of women honour their obligation to pay back the loans, as opposed to men who often evade paying back the big loans they secure. Third, we have tended to treat women as a homogeneous group whereas we need to distinguish those doing well and those needing a hand. Finally, the education system in most countries is gender neutral, implying that both boys and girls will have equal access. However, the reality is different. Girls face more constraints than boys, such as a family preference to pay school fees for a boy in the family whenever the financial resources are scarce. Further, girls are brought up to believe that science subjects are hard and meant for boys.

Sara Frocklin also pointed out that a strong theme coming out of the sessions was that organisations for women in the fish value chain were often weak or lacking. To help strengthen their positions and capacity, women fish traders need formal places to meet, and opportunities for training and getting to know each other and their collective needs.

Sebastian Mathew of the International Collective in Support of Fishworkers recommended that we consider a human rights based approach to unleash the power of women to fulfill the multiple social, health, reproductive and business roles expected of them in today's coastal communities. Stella Williams pointed out that in Africa, women are being used more and more in peace-making efforts. In India, Shaym Salim highlighted the superior performance of women in funds management and in delivery of outcomes in Self Help Groups. Lasse Linstrom pointed out that we had talked quite a lot about women and men but children and youth in fisheries should also be recognised as they play large roles in many households. Mundis Maris, who Stella Williams was representing, does target the youth in its work, and it is finding that parents do not want their children to go into fisheries, but to become professionals if possible. Mundis Maris also reaches people through art and creativity.

Acknowledgements

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The International Institute for Fisheries Economics and Trade (IIFET, http://oregonstate.edu/dept/iifet/) is an international group of economists, government managers, private industry members, and others interested in the exchange of research and information on marine resource issues. IIFET organises biennial conferences; IIFET 2012 was held in Dar es Salaam, Tanzania, with the theme Visible Possibilities: The Economics of Sustainable Fisheries, Aquaculture and Seafood Trade. IIFET 2012 was co-organised by the University of Dar es Salaam (www.udsm.ac.tz) and IIFET.

The mission of the Aquafish Collaborative Research Support Program (CRSP, http://aquafishcrsp.oregonstate.edu/) is to enrich livelihoods and promote health by cultivating international multidisciplinary partnerships that advance science, research, education, and outreach in aquatic resources. Bringing together resources from United States of America and host country institutions, the AquaFish CRSP strives to strengthen the capacities of its participating institutions, to increase the efficiency of aquaculture and improve fisheries management in environmentally and socially acceptable ways, and to disseminate research results to a broad audience.

This report was prepared by Meryl Williams with the assistance of all presenters, panelists and other contributors.

Improving gender equity in aquaculture education and training: 30 years of experiences in the pond dynamics/aquaculture, aquaculture, and AquaFish collaborative research support programs

H. Egna[1], L. Reifke[1] and N. Gitonga[2]*

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Abstract

The AquaFish Collaborative Research Support Program (CRSP) is dedicated to improving gender equality in the aquaculture and fisheries sectors and in the CRSP by creating equal opportunities for women and men in research, training and educational activities. Recognising the barriers and complex issues women face, the AquaFish CRSP has taken a mindful approach towards gender integration by focusing on women beneficiaries of its research and outreach, and on women in the Program. Gender must be included in projects in a cross cutting and an individual way. Despite these steps, gender-segregated statistics from AquaFish display characteristics of a "leaky pipeline" as seen in other fields of science. During the original Pond Dynamics/Aquaculture CRSP (PD/A) and the subsequent Aquaculture CRSP (ACRSP) (1982–2008), 36.8% collectively, of degree students were women. In the AquaFish CRSP (2006-current), 55 women (55%) of degrees have been awarded to women. Although reaching a 50% target for women is a major accomplishment, the same proportion is not entering higher positions in science or research careers. Surprisingly, women still make up less than 50% of the CRSP short-term trainees. More research is needed to understand leaks in the pipeline and barriers to women's participation.

Introduction

Globally, women play an integral role in the aquaculture and fisheries sectors. Even though women's roles and responsibilities are beginning to change in some countries, there are still constraints that can limit their participation. Some constraints that women face in aquaculture and fisheries are: time availability and allocation, land ownership and access to water, credit and labour, and access to training and extension services. Lack of training opportunities can trap women in these vulnerable and poorly paid positions without any prospects of getting ahead (UNFAO 1998).

According to FAO, gender discrimination stems from the low value attached to women's work and, in fisheries, is perpetuated in their limited access to credit, processing technology, storage facilities and training (FAO 2010). Even in developed countries today, such as the United States of America, women earn USD 0.82 for every dollar a male earns in an equivalent job, or about a 15% disparity in equal pay for equal work. Few women reach the upper echelons of management in medicine, science, business, fisheries, or agriculture. The International Decade for Women, beginning in 1975, stimulated efforts to improve the living conditions of women and to correct the imbalances between men and women, but more is yet to be achieved.

Methods and challenges of involving women in science programmes

The AquaFish Collaborative Research Support Program (CRSP) (2006-present) and its predecessors — the Pond Dynamics/Aquaculture (PD/A) CRSP (1982–1996) and Aquaculture CRSP (1996–2008) — have long recognised the marginalisation of women, inherent social and economic inequalities, and the vulnerable positions that women occupy in the aquaculture and fisheries sectors. Through equity in training opportunities, the CRSP (refers to all three CRSPs: PD/A, ACRSP, and AquaFish CRSP) has been able to provide women the tools to empower themselves, increase bargaining power, and enter new career opportunities. The increasing number of women graduates in academic, entrepreneurial, and

[1] AquaFish CRSP, 418 Snell Hall, Oregon State University, Corvallis OR 97331 USA
[2] Fish Africa, P.O. Box 64358-00620 Nairobi, 6200 Kenya
* Corresponding author. E-mail address: Hillary.Egna@oregonstate.edu

governmental positions as well as their visibility in training courses and through community and regional involvement is helping to influence the enrollment of women students in degree programmes. However, the involvement of women in high power positions in the aquaculture and fisheries sectors has been a challenge and the same stands true for the involvement of women graduates in high positions in science and research fields.

Women have long been under-represented in science, engineering, and technology careers (Blickenstaff 2005) and academic employment (Bagihole 2000 as cited in Bebbington 2002). While women's representation has improved at the global scale in more recent years, the collective quantitative data on women in the science fields still show that women are not remaining in science at the same rate as men — a phenomena called the "leaky pipeline". Blickenstaff (2005) and others have described the system that carries students from secondary school through graduate school and on into their careers as a pipeline in which various holes or leaks occur, causing students to drop out. For example, a student may begin university pursuing a science degree and change course halfway through or a student might graduate with a science degree and decide to pursue a different career. The concern is that women leak out more often than men (Blickenstaff 2005). The problem appears to be progressive and persistent, meaning that women's participation continues to drop along the whole pipeline, and that over time this issue has not gone away (Cronin and Roger 1995).

The CRSP is no stranger to this issue and for the past 30 years has actively worked toward gender equity in all its projects. The CRSP data on women graduates support this leaky pipeline metaphor despite the extra attention given by the CRSP to gender equity and equality. After years of informal equity standards, an officially sanctioned 50% benchmark was set with the start of the AquaFish CRSP for training equal numbers of men and women in short- and long-term training.

If given equal opportunities and access from the beginning of their schooling, men and women could potentially enter research careers in equal proportions. However, the increase in women graduates has not been accompanied by an associated increase in the proportion of women in academic science, engineering and technology careers (Bebbington 2002). A study in the UK showed women were 2% or less of the professors in many sub-disciplines of science, engineering and technology (Bebbington 2002). A similar phenomenon is seen with CRSP students and researchers as explained later on in the paper. Glover (2002) showed that even in science fields where women are well represented, such as biology, they aren't necessarily reaching the top of their fields. Equal pay for women has been and continues to be an issue, as well as the fact that women are more likely to be employed on short-term contracts and less likely to apply for research grants, even though they are as successful as men when they do apply (Blake and LaVelle 2000 as cited in Bebbington 2002). Why is this happening? What are the barriers that prevent women from moving through the pipeline into careers in science and research?

A number of theories have been proposed as to the barriers facing women in science. The following are a few possible explanations for the leaks in the pipeline that keep women from moving up the ladder in science. The explanations below are adapted from Bebbington (2002), Blickenstaff (2005), and Glover (2002). Most of these hold true in developed and developing countries.

Balancing work and family demands. The demands of family and work are inescapable for women and are exacerbated in developing countries where women spend large amounts of time fetching water, caring for children, and harvesting food. The CRSP short-term training data show that this issue is more complex than initially thought. When CRSP training courses were local and short-term, they were not necessarily better attended by women. And, conversely, when training is far away and long-term — requiring the student to leave their home country to pursue a degree in the US — we found a greater percentage of women participating

Societal gender roles. Gender roles are imposed on us almost as soon as we are born. Women may feel pressure to be the primary care provider at home and men and women both may be reluctant to wholly accept and encourage women in the field of science because those are not the traditional gender roles to which they have grown accustomed.

Science curricula and pedagogy are more geared toward men. This can start from a very young age with science books featuring significantly more boys than girls doing the science or teachers paying more attention to male students and continues through graduate school with more male students and professors moving into higher positions.

Women's work is often overlooked/undervalued. People have little incentive to get ahead if it is perceived they will not be recognised for their work. This is often the case with women's contributions to research.

Women's personal values. Ultimately a woman may value the education itself more than the career. Women may hold different definitions of success based on ethnicity, culture, and personal values.

The culture of science itself. Many of the explanations above could be considered part of the culture of science. The masculine nature of that culture may contribute to the under-representation of women. If women have a sense that they won't get ahead or won't feel welcome in the field, they might choose other career paths.

The challenges of mainstreaming gender in science and technology research projects are many. Key elements of a framework CRSP uses to address these challenges include developing an initial process, defining programme objectives, identifying leaders and mentors, and accountability measures to vet the overall process and ensure success (Fig. 1). The initial process looks at the big picture for achieving gender equality; programming describes more specific programme level objectives for gender mainstreaming; leadership discusses the importance of empowering champions and role models; and accountability is a reflective approach to help identify what works and does not work in gender mainstreaming. This model is meant to be an iterative process where successes, actors, and outcomes are fed back into the system creating a positive feedback loop of mentoring, development, and eventually gender mainstreaming.

The AquaFish CRSP has addressed some of the challenges of involving women in science and creating equal opportunities for women and men to participate in the Program's research, training, education, or other activities. As a gender-responsive organisation, the CRSP has adopted a multifaceted approach to promote and integrate gender equality. Some of the specific actions taken by the AquaFish CRSP include:

a) collecting and analysing disaggregated data from individual projects to gauge the gender inclusiveness success;

b) promoting participation of women in formal and informal training opportunities provided through the CRSP by setting a 50% benchmark for women in training courses;

c) mandating that all core research projects have a strategy for integrating and addressing gender (a Gender Strategy);

d) working with each of the core research projects to ensure it has at least one gender-focused investigation; and

e) providing specific extension and technical services for women related to sustainable aquaculture and aquatic resource management.

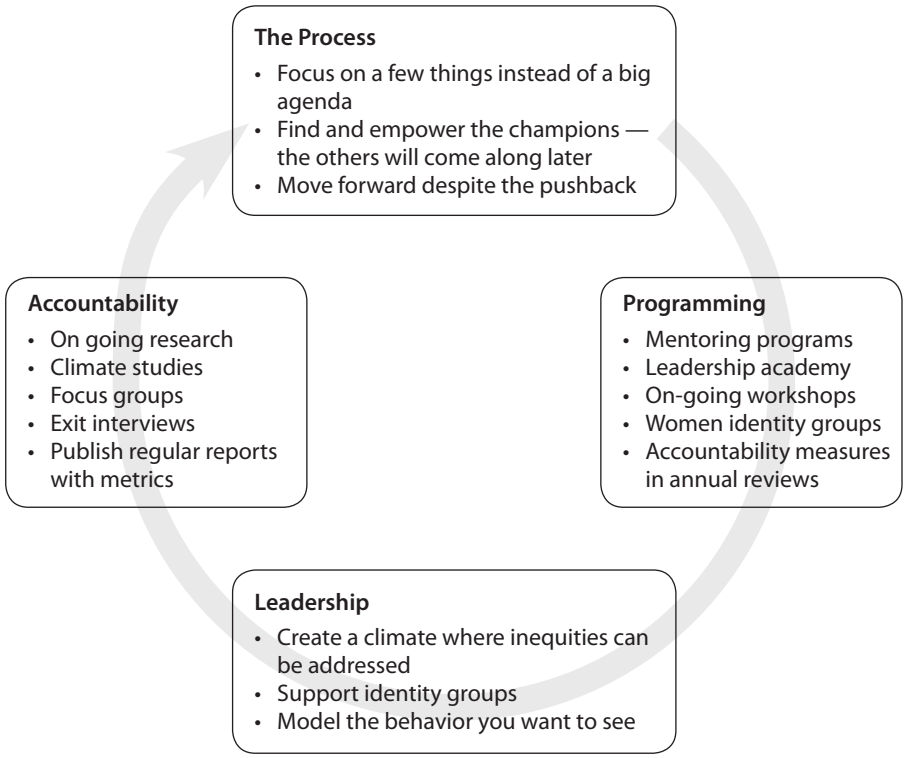

Figure 1. Contextual diagram outlining the process for mainstreaming gender into science and research programmes.

A synopsis of AquaFish CRSP training

Long-term training

The CRSP has strived to provide training for students who were interested in aquaculture and fisheries, and would presumably go on to work in these fields, whether as owners or managers of private farms, officials in government organisations, members of non-government organisations, or faculty in institutions of higher education involved in research and extension. As such, CRSP longterm training efforts focused on teaching general biological and ecological knowledge, scientific principles, and research methodologies, and provided students with early experience in conducting experimental work. Long-term training typically took the form of participation in degree programmes (BS, MS, or PhD) at higher educational institutions, either in the US, a participating Host Country, or a third country. The hope is that these students will be the next generation of researchers and research administrators in aquaculture, fisheries, and related sciences. The goal is to empower these graduates with the ability to do research, generate new knowledge, and solve pressing problems in their home countries.

During the Pond Dynamics/Aquaculture CRSP (PD/A) and ACRSP (referred to collectively from now on as ACRSP) from 1982–2008, 683 students completed degree programmes with full or partial support from CRSP (Aquaculture CRSP 2008). Of those students for which gender data were reported, 36.8% were women (Table 1). The number of women completing degree training programmes supported by the CRSP increased dramatically beginning in about 1999, and the percentage of women candidates was consistently greater than 40% during the last three years of the Program (2006–2008). The percentage of women seeking degrees decreased as the degree level increased: of those seeking a BS, 41.8% were women; of those seeking a MS, 33.1% were women; and of those seeking a PhD, 30.5% were women (Table 2). This finding is consistent with the idea of the losses of women being progressive and persistent down the career pipeline. That said, at least 30% participation by women was achieved at all degree levels over a nearly 30-year period.

As of 2010, the AquaFish CRSP (as differentiated from PD/A and ACRSP) has trained or is currently training 273 students in degree programmes with 130 being women (47.6%) (AquaFish CRSP 2010). In 2008–2010, at least 50% of the students completing degrees each year were women (Table 1). When combined with the previous three years of ACRSP data, it shows that over half (51%) of the graduates in the past five years were women. Increasing gender equity in educational opportunities is a

Table 1. Numbers of students completing degree programmes with CRSP support from 1984–2010. ACRSP data for degree completion is presented from 1984–2008 and AquaFish from 2008–2010. Data for degree completion starts after program inception; thus, degrees were completed in 1984 even though the first CRSP began in 1982. For AquaFish, the first degrees overlapped with the final year of ACRSP (both CRSPs ran concurrently) and thus, independent data for 2008 is presented for ACRSP and AquaFish.

Year	Total number (data not collected)	% women	Year (cont'd)	Total number	% women
1984	4	0.0	2000	34	32.4
1985	16	37.5	2001	54	38.9
1986	13	38.5	2002	15	20.0
1987	17	47.1	2003	3	0.0
1988	6	16.7	2004	76	34.2
1989	16	12.5	2005	47	38.3
1990	20 (2)	33.3	2006	37 (1)	50.0
1991	10	10.0	2007	36	47.2
1992	13	38.5	2008	29	44.8
1993	9	11.1	Year unknown	98 (3)	41.1
1994	11	27.3	**ACRSP Total**	**683 (7)**	**36.8**
1995	25	36.0	2008	17	72.2
1996	12	25.0	2009	63	50.8
1997	12 (1)	54.5	2010	20	50.0
1998	27	29.6	**AquaFish Total**	**100**	**55.0**
1999	43	44.2	**Total**	**783 (7)**	**39.1**

Table 2. Degree programmes completed by men and women over the 25 year history of the ACRSP (1982–2008).

Degree	Total number (gender data not collected/reported)	% women
BA/BS	304	41.8
MS	274 (3)	33.6
PhD/PostDoc	82	30.5
Data not available	23 (4)	31.6
All degrees	**683 (7)**	**36.8**

major achievement in itself. But while it appears that the Program has equal number by gender, this does not yet mean that the same proportion are entering higher positions in research careers. So who is doing the work now?

With regard to women in science leadership roles, the AquaFish CRSP has one woman US Principal Investigator (PI) out of seven total PIs (14.3% women), only slightly higher than the three out of 24 (12.5%) in the older ACRSP. In addition, the CRSP's Lead Principal Investigator and director is a woman. An analysis of all the PIs, Co-PIs, and Investigators across all seven core research projects in the AquaFish CRSP, however, shows 25 women out of 99 personnel (25%). Where have all the women graduates gone? One of every potential two women degree holders is not yet represented in the scientific leadership of the Program. More women should be in the pipeline as recent graduates. Since smaller percentages of women graduated before 1999, fewer were available to be senior researchers, principal investigators, and executive research administrators. This number might increase in the coming years as women graduates make it further down the pipeline.

Short-term training

Short-term training supported by the CRSP over 30 years includes learning opportunities focused on specific topics and the courses are compressed into short time periods of between half a day to two or three weeks up to six months. Learning opportunities most frequently occur as short courses, workshops and seminars, and participation in conferences. The target audiences for this type of training are typically farmers, extension agents, government officers, other stakeholders, or students who want to learn about aquaculture and fisheries basics or need specific new skills to apply on their farms, in their research or production facilities, in their private enterprises, or in their education and outreach efforts. Information presented includes the current state of knowledge about targeted species, whereas skills training included topics such as pond construction, broodstock management, fish propagation, hatchery rearing of larval fish, fingerling production, water quality monitoring, computer and software training, extension methods, survey methodologies, marketing, record keeping, to name a few. Other examples of short-term training include individualised aquaculture information relevant to a specific situation; on-the-job mentoring and training at field sites; and short internships to help participants develop particular skills.

Preliminary gender data for short-term training in the current AquaFish CRSP, since its inception in September 2006, shows over 100 short-term training events with over 3,000 participants, of which approximately 34% were women. Women's participation was approximately 30% for the first two years of the Program, with an increase to about 40% in 2010 (Table 3). While these numbers may be increasing, they still do not reflect the level of participation seen in long-term training.

Women are assumed to undertake short-term training more readily than long-term training because it is typically local and does not require a significant time commitment. These data do not support this assumption and, furthermore, they suggest a greater percentage of women participating in long-term and long distance degree training. Perhaps the short-term training opportunities have not been well advertised or accessible, or are not of as much interest to women as to men.

Table 3. Non-degree programmes undertaken by men and women over the history of the AquaFish CRSP.

Year	Total number	% women
2008	888	33.9
2009	1,440	31.8
2010	694	39.6
Total	**3,022**	**34.2**

Other factors may be cultural mores and gender roles in the locations where the short-term events are held. Lower percentages of women were trained in events in Africa (such as Kenya, Uganda, and Mali) than in Asia and Latin America. Unequal access to training may be a consequence of the geographical popularity of the subject matter, or how widespread aquaculture is in a country or geographical area. Asia accounts for over 80% of the world's aquaculture production while Africa and Latin America account for about 4% together. That aquaculture is commonplace in Asia may account for the increased numbers of women trainees from Asia; however, this would not explain

the higher numbers from Latin America, where aquaculture is not a mainstream activity. As more concerted efforts such as mandatory gender-focused investigations and country specific strategies are beginning to take place in short-term training efforts, and aquaculture becomes more geographically widespread, the number of women participants is expected to continue to rise.

Conclusions on mainstreaming gender into science and research programmes

Recently, women have made great strides in terms of equal rights, educational and professional opportunities, better wages, and political power. More women are in the formal workforce today than any time in history. Because of the aging of the cohorts that made up the vanguard of aquaculture science, a large number of retirements are on the horizon and many top leadership positions will soon be vacant and some could be filled by women. Combined with an increase in women graduates, this might start the process of blocking the holes in the leaky pipeline. To achieve this, women will need to be retained in the pipeline for long enough to reach these leadership positions.

In order to have a better understanding of what the leaks are in the aquaculture science pipeline, future research should include follow up studies of CRSP women graduates. We need to think critically about the leaks and undertake intentional actions to bridge the gap between training and employment, and between employment and promotion to the highest levels. Qualitative research is needed to look at how and why these barriers persist. A deeper understanding of the leaks at different stages will require evaluating the processes beyond the statistics. Another aspect of the complex issue involves an epistemological approach (Bebbington 2002) to understand women's relationship to science and the production of scientific knowledge. As the body of scientific knowledge continues to be built and refined, we need all perspectives and an ability to ensure the most objective and accurate accumulation of knowledge. Over the past many years, the PD/A, Aquaculture, and now AquaFish CRSPs have promoted gender equality and engaged women in training activities by collecting gender disaggregated data, setting explicit goals, and evaluating outcomes. These sustained efforts have been successful in increasing women's participation in longand short-term training over time. It is our hope that these efforts will have lasting effects on gender equity in the aquaculture and fisheries sectors all the way through the pipeline.

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Improvement of women's livelihoods, income and nutrition through Carp-SIS-Prawn polyculture in Terai, Nepal

S. Rai[1], S.H. Thilsted[2], M.K. Shrestha[1], M.D. Abdul Wahab[3] and K. Gharti[4]*

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Abstract

Many poor Nepalese women and children suffer malnutrition caused by vitamin and mineral deficiencies. In December 2008, the project "Improvement of women's livelihoods, income and nutrition through carp-SIS-prawn polyculture in Terai, Nepal" was launched in Chitwan, a district, to test the possible role of small indigenous fish species (SIS) in combating malnutrition. Fifty household ponds of 100 m^2 each were constructed and stocked with carp such as rohu (*Labeo rohita*), silver carp (*Hypophthalmichthys molitrix*), bighead carp (*Aristichthys nobilis*) and mrigal (*Cirrihinus mrigala*), and SIS such as dedhwa (*Esomus danricus*), mara (*Amblypharyngodon mola*), pothi (*Puntius sophore*) and prawn (*Macrobrachium rosenbergii*). Average total production was 2.6 t ha^{-1} $year^{-1}$ but was affected by low stocking rates and mortality caused by poisoning from canal water. On average, the farmers' households consumed 54% of the production. Farmers, all of whom were women, and their families consumed all SIS and sold surplus carp and prawns. Their fish consumption was above that of the national average, which is still low by world standards. Farmers earned Nepalese rupee 1,523 $household^{-1}$ in 250 days. The study's results, although modest, are a promising start to introducing new farming practices to increase the income, food and nutritional standards of women and their households.

Introduction

Among poor women and children in Nepal, malnutrition caused by vitamin and mineral deficiencies has been well recognised as a serious health problem (Ministry of Health and Population (MOHP) 2006). Essential micronutrients such as iron, zinc, vitamin A and calcium are lacking in the Nepalese diet, and consequently large population groups are suffering from diseases and disorders associated with micronutrient deficiencies. The most common forms of malnutrition in the country are protein energy malnutrition (PEM), iodine deficiency disorders, vitamin A deficiency, and iron deficiency anaemia. Nearly 48% of children under five are anaemic and 49% are stunted (MOHP 2006). Similarly, 36% of women aged 15-49 are anaemic (MOHP 2006). The situation is dire, especially among rural, ethnic minority women and children because they are resource-poor and have very little education. Limited access to resources affects women's nutrient intake, underlining the importance of nutrient-rich food sources.

Small indigenous fish species (SIS) are of special interest because SIS are rich in essential micronutrients including vitamins and minerals (Roos et al. 2007a). Nutrient analyses of common Bangladesh SIS such as mola (*Amblypharyngodon mola*) and darkina (*Esomus danricus*) have shown that they contain much higher vitamin A, calcium and iron than do cultured fish (Roos et al. 2006). Studies in poor, rural households in Bangladesh and Cambodia showed that even small quantities of the vitamin A-rich fish, mola, produced in household ponds, can meet the annual vitamin A requirements for 2 million Bangladeshi children. A traditional, daily meal with the ironrich small fish, trey changwa plieng (*Esomus longimanus*) can meet 45% of the daily median iron requirement of Cambodian women (Roos et al. 2007b). Semi-intensive carp polyculture is the major established aquaculture system in Nepal.

Existing carp polyculture systems do not however promote household fish consumption because carp are usually grown to a large size and sold in the

[1] Aquaculture Department, Institute of Agriculture and Animal Science, Rampur, Chitwan, Nepal
[2] Department of Human Nutrition, Faculty of Life Sciences, University of Copenhagen, Denmark
[3] Faculty of Fisheries, Bangladesh Agricultural University, Mymensingh, Bangladesh
[4] Fisheries Research Division, Nepal Agriculture Research Council, Trishuli, Nuwakot, Nepal
* Corresponding author. E-mail address: sunilarai@yahoo.com

market, rather than being consumed by the farmer. Developing a production system that increases household access to nutrient-rich fish consumption, in parallel with the carp production, also carries potential to increase household income.

Polyculture of SIS with carp and prawn appears to be one of the possible options. Incorporating SIS and prawn in carp ponds can benefit farmers in two ways: i) by improving the nutritional status of farming families through regular partial harvesting and consumption of nutrientdense, self-recruiting SIS fish; and ii) by increasing household income from selling valuable carp and prawn to local markets. Realising the potential role of SIS to address the malnutrition problem, a project entitled "Improvement of women's livelihoods, income and nutrition through carp-SIS-prawn polyculture in Terai, Nepal" (carp-SIS-prawn project) was launched in Chitwan District in Terai, Nepal by the Institute of Agriculture and Animal Science (IAAS), Nepal in collaboration with the Bangladesh Agricultural University (BAU), Bangladesh and the University of Copenhagen (KVL), Denmark. The project, which is still in progress, aims to improve the health and nutrition of women and children through increased intake of nutrient-dense SIS, and to empower women by providing additional income to the family. The total duration of the project is 3 years, December 2008 to November 2011.

The project was launched in the Tharu community. Tharu are a marginalised ethnicity in Nepal. They make up 6.8% of the total population (Central Bureau of Statistics 2006). They are traditional fishers, capturing fish from rivers, swamps, lakes, and ponds to feed their large families. The catch from such fisheries is low and inconsistent. Hence, producing fish in their own ponds can provide more consistent yields while also improving household income and nutritional status. In addition it may also decrease fishing pressure and improve fish stocks in natural water bodies.

Activities

Site and farmer selection

Since the project aims to empower women through fish farming, only women farmers were selected for the project. Women were involved in the income generating activity to help empower them economically and socially. In total, 50 women farmers were selected at Fulloria, Mudovar, Jeetpur and Simara in Chitwan District. Criteria used to select participants in the project included their access to resources, especially water sources, and their interest in fish farming.

Pond construction

Farmer selection was followed by pond construction. Altogether 50 ponds were constructed at the site. The average pond size was 98.5 m^2. Pond size varied between 35 m^2 and 236 m^2. Pond size depended on the land available to the farmer and the farmer's willingness to devote land area to pond construction. The surface area covered by all ponds in the project amounted to 0.5 ha. Pond construction began in February and continued to the end of March 2008.

Pond stocking and management

Ponds were stocked with fingerlings of four carp species (rohu (*Labeo rohita*), mrigal (*Cirrihinus mrigala*), silver carp (*Hypophthalmichthys molitrix*), bighead carp (*Aristichthys nobilis*)), three SIS (dedhwa (*Esomus danricus*), mara (*Amblypharyngodon mola*), pothi (*Puntius sophore*)), and one prawn (*Macrobrachium rosenbergii*) in May 2008. Fingerlings of rohu, mrigal, silver carp, bighead carp and juvenile prawn were stocked at rates of 3,000, 1,000, 1,000, 2,500 and 10,000 ha^{-1}, respectively (Table 1). SIS were stocked at a rate of 25,000 ha^{-1}. Farmers adopted five different farming practices: i) carp farming, ii) carp + prawn farming, iii) carp + dedhwa + prawn farming, iv) carp + pothi + prawn farming and v) carp + dedhwa + mara + pothi + prawn farming. Ten farmers adopted each type of farming system as shown in Table 1. Prawn juveniles were brought from Bangladesh and nursed at IAAS ponds for 1 month prior to introduction into the ponds. Fish were fed a daily mixture of rice bran and soybean cake at 3% of total estimated biomass. Ponds were fertilised with urea, di-ammonium phosphate (DAP) and cow dung monthly at the rate of 0.4 g N m^{-2} day^{-1} and 0.1 g P m^{-2} day^{-1} (Shrestha and Pandit 2007). Each farmer was provided with a record keeping book so that she could record the numbers and weights of fish consumed in the household, sold, harvested and that have died, as well as the amounts of feed and fertiliser applied to the pond. Records in the notebook were monitored by the Field Supervisor and a Research Student associated with the project. The record books were later used to estimate the fish production and income earned by the farmers.

Training

Two training sessions were conducted: training for the trainers and training for farmers. Eighteen senior and experienced women farmers (13 from the Rural Integrated Development Society (RIDS) and five from the Rural Empowerment Society (REST)) were trained to be trainers by experts from IAAS and

Table 1. Stocking density (number of fingerling/juvenile per hectare) of carp, SIS and prawn in different farming systems. Ten farmers adopted each type of farming system.

Species	Types of farming systems				
	Carp	Carp-Prawn	Carp-Dedhwa-Prawn	Carp-Pothi-Prawn	Carp- Dedhwa-Mara-Pothi-Prawn
Rohu	3,000	3,000	3,000	3,000	3,000
Mrigal	1,000	1,000	1,000	1,000	1,000
Catla	1,000	1,000	1,000	1,000	1,000
Silver carp	2,500	2,500	2,500	2,500	2,500
Dedhwa	-	-	25,000	-	8,334
Pothi	-	-	-	25,000	8,333
Mara	-	-	-	-	8,333
Prawn	-	10,000	10,000	10,000	10,000

the Nepal Agriculture Research Council (NARC). Training focused on the fundamentals of carp-SIS-prawn farming and the role and importance of SIS in nutrition of women and children. The training was followed by a field trip to Madi, where participants observed successful integrated fish farming and were able to interact with farmers in Madi. Those 18 senior and experienced farmers, who had received training on carp-SIS-prawn polyculture, then served as Project Trainers. One month later, the Project Trainers trained the project farmers. Farmers were taken on a field trip to Pokhara to observe pond and cage fish culture, and interact with farmers. A written manual in Nepali on carp-SIS-prawn polyculture was prepared and provided to all farmers during the training.

Women fish farmer groups

Three women fish farmers' self help groups were formed and farmers were allocated to a group based on their location:

i. Farmers of Fulloria were allocated to the Namuna Bikash Mahila Machapalan Krishak Samuha

ii. Farmers of Mudovar were allocated to the Janmukhi Mahila Machapalan Krishak Samuha

iii. Farmers of Jeetpur and Simara were allocated to the Rai Mahila Machapalan Krishak Samuha

Each group had between 15 and 18 members. The women worked, developed plans and shared their problems in the groups. This enhanced their ability to work together and also developed social harmony in the community. Each group held monthly meetings and members deposited Nepalese rupee (NPR) 10 mth^{-1} each into their group's fund. This fund was then to extend loans of NPR 500–5,000 $person^{-1}$ to needy group members, at an interest rate of 1–2% mth^{-1}, and to repair equipment such as pump sets and fish nets.

Partial harvesting of SIS

SIS bred in the ponds within 2 months of the ponds being stocked. Farmers and their families began consuming SIS soon after the new juveniles were seen. They periodically harvested SIS by seine net until the end of the culture period.

Results

Fish and prawn production

After stocking in May, fish were grown for 250 days and prawns were grown for 150 days. Prawns were harvested by the end of November before temperatures dropped below the limits required for good growth and survival. Average total production was estimated at 16.5 kg $pond^{-1}$ which was equivalent to 2.6 t ha^{-1} $year^{-1}$. Total production represents the average of both fish (carp and SIS) and prawn consumed and sold in all 50 ponds. The total production per pond varied by pond size and farmer, and ranged from 3.4 to 40.3 kg $pond^{-1}$. Production of some ponds was affected by using poisoned canal water to top up the ponds; most of the fish died in those ponds. Canal water was poisoned due to application of pesticide to fish in Rapti River. Eight affected ponds were cleared and dried in the middle of the project.

Total production in SIS-stocked ponds was 27% to 33% higher compared to that in non-SIS ponds (Fig. 1). Carp was the major contributor (88%) to the total production while SIS and prawn contributed 8% and 4%, respectively. Among SIS, dedhwa gave the highest average production of 2.4 kg $pond^{-1}$ whereas mixed SIS and Pothi gave 1.9 and 1.7 kg $pond^{-1}$, respectively. Average prawn production was 0.73 kg $pond^{-1}$ and was from 0.01–3.27 kg $pond^{-1}$. Total production did not vary significantly ($P < 0.05$) among different farming systems. However, average total production was higher in SIS-stocked ponds than in carp ponds.

Highest (18.7 kg pond^{-1}) total production came from carp + dedhwa + prawn farming and lowest (13.1 kg pond^{-1}) total production came from carp farming, both after 250 days.

Fish consumption

On average, the farmers' households consumed 54% of the total production. Consumption varied from 0.8–22.4 kg household^{-1}. By farming group, the highest (10.2 kg household^{-1}) and lowest (7.3 kg household^{-1}) amount of fish and prawn was found to be consumed by carp-dedhwa-prawn growing farmers and carp growing farmers, respectively (Fig. 2), although the differences were not significant. Carp was the major commodity consumed by farmers (81%), compared to SIS (12%) and prawn (7%). All farmers growing SIS consumed but did not sell them. SIS consumption ranged from 0.03 to 5.3 kg household^{-1}. SIS contributed 15% to the total fish consumption. Similarly all farmers growing prawn ate them, though in small amounts because the giant freshwater prawn was a new species to them. Prawn consumption was from 0.02–1.7 kg household^{-1}.

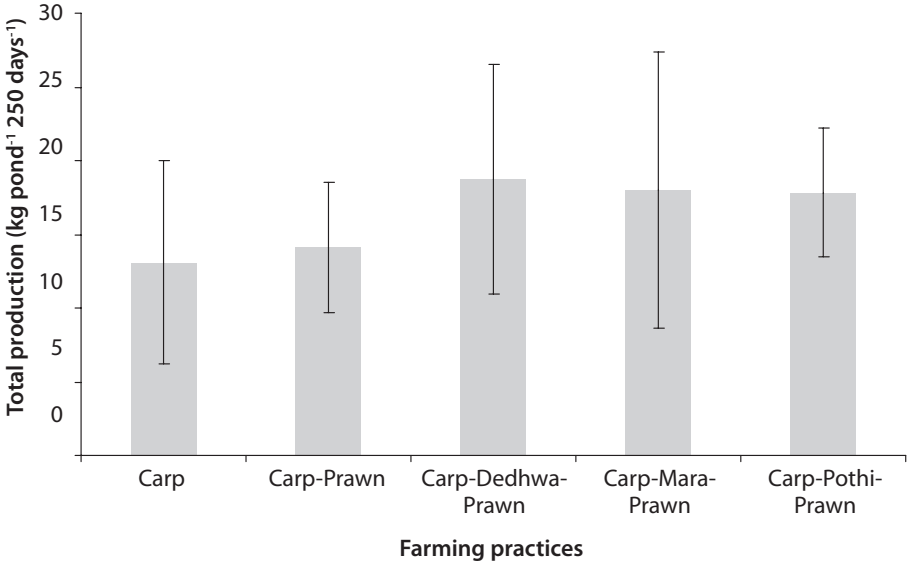

Figure 1. Total production (mean±SD) of fish and prawn (kg pond^{-1}250 days^{-1}) under different farming practices.
Bars represent average production of 10 households.

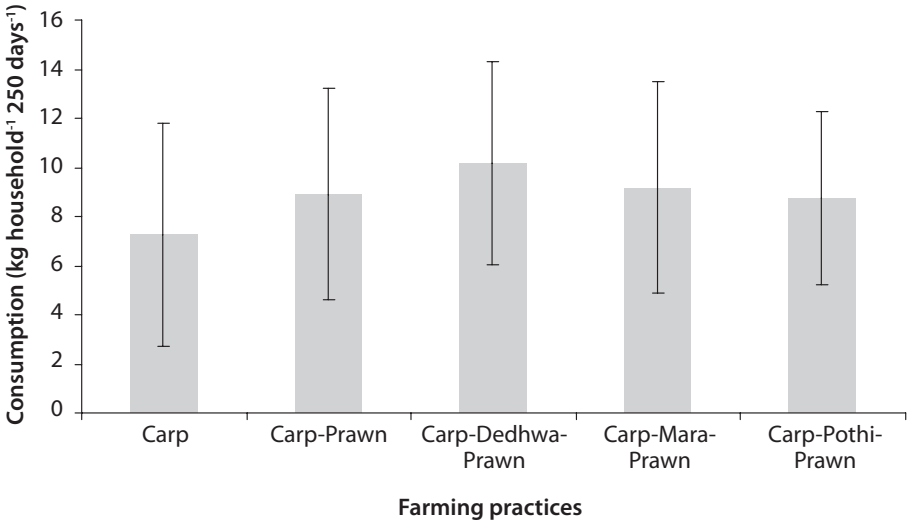

Figure 2. Total household consumption (mean±SD) of fish and prawn under different farming practices (kg household^{-1} 250 days^{-1}).
Bars represent average consumption of 10 households.

Income generation

Farmers sold surplus carp and prawn. They sold carp and prawn at rates of NPR 200 kg^{-1} and NPR 600 kg^{-1}, respectively. The total amount of carp and prawn sold was from 0.7–24.2 kg $household^{-1}$. Farmers earned NPR 135–4,846 for a growing season, which they used to cover household expenses. Farmers earned more than NPR 1,600 from carp-SIS-prawn ponds and less than NPR 1,200 from carp-only ponds (Fig. 3), showing a substantial increase in income from these polyculture systems. However, the differences between average incomes by farming practice were not significant.

Discussion

The project supported 50 women farmers. They actively participated in production and capacity building activities. Altogether, the carp-SIS-prawn project was able to help around 70 women, including all involved in training, research and supervision.

The carp-SIS-prawn growing farmers began consuming SIS regularly through partial harvesting of the ponds while carp and carp-prawn growing farmers had to wait until carp and prawns were large enough to eat. All farmers sold excess carp and prawn, and earned some income which helped them to be more empowered economically.

Total production was higher in carp-SIS-prawn ponds than in carp ponds. Average total production was lower than the national average production of 3.3 t ha^{-1} $year^{-1}$ (Ministry of Agriculture and Co-operatives 2009), and it varied greatly among pond producers. This variation can be attributed to uncontrolled conditions including lower stocking density, fewer carp species stocked in ponds, poisoning from source water and water turbidity. In Nepal, stocking density of carp is typically 10,000 ha^{-1}, which is higher than the 7,500 ha^{-1} used in the present study. Similarly, farmers stock six to seven carp species in polyculture ponds to maximise the production by utilising all available niches, compared to the four carp species used in the present study. Some farmers used poisoned canal water from the Rapti River to top up the ponds. The chemicals were thought to be from fishermen who illegally used pesticides in the river to capture fish; the poisoned river water then reached the ponds through canals. This killed fish in the ponds and decreased production.

Among SIS, mara did not perform well. This may have been because it was stocked together with dedhwa and pothi. The latter two species may have been superior to mara under the pond conditions. Mara is not endemic to Chitwan, but dedhwa and pothi are widely available, found in almost all ponds in Chitwan, and enter ponds with canal water. However, their contribution to the total production is not counted in national statistics because these are considered weed fish. Although the Tharu community are not aware of the nutritional value of dedhwa and pothi, they do consume them.

Though prawn production was comparatively low, it made a significant contribution to total household income through its high economic value.

Fish are an integral part of the diet and income of Tharu people. Farmers and their household

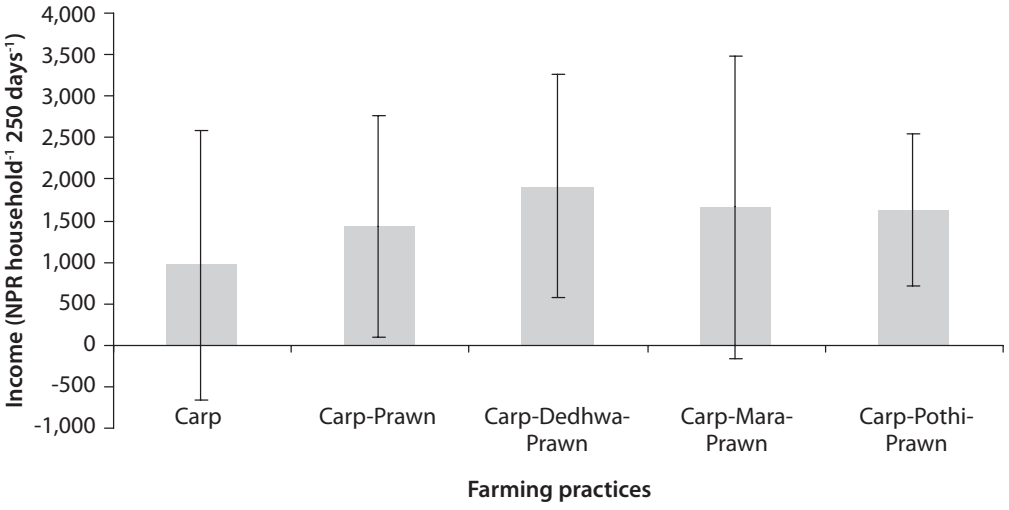

Figure 3. Total income (mean ±SD) generated by farmer from fish and prawn sales (NPR $household^{-1}$ 250 $days^{-1}$) under different farming practices. Bars represent average income from 10 households.

members consumed 8.9 kg of fish in 250 days with an average consumption rate of 2.3 kg person^{-1} year^{-1}, which was 31% higher than the Nepalese national average of 1.77 kg person^{-1} year^{-1} (Ministry of Agriculture and Cooperatives 2010). This is low by comparison with the global average consumption. The fish consumption rate among carp, SIS and prawn growing farmers was 65% higher than the national average. Household fish consumption was 20 to 40% higher in carp-SIS-prawn farmers compared to carp farmers. Increased intake of such nutrient rich SIS by farmers is believed to improve their nutrition. Since SIS are eaten whole without loss of nutrients from cleaning or as plate waste, these contribute greatly to the micronutrient intake of farmers. Farmers growing carp, SIS and prawn together earned more income because production was better and prawn fetched a higher price. Income generation and pond ownership helped the women to be empowered financially.

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For a better tomorrow

B. Clabots[1]

Women in the Philippines are taking a stand against destructive and unsustainable fishing. On the small island of Siquijor, they have begun to play an important role in the management of a few community-based marine protected areas (MPAs). Aided by the technical support of their local government and the NGO Coastal Conservation and Education Foundation, some women have been empowered to manage marine sanctuaries to the benefit of the entire community.

MPAs are a key global tool of marine conservation, and stakeholder participation is a well-acknowledged critical component of their success. Although over 1,000 MPAs now exist in the Philippines, only 20 to 30 per cent of them are effectively managed. In their intent to create collaborative management of MPAs, NGOs and government agencies have historically focused on fishermen as the primary stakeholders.

Fishermen are sometimes already members of an established Fisherfolk Organization (FO), and when the process of creating an MPA begins, the FO is pulled in to jointly manage the MPA alongside the local government. Women who glean or collect shells and urchins have traditionally not been considered "fishers" and, therefore, FOs are mostly or entirely male-dominated. As women have been systematically excluded from the opportunity to participate in MPA management, most management teams have few or no women involved. Instead, the FO and the local government put in the time and effort to manage the MPA but also receive the monetary benefits that come from divers' user fees.

Several case studies point to the positive role of women in MPA management; however, open-water MPAs are not covered by the literature. This article explores the role and effectiveness of women's participation in open-water MPA management in the Philippines.

There are two cases in Siquijor where the local women have taken the initiative to participate in MPAs. In one location, Maite, 28 women created their own registered association. Pushed and encouraged by a local retiree, the women were the main drivers of the MPA. They collaborated with their town council and FO (in which many of their husbands were members) to establish an MPA in their local waters in 2009. In the second location, Bino-ongan, 11 women who are not members of an association or the local FO volunteered their time to assist their town council in the establishment and maintenance of an MPA. In Bino-ongan, the women reported that the local fishermen and the FO were not even interested in establishing and managing the MPA. The women have successfully assisted the town council in performing baseline ecological surveys and delineating the boundaries of the MPA with homemade buoy lines of plastic bottles.

In Maite, the women involved in the MPA are mostly non-gleaners, and range in age from 23 to 73; they primarily manage their households and run a variety of small businesses. Though burdened by many hours of unpaid domestic responsibilities, the women participate in all aspects of MPA management. They take turns guarding the MPA day and night, reprimand violators, clean up the beach, maintain the guardhouse and buoy lines, collect crown-of-thorns sea stars, and monitor the condition of the reef by snorkelling. In comparison with a study site run by only fishermen, the women in Maite seem to have maintained better records, run a tighter budget, and displayed greater enthusiasm in sharing information with community members.

Though non-fishers, the women in both study sites were found to have an acute awareness of the state of local fisheries. Women acknowledged that the poor state of fisheries and uncertainty over their children's ability to catch fish and earn a decent livelihood in future are some of the primary reasons for their participation in the MPA. Some declared it was their duty as citizens to protect their local coral reef from destructive fishing methods. In the words of a woman from Maite: "We are the *barangay* (pioneers) who started this sanctuary. We have to preserve our sanctuary, our resources, the corals

[1] School of Marine and Environmental Affairs, University of Washington, Seattle. Email: barbara.m.clabots@gmail.com

and the fish because we have so much illegal fishing in our area. So we have to make a guardhouse and a schedule of duty to fight illegal fishing. We have to protect our sanctuary for the future of our children. Maybe someday we will have many fish."

In contrast, the few fishermen in MPA management in Maite stated that they participated because they hoped to gain extra income not only from increased fish stocks but also from government projects external to the MPA, like tree planting and seaweed farming.

Though small, the Maite MPA is a popular diving site among local tourist operators and has brought USD 6,000 into the community from collections of divers' fees over the past three years. Only 15 per cent of the profit is divided among all 50 members of the management team, giving each member an average of USD 6 per year. This cash benefit is too small in Maite to be considered a primary incentive. However, today, the increased catch size, which many community members attribute to the MPA, is seen as benefiting the whole community.

The local government staff reports other benefits of including women in coastal resource management, such as better understanding among community members and a significant decrease in conflict. In livelihood projects, women reportedly take greater initiative, delegate tasks, take care of details, and agree to put in the most labour, leading to improved project outcomes.

There are many reasons women should be included in the process of establishing and managing protected areas. Small MPAs often include the intertidal zone, so gleaners — mostly women — who collect shells and urchins at low tide are the primary resource users and, therefore, a critical stakeholder group. They not only have special knowledge of the intertidal zone that can be used for more effective management, but gleaning is also a primary local source of food — the fish caught by men is often sold but the marine invertebrates gathered by gleaners are often consumed at the dinner table.

Further, when an MPA is established, fishermen are often able to deal with the new restrictions it imposes by putting out their boats further from the coast; gleaners, however, have limited alternate fishing grounds. Clearly, gleaners and fisherwomen are the most marginalised by MPAs and should, therefore, be considered primary stakeholders. According to MPA researchers, including women in natural resource management "increases collaboration, solidarity and conflict resolution". Conflicts over natural resources are common in the Philippines, where artisanal fishers battle daily against commercial boats and depleted fish stocks. To improve marine conservation as well as to empower women and promote gender equality, women must be systematically included in the management of MPAs.

Shifting livelihoods

P. Mbatha[1]

Rural coastal communities in South Africa and Mozambique have, for long, harvested resources such as fish, and forest and agricultural products, to support themselves and their families. Although communities in both countries are culturally diverse, they share histories of colonialism, with manifest inequalities and vulnerabilities arising from the apartheid era in South Africa and civil war in Mozambique influencing the nature of livelihoods pursued by these communities. Research conducted by a colleague, Mayra Pereira, and me in these two countries, highlights the distinctive gendered nature of these livelihoods, and how in a dynamic coastal and fisheries context, women and men's choices, options and adaptive responses differ.

In both countries, livelihood options for women are limited. Most of their livelihood activities are at the household consumption level with little money being earned. In areas such as Josina Machel, Conguiana and Gala in Inhambane and Maputo provinces of Mozambique, fisheries and tourism are male dominated. These sectors have a strong relationship as tourism provides most of the monetary benefits to local fishers. Women engage mainly in post-harvest activities (processing, selling, marketing of marine resources) resulting in some empowerment. Agriculture, vegetable and fruit cultivation are supplementary activities that feed the household and bring in some money.

In contrast, in South Africa, where the tourism-fisheries relationship is not strong, women predominate in rural coastal areas and are deeply involved in harvesting of resources. Yet the livelihood scenario for women in communities such as Sokhulu and Mbonambi in the KwaZulu-Natal Province, on the east coast, is bleak. The women harvest brown mussels whose sale is banned in most of the region. Mussel harvesting occurs only once a month and permit holders are allowed 25 kg per harvest, which women harvesters argue is insufficient for food security. These women want alternative income opportunities like craft markets where locally-made products such as straw mats, baskets, ornaments and jewellery can be sold. In several communities in KwaZulu-Natal, women have entered into mussel co-management arrangements with the provincial conservation authority, empowering a few who are employed to monitor the harvesting. This also creates a limited number of alternative livelihood options.

In the former Transkei region of the Eastern Cape of South Africa, in addition to harvesting brown mussels for household consumption, women harvest oysters and crayfish, which are sold to industry and the tourism market as well as contributing to household needs. The meagre money earned from such activities is used to clothe and educate their children.

Gender inequalities continue though women in both countries have varied livelihood activities. Patriarchal and patrilineal systems govern coastal resource use, living conditions, and opportunities for benefiting from the coastal sectors. For instance, land and associated natural resources are largely vested with men; few women own land.

However, a recent study by Leila Emdon suggests that in some areas of the former Transkei region, gender roles are shifting; women are adapting to changing circumstances. The establishment of the Hluleka Nature Reserve/Hluleka Marine Protected Area (MPA), and the consequent demarcation of a notake terrestrial and marine protected area has resulted in increased food insecurity and livelihood vulnerability for the Hluleka community. Agriculture resources have dwindled outside the protected area due to increased poverty and environmental changes like rainfall vulnerability, causing greater reliance on fisheries resources. Among the Hluleka, historically men have been the breadwinner but the government's introduction of social grants (like child support and pension) to those earning below R 38,400 (USD 3,728) per annum, has meant women are the ones who qualify.

[1] Environmental Evaluation Unit, University of Cape Town, South Africa. Email: phililembatha87@gmail.com

This has changed the equation. In fact, government support grants have become the primary monthly household income source to many households. One may think that the childsupport grants amount to very little, but it is amazing how access to this small grant has shifted gender roles, expanding women's livelihood options to activities such as dwelling construction, craft products, trading resources with each other. The men rely solely on fishing, which is now increasingly constrained due to the no-take MPA. Some women report that they now do not feel the need to marry because the government grants makes them independent.

In Mozambique, in the absence of such government support, women's access to income is increasingly dependent on fishing and tourism. However, a 2011 study by Mayra Pereira shows that increased tourism is competing with the availability of fisheries resources to local people, causing fisheries resources to decline. As a result, inflation in the prices of local fisheries resources, is reducing the incentive for tourists to buy from local people. Tourism pressure on local fisheries resources will, in turn, impact women's abilities to pursue livelihood security.

Traditional fishing methods and fisheries management on Ahamb Island, south Malekula, Vanuatu

A. Obed[1] and V. Vuki[2]

Introduction

In the Pacific Islands, fishing is as old as hunting and food gathering. Fishing is considered to be a form of primary production. Fishing methods vary from using bare hands to using more complex methods to catch fish and invertebrate. Modifications of traditional fishing methods over long periods of time have been made in most traditional community in order to develop fishing technology that improves gear efficiency and fish catches.

In this paper, we discuss the traditional fishing methods and traditional fisheries management practices on Ahamb Island in Vanuatu. In particular, specific examples of traditional management adopted by the chiefs of the island, and those that are widely accepted are discussed.

Study site

Ahamb Island is located off the south coast of the main island of Malekula. It is 5.5 km^2 in area and the human population over the last 30 years has varied between 500 and 600 people. It is one of the most populated islands south of Malekula.

About 95% of the population's ancestral origin is from the main island of Malekula where they migrated to Ahamb Island because of dangers from malaria and cannibalism. There are 20 tribal clans on Ahamb.

Ahamb islanders have limited land resources and, so, rely on marine resources for their main sources of protein.

In a meeting with the islanders and the Vanuatu government in 1970, it was agreed that the main community farming activities should be carried out on the mainland of Malekula. The main reason for this was to limit farming activities on Ahamb Island that cause erosion and other disturbances to the environment because of the smaller island's increasing population.

Division of labour

There has always been a division of labour in Ahamb society, and different age and gender groups perform different tasks. For example, adult males tend gardens and farms, and are sometimes accompanied by their wives. Younger unmarried women glean the intertidal and mangrove areas for shellfish, octopus and other invertebrates.

Younger unmarried men participate in fish drives and turtle drives, sometimes venturing out to the outer reef edge or deeper water areas to spearfish. Canoes are usually taken out to sea during these occasions.

Traditional fishing methods

Traditional fishing methods range from gleaning for shellfish in shallow water areas to trolling for tuna and other deeper water fish. Bare hands are used for gleaning shellfish, crabs and invertebrate from mudflats, mangroves and intertidal reefs.

Women often use sticks (made from hard mangrove roots) that are sharpened at one end. The stick is used to poke fish in rocky tidal pools so that they are able to come out of their holes. It also assists the fisherwoman in getting shellfish from burrows because a woman will not use her bare hands to pick the shellfish from the burrows because of dangers of being bitten by moray eels and other fish camouflaged in the hole.

The women also use the stick to determine whether an octopus or triggerfish is in its hole and this is done by poking the hole with a stick and smelling the stick to find out whether the stick has some characteristic smell of an octopus or triggerfish. When not in use, the stick is often kept over the fireplace to help keep it dry and make it strong before it being used again on another fishing trip.

Bows and arrows are also used for traditional fishing. Bows are made from mangrove roots, and

[1] Vanuatu Fisheries Department, Northern Regional Headquarters, Luganville, Santo, Vanuatu. Email: oalsen@gmail.com
[2] Oceania Environment Consultants, PO Box 5214, University of Guam Station, Mangilao, Guam 96913. Email: vuki61@yahoo.co.uk

banyan tree roots are used to tie the ends of the bow together. The arrows are made from small pieces of bamboo, and one end is either sharpened or has barbs at the end. The barbs are made from the trunks of palm trees. Banyan tree roots are used to tie the barbs and bow together.

Fish drive

The men of Ahamb typically only use this traditional fishing method for special occasions, for example, during the new yam harvest season.Although men are the ones who use this method, the whole community participates in the preparation of the new yam harvest season feast.

Women and young girls help prepare the coconut fronds for the fish drive (by weaving the fronds to a vine) and prepare the fish after the fish drive. The length of each vine with coconut fronds would be about 20 m. The vines entwined with coconut fronds are combined to make the larger fish drive drag net.

While the women prepare the feast, the men venture out to sea in canoes with their spears, bows and arrows and coconut fronds. Fish are driven toward shallow water areas of the lagoon using coconut fronds as dragnets.

The technique uses a long fish dragnet made of coconut fronds attached to two long strands of vine and is about 150–200 m in length. About 30–40 men participate in the fish drive holding the fish dragnet and encircling a section of the lagoon in a semi-circle facing the shoreline.

The fish drive begins in the deeper section of the lagoon and men are suspended in water as they swim and haul the dragnets to the shallower section of the lagoon. Men also use sticks to beat the water surface to scare the fish into the net. Then the men and their dragnets form a smaller circle about 20 m in diameter and the fish are trapped inside the circle of coconut fronds. Men then can use the spears or bare hands to catch the fish. The fish can also be shot with a bow and arrow. Occasionally, other marine animals are caught, including turtles and dugong.

Turtle drive

A turtle drive is mainly done during a full moon when the tide is at its highest. Three to four large sailing canoes are used, with each one carrying four to five men. The person in the front of the canoe hangs onto the canoe's mast while also holding a torch or flashlight. Two people at the end of the canoe use long bamboo poles to steer the canoe. Once a turtle is spotted, one of the two men at the back of the canoe jumps into the water and catches the turtle by hand.

A turtle drive is highly regarded by the community and is commonly done by experienced fishermen. Some customary beliefs (e.g. abstaining from sexual intercourse before going out fishing) are associated with this practice, especially during the preparation of the drive and during the actual fishing.

Fish poisoning

Using plants to stupefy fish is a common practice and is done by both men and women. Several types of plant species, vines and tree bark are used and are often prepared by women who pound them with stones or sticks. The pounded material is then wrapped in a cloth and squeezed into the river or tidal pools. All of the men in the village participate in this fishing method, especially when preparing for a feast.

The toxin, which does not affect humans, dissipates as the water flows downstream. The toxin stuns the fish, which then float to the surface and can either be speared or collected by hand. The freshwater eel, *Anguilla* spp., is often caught for village feasts using this method. Freshwater eels can reach 2–3 m and can weigh 15–20 kg. Spears are used to kill the eels, which are then cut into pieces using knives.

Lobster fishing

Lobsters are often caught using a Y-shaped stick. The lobsters are then grabbed off the stick using bare hands. Lobsters are typically caught at night on a high tide, and when there is no moon. Dried coconut fronds are tied together and then lit to provide light for finding lobsters. Lobsters are common on all Malekula reefs.

Palolo (Eunice viridis) *worm fishing*

Palolo worms are polychaete worms that are found throughout the Pacific Islands region. The worms are considered to be a delicacy, and *palolo* worm fishing is a major community activity (involving women, men and children) during the months of October to December (before the full moon), when the worms rise to the surface of the sea.

When the *palolo* worms rise to the sea surface, all of the island's clans go out to sea, taking coconut fronds tied together in a bundle and then lit as lights to attract the worms. Modern mosquito nets are now used to catch the worms, which are then poured into buckets. Women cook the worms inside a length of bamboo with vegetable leaves and coconut milk. It is believed that pregnant women should be the ones to hold the light because they will attract the most *palolo* worms.

Modification of traditional fishing gear and the introduction of modern gear

Since the arrival of Europeans, traditional fishing gear has been modified or replaced by modern materials and techniques. For example, the use of monofilament gill nets is quite prevalent now (instead of the traditional method of using coconut leaves and vines), and gill nets are frequently used for fish drives.

Multi-prong spears are still widely used but iron and wires have replaced vines and mangrove roots. The Hawaiian hand sling (rubber and a piece of sharp rod) has become more popular than the traditional bow and arrow.

Dynamite is now being used to kill large schools of fish near the beach. Monofilament line for bottom fishing and trolling are have replaced traditionally woven line, and steel lures or barbed hooks have replaced shell hooks.

Modern vessels with outboard engines have also replaced dugout canoes and, combined with modern fishing gear, have decreased the time and effort required for fishing operations. However, more efficient fishing gear has resulted in the overexploitation of marine resources to feed the rapidly growing population of Ahamb Island.

Traditional fisheries management

In the past, community leaders, especially chiefs, implemented traditional fisheries management. Some of the traditional fisheries management measures included closed seasons, closed areas, and size limits.

Closed seasons are used for octopus, turtles and various types of shellfish such as trochus and green snails. There is now a ban on killing turtles between September and December because of their breeding season.

The use of closed areas as a fisheries management tool is mainly for turtle egg-laying beaches, specifically those beaches in the vicinity of Faro and Limaning on Ahamb Island. In addition, the reefs near Faro and Limaningare also closed for collecting certain shellfish and octopus during the breeding seasons. There is now a ban on the use of explosives on islands and reefs around the South Malekula area.

Minimum size limits are now used to control the taking of turtles, trochus and green snails.

The use of fish poison to stupefy fish only occurs during high tides. In rivers, fish poisoning is used only in certain areas. Fishermen block sections of streams and rivers using stones. But fishermen have to re-open the blocked outlets after fishing. The medicine men (or magicians) are often called upon to bring rain the next day to flush the rivers after poisoning the rivers to stupefy fish and eels.

In the past, these fisheries management guidelines were laid down by chiefs and were adhered to by community members. With the introduction of new fishing gear and commercial fishing practices, however, it became difficult to enforce traditional management rules and regulations because fish were now a source of cash income. Traditionally, fish were caught to feed members of a household, but commercial fishing has led to fishing to earn cash. And commercial fishing utilises more efficient fishing gear to catch more fish for urban markets.

Traditional fishing methods and fisheries management in Gao District, Santa Isabel Island, Solomon Islands

N.M. Basily[1] and V. Vuki[2]

Introduction

The people from Gao District, Santa Isabel in the Solomon Islands have developed numerous fishing methods. In this paper, we discuss the traditional fishing methods used in the district. Prior to European contact, the fishing technologies used were very simple and ranged from shell gathering using bare hands to more complex methods.

We have selected nine of the most commonly used traditional fishing methods in Gao District. The methods described here include the use of bare hands to collect and gather shells, fish poisoning using local plants, *grao'o* (river or freshwater fishing), bow and arrow fishing, *huahulangi* (mangrove crab tracking and collecting), *vae'e* (turtle fishing), *kwarao'o* (shallow water or reef fishing), *namoko* (reef fishing, netting or trapping) and *gria'a* (bonito fishing). We also discuss here the roles of men and women and traditional fisheries management measures practiced in Gao.

Map of the Solomon Islands showing the island of Santa Isabel (Source: australianmuseum.net.au/Solomon-islands-map).

Gleaning for shellfish and invertebrates

Older women and children often gather and collect shellfish in reef areas or in mangrove swamps, rivers and estuaries. In practice, all shellfish and invertebrates that are edible are collected for subsistence consumption or sold for cash. Shells in reef and mangrove areas are usually collected at low tide or during the dry season. Shell collecting is common during extreme low tides. *Trochus niloticus*, *Tridacna maxima*, *Tridacna derasa* and *Turbo* spp. are some of the common shellfish collected from inshore and offshore reefs.

Fish poisoning

Fish poisoning is practiced when very few fish have been caught using other fishing methods. Two kinds of plants are commonly used. One plant is used in freshwater streams and the other is used in the sea.

Barringtonia asiatica, or *phutu* in the local Maringe language of Santa Isabel, is used to stupefy freshwater fish. *B. asiatica* is a common coastal tree on most Pacific Islands. The tree has a large one-seeded fibrous fruit and is buoyant and can float in the sea and travel long distances. The seeds contain saponin toxins and these can stupefy fish.

The seeds are cut open using a sharp knife and white seeds are extracted and pounded using a stone or rock. The seeds are pounded or scraped and wrapped in a piece of cloth and thrown into the stream. Sometimes the seeds are not wrapped in a cloth; instead, the pounding takes place at the upper section of a freshwater stream, allowing the toxin to flow downstream and stupefy fish and eels.

[1] Marine Studies Programme, University of the South Pacific, PO Box 1168, Suva, Fiji
[2] Oceania Environment Consultants, PO Box 5214, UOG Station, Mangilao, Guam 96913

A shrub called gughunes in the local language (*Derris* spp.) is used to stupefy fish in the sea. These woody plants are found in wetlands and inland forests and belong to the pea family. The plants contain the toxin rotenone in their leaves, roots and seeds. The leaves, seeds and roots are collected and pounded at the beach. Once they have been thoroughly pounded, the leaves and roots are mixed with sand and wrapped in a piece of cloth. The sand prevents the leaves, seeds and roots from becoming too slimy. The toxins are very effective at low tide, especially in tidal pools.

A diver may squeeze the poison into a specific area of the reef where there are brain corals, and where fish may aggregate under these large coral formations. The diver dives to the base of the coral head with the pounded mixture wrapped in a cloth, and then squeezes the cloth to release the toxins.

This is usually repeated in several spots. It takes about two to five minutes (depending on the concentration of the mixture) for the fish to be stupefied and float to the surface. Once the fish are on the surface they are collected by hand and placed in fishing baskets.

Both men and women are involved in collecting the relevant parts of *B. asiastica* and *Derris* spp. and in pounding the seeds, roots and leaves. Women do the actual pounding of the seeds and the leaves, while men generally are the ones to release the toxin if it involves diving. Both men and women release the toxins in tidal pools at low tide.

Grao'o

This method uses a small net made from native or local bark of the plant *Hibiscus tiliaceus*. The branches of the plant are cut and soaked in sea water for several weeks until they are softened enough to make fibers. The fibers are then dried and made into long, thin pieces of rope. The dried ropes are then woven together by hand to make a net. Preparing the bark and weaving the fibers are done by women.

The woven fibers are attached to a hoop made from a larger vine or cane to form a net. This hoop is then attached to the end of long stick (1.5 m). The net scoops fish from streams and rivers. This fishing method is used by both men and women who live in the interior of the island, and is widely used in small streams and rivers.

Bow and arrow

Both bows and arrows are made from plants such as mangroves and bamboos. The bow is made from mangrove roots and is flexible enough to bend. The arrow has three to five prongs, depending on the type of fish targeted. The prongs are tied to the end of the arrow, forming a triangle if a small sized fish is caught.

When the arrow is shot, any fish that is not pierced by one of the three prongs will become entwined between the prongs.

If a larger sized fish is the target, the arrow will need to have one large barbless prong to pierce the fish's flesh. Bows and arrows are made and used by men for fishing although they are also used for hunting.

Huahulangi

Huahulangi refers to any fishing technique used for hunting mangrove crabs, and involves following crab tracks using a dugout canoe and paddling slowly.

Women are especially skilled in finding mangrove crab tracks and use this fishing method more often than men although men also use this method if requested to help or when required. Older females often pass down their hunting skills to younger women.

Vae'e (turtle fishing)

Vae'e is primarily used to catch turtles, and is usually carried out in the open sea or deep water. A canoe, turtle net and spear are the required tools for this particular fishing method.

More than 10 people are involved, with one or two standing in the front of the canoe with a net and spear. Throughout the whole process, only one person is allowed to paddle and control the canoe. This ensures that there is minimal noise and disturbance to the water, which is essential for this type of fishing. Several canoes may go out hunting for the same turtle.

When a turtle is spotted, all of the canoes try to get close to the turtle before the two standing near the front of the canoe decides whether they will use a spear or a net to capture the turtle. Once the spear or net is used, a number of men jump into the water and onto the turtle.

Those who jump onto the turtle must be good swimmers and divers because the turtle will try and escape by diving down to the sea bottom with the men hanging onto it. Experienced male divers know how to bring the turtle to the surface when this occurs.

Kwarao'o

This fishing method is done on the reef or in shallow water, preferably at low tide. Long vines and leaves of a certain shrub (*Derris* spp.) are gathered for use with this method. The leaves of the vines are crushed using a rock and then wrapped in a piece of cloth and tied. The crushed leaves are from the same plant used for stupefying fish in the fish poisoning method. The toxin is rotenone.

Two or three men paddle out in canoes over the shoals until they locate a large number of fish (or a school of fish). Once the fish are located, the men signal the party of men waiting with their vines on the shore to come to the spot where the fish have been sighted.

The leaves that have been crushed are thrown into the water and the toxins that stupefy fish are released. If a school of fish is sighted, the men quickly form a circle and surround the school. They use five to six lengths of vines with the leaves attached, thereby forming a primitive type of trawl net that lies about 1.5 m below the surface of the water. The stupefied fish float to the surface and are trapped in the narrowing circle of vines and fishermen. The fish are caught by hand and thrown into the canoe.

Namoko (also called *nhamhoko*)

This fishing method involves making a net that is much smaller than the *gria'a* net (see below). The *namoko* net is designed for reef and shallow water fishing, and involves four to five men. The net is made from the bark of a tree, *Hibiscus tiliaceus*, and although it is made entirely by women, men are the ones who use the net for fishing.

The net is square-shaped and has a cone-shaped loop at the center. The lines attached to the corners of the net are used for pulling the net up. All of the fish that become trapped end up in the cone-shaped section of the net. The person who waits in a canoe at some distance away, then unties the loop and the catch falls directly into the canoe.

After each catch, the net is placed on the seafloor until another school of fish swim above the net. The men then signal each other and quickly pull the net up. This process is repeated every time a school of fish reaches the net.

Gria'a

The people of Gao District on the island of Santa Isabel have fished for bonito for hundreds of years. Bonito (*Sarda chiliensis*) are medium in size and swim in large schools. They are smaller than tunas but are similar in shape.

Gria'a is a very complex fishing method designed primarily for catching or netting bonito. This method involves preparing two different nets and is rather unique because the nets are used exclusively for this style of fishing. The two nets are made separately and are prepared from tree bark (*Hibiscus tiliaceus*) and vines. The two nets are tied together to form a larger net that is more than 30 m in diameter.

The larger of the two nets forms the outer part of the main net. The mesh size is approximately 100 cm and is large enough that a person can crawl through the mesh without touching the ropes. The inner part of the net has a very small mesh opening of about 30 cm. The large mesh size of the outer part of the net allows larger fish such as sharks to escape. The inner section of the net is shaped like a big saucer and is designed to trap and hold the bonito.

Bonito fishing requires specialised skills and knowledge. Net construction requires skills that are passed down from the elders. Some of the elders who still have these skills try to mentor the younger men. Knowledge of local currents and how they flow, and the path that the bonito school follow at certain times of the day is essential for successful fishing.

A tripod-type bench is often raised to about 3.0–4.5 m above the sea surface, and is erected on the fishing ground near where the net is laid out on the sea floor. A watchman keeps an eye on the net.

The success of the bonito fishing depends on all of these tasks. It is necessary to position the nets and the tripod bench at a certain angle so that the approaching school of bonito does not see them. If the net and the tripod bench are incorrectly set up, and the bonito school sees them, they will divert their route to avoid the net.

About three-quarters of the net is spread out on the seafloor at about 4.5–6.0 m below the surface of the water. Only the back of the net is tied firmly to a post about 1 m below the sea surface. The front end of the net is held by the watchman and is well below the sea surface. The watchman is the only person remaining at sea while the rest of the fishermen wait in their canoes at the shoreline.

When a school of bonito enters the area above the net, the watchman pulls the section of the net he is holding so that the front section of the net is raised to about 1.2 m below the sea surface. When this is done, the watchman then signals the rest of the men to come and pull the net up. The canoes do the pulling of the nets.

When the school of bonito approaches the rear end of the net, they react by diving down away from the reef and returning only to find that there is another "reef" in front of them. At this point the bonito react as if the reefs were surrounding them and so dive down and remain at the bottom of the net.

During the confusion, other fish such as sharks escape through the outer part of the net. The bonito remain at the bottom of the net until they are pulled up with the net.

This fishing method can catch up to 2,000–5,000 bonito in a single catch with three to four catches in one day. This type of fishing is done only during festive seasons and especially during the feasting season from November to the end of January each year.

Men and women are fairly represented in this activity, from net construction and rope making to the actual fishing. It is taboo, however, for men and women to have sexual intimacy before fishing for bonito. Because of this belief, only unmarried females are given the opportunity to accompany the men to the fishing ground. The women who remain behind in the village have an important role in preparing leaves and other needed materials for baking the fish.

Fisheries management

The limitations of traditional fishing methods and gear are some of the reasons why marine resources in the Gao District of Santa Isabel are not as heavily exploited as in other areas of the Solomon Islands. Money is required to purchase modern fishing gear and people living in Gao District generally do not have access to modern fishing technologies because they have limited means of earning money.

Most of the traditional fishing methods discussed here are still practiced today. The people of Gao live in a communal society where clans or tribes own land and marine resources communally. Therefore, the management of marine resources is the responsibility of the clan or tribe, which means that everyone is aware of the role they play in resource harvesting.

Another common way of managing marine resources is to have taboo areas that are marked for no fishing for a certain period. This is done in consultation with clan elders and is, therefore, a highly respected management tool. This method is done particularly during times when resources are needed for a feast.

Finally, because marine resources are tribally owned, members of one clan cannot harvest the resources from another clan without permission. This restricts the exploitation of marine resources and prevents overexploitation.

Freshwater fishing, fisheries management and the roles of men and women in Tonia Village, Viti Levu, Fiji

M.R. Dakuidreketi[1] and V. Vuki[2]

Introduction

There is limited information on freshwater fishing in Fiji. In this paper we describe the freshwater fishing methods, fisheries management, and the respective roles of men and women in Tonia Village, Viti Levu Island, Fiji. The traditional fishing methods of *qolua*, *nimanima*, *duva*, *bubura*, *cina*, and pole-and-line and net fishing methods are described here.

Traditional fishing methods

Qolua

This fishing method uses hollow bamboo stalks with either one or both ends open to allow fish to enter. The stalk is usually placed in a deep section (60 cm) of the river and is left long enough (1–2 hours) to allow fish to enter one of the ends of the bamboo stalk. After fish have entered the bamboo stalk, both ends are blocked with non-hollow bamboo stalks so that when the fisherman or fisherwoman retrieves the stalk the fish caught inside do not escape. This method is selective because it catches mainly eels.

Nimanima

This fishing method is used in creeks where there are large depressions in the rocks. These depressions, called diro, can be as deep as 30 cm and are formed by water scouring the rocks. Fish often become trapped in diros after a flood or heavy rain.

When the water recedes after a flood and returns to its usual level, a *diro* still holds water inside it even though there is no new freshwater input from the stream. With this method, a fisherman scoops water out of the *diro* using a small container. Water is removed until the fish can be easily caught. The name *nimanima* literally means scooping out water from a *diro*.

Nimanima is practiced in creeks rather than in rivers and ponds because creeks typically have the characteristic depressions in the rock. This method is commonly used during the dry season when no additional water enters the diro while scooping water out. Different varieties of fish are caught using this method but prawns and eels are the main species. This method is practiced by both men and women.

A disadvantage of this fishing method is that it is labour intensive and can take about 30 minutes to an hour to remove water from the *diro*. This is especially true if the *diro* is large, which then requires considerable effort to remove the water. This is also a destructive fishing method because small fish are killed once the water is removed from the *diro*, and then the *diro* completely dries out if there is no more rain to fill it again.

Duva

The roots of *duva* (*Derris* spp.), although officially banned by the Fiji government's Department of Fisheries, are commonly used by men and women to catch fish. The roots of the *duva* plant are pounded and wrapped in a cloth and soaked in the selected area of the stream or river where the fisher wishes to stupefy fish. Once the toxin stupefies the fish, it floats to the surface. This method is not selective and stupefies both adult and juvenile fish. The toxins from the pounded roots can stupefy fish but do not harm humans.

Bubura

This method is usually done by men individually or in a group and requires the fishers to walk on muddy and swampy ground with very little water. The fishers continuously strike the ground with long multi-pronged iron spears. The spears are about two metres long and have three to four iron prongs at the end. The striking continues until the fisherman has struck an eel or fish with his spear. This fishing method is used to catch eels, which inhabit swampy areas in Tonia. It is an easy method to use but the catch rate is usually low. This method specifically targets eels, but is destructive to vegetation growing in swampy areas and along the creeks.

[1] School of Education, Faculty of Arts, Law and Education, Laucala Campus, Private Mail Bag, Suva, Fiji. Email: rawaikela_m@usp.ac.fj
[2] Oceania Environment Consultants, PO Box 5214, UOG Station, Mangilao, Guam 96913. Email: vuki61@yahoo.co.uk

Cina

Cina means "light" in Fijian. This fishing method requires the use of light. Traditionally, leaves were tied together in a bundle and lighted as a torch, but now fishers use kerosene lamps and flashlights or torches that are powered by batteries. The torches are used at night to catch fish while they are sleeping. In addition to the use of light, bush knives and spears are also used. Fishers hold the light above the water as they walk along the creek or the river. Sometimes they dive if there is someone else to hold the light. Usually this method is done by a group of two or three people.

This method is commonly used during the dry season when there is no rain. The water level is also low and very clear and not murky during the dry season because of the lack of rainfall and runoff into the river. The water needs to be clear so that the fishers can see the fish underwater. Both men and women practice *cina* and are often seen fishing together. A variety of fish are caught using this method.

Pole-and-line

This method uses a pole and a line that has a cork and hook at the end of it. The cork is tied between the pole and the hook. When a fish is caught, the floating cork moves up and down in the water and the fisher pulls in the fish.

Pole-and-line fishing requires the use of live bait, in particular earthworms. All types of freshwater fish are caught, depending on the type of bait used. The method is very efficient.

Nets

Women use nets in rivers and streams. Nets are usually made of monofilament and have two wooden handles for moving the net through the water. The handle also serves to hold the net down on the bottom of the river or stream while the women beat the surface of the water with a stick. Usually more than one woman is involved so that one beats the water with the stick while the other holds the net in place. The one that beats the water with the stick may also help remove any grass or wood or whatever else the fish may use as a hiding place.

The size of the fish caught depends on the size of the net's mesh. A variety of fish such as *ika droka*, *vo* and tilapia are caught using this method. In the past, nets were made from finely woven lines but today monofilament netting is used.

Subsistence fisheries and the roles of men and women

Fishing in Tonia is mainly done for leisure and/or to feed the family household. Each fisher chooses a suitable fishing method to catch fish for his or her own family.

Women dominate fishing activities with their fishing net and catch fish to feed their family. In contrast, men work in the gardens, tending crops and livestock, but take part in traditional fishing methods such as *burabura*, *nimanima* and *cina* whenever they are able.

Women and men from Tonia do not fish in the sea because they live inland and do not have access to reefs and coastal areas. All of their fishing is done in rivers, streams and freshwater pools. Women prefer catching fish in creeks and small ponds because it is easier for them to catch fish there than in deeper rivers.

Each fishing method is used during a specific season, time of day, and weather conditions to ensure maximum efficiency of the given fishing method. For example, *nimanima* cannot be used during the rainy season and cina is used only at night when the water is clear. *Burabura*, on the other hand, is used only on a fine day (blue sky, no rainfall and sun is shining brightly) with very little water in swampy areas.

The types of fish caught for subsistence purposes vary and depend on the fishing method used. For example, eels or *duna* (*Anguilla marmorata*) are caught using the *burabura* and *qolua* methods, while prawns or *ura* (*Macrobrachium* spp.) are caught using the *nimanima* method. Different freshwater fish species are caught using *cina* and net fishing methods; for example, jungle perch or *ika droka* (*Kuhlia ripestris*), a native fish species in most Fijian rivers and the introduced grass carp (*Cyprinus* spp.).

Traditional fisheries management

Managing the freshwater fisheries resources of Tonia Village is important for subsistence fisheries and for the conservation of resources in the long term. Very few traditional fisheries management measures are in place and these include closed areas or tabu areas, and enforcement through traditional village-based controls (e.g. a ban on destructive fishing methods).

Closed areas or tabu areas are mainly enforced when there is a death of a chief or clan elder. A specific pond, stream or a section of the river will be closed for fishing until the 100th night after the burial. The reason for closing the area is to allow the fish stock to increase during the three months of mourning, or 100 nights.

Once the ban is lifted, villagers are able to fish in the area using different methods with no restrictions on the size of fish caught. Juvenile and undersized fish are also taken during a fish trip. Because of the Fiji Department of Fisheries' awareness programmes,

villagers are beginning to realise the need not to catch juvenile and undersized fish and leave them in the river for the future.

Fish caught from the tabu areas are used for the 100th night feast after the burial or *vakabogidrau* (the name of the feast).

Although closed areas are only declared in order to prepare for the 100th night feast after the death of a chief or clan elder, this method could also be used effectively for conserving fish stocks in streams, ponds and specific sections of a river.

Recently, Tonia villagers have realised that destructive fishing methods such as the use of *duva* (*Derris* spp.) is not good. Now, a ban on the use of duva is in place and the village chief can impose penalties if a fisher is caught using it. In addition, the use of chemicals and dynamite are now prohibited.

Roles of men and women

Men's roles in the village are clearly distinct from those of women, and the division of labour is clearly understood by both. Men's roles are entwined in leadership, farming, house building and repairing, and keeping the village compound clean. Men also collect firewood and are involved in any physical activity that is required for the smooth running of their household or the village community as a whole.

Nearly all men's activities are done in groups, which makes men's work much easier than working individually and independently. The village organiser, or turaga ni koro, divides the men into groups and each group has a leader to guide activities, such as planting and weeding of a new plantation area. Each individual in the group takes a turn in the planting of their crops.

After each person plants their crops, the group leader then decides whether to continue with planting or to shift to another activity. There may be only a few days in a week dedicated to group work but other days may be devoted to family activities such as firewood gathering.

Men's role in fishing in Tonia Village is limited, and fishing methods used during their leisure time include *nimanima*, *burabura* and *cina*. One of the main roles of women is to fish to provide protein for their household. Both men and women also fish for recreation. Other women's activities include cooking, washing, looking after children, and household cleaning. Women also work in organised teams or groups, especially mat weaving and sewing. Women in the church or clan organise groups of women to sew and weave mats from pandanus leaves. These work sessions provide opportunities for women to support the church and the clan and also to learn from each other.

Women use their fishing nets by themselves or go out in groups to fish in streams, ponds and sections of the river near the village. They usually go out in the morning after cleaning the house and return in the afternoon before the sun goes down. The catch is cooked for dinner and women typically fish on a daily basis. Almost all of the women catch enough for their own household's daily consumption, and fish are never sold because urban markets are quite a distance from the village.

Empowering women in fisheries

Source: *www.solomonstarnews.com/feature/women/20061-empower-women-in-fisheries*

The WorldFish Center, in partnership with the Solomon Islands Locally Management Marine Area (SILMMA) Network, hosted a "Women and Fishing" training workshop from 4th to 6th of November, 2013. The workshop was made possible with funding from the New Zealand, Mekem Strong Solomon Islands Fisheries program.

Over the 3 days, 19 women came together to represent their various provinces including Guadalcanal, Isabel, Malaita, Western and Central Islands. The core purpose of the training was to provide Solomon Islands' rural women with general information about marine resource and resource management to improve their understanding of basic marine biology facts and how these interact with the marine resource management goals. The training was held at the OG conference room, Kukum Highway and facilitated by two WorldFish Center staff, Zelda Hilly and Faye Siota.

Over the course of the training six messages were discussed:

- Marine resources are important for a healthy family and community.
- Healthy habitats are important for our marine resources.
- Coral is an animal. A healthy reef is made up live coral.
- Marine animals have a life cycle.
- If there is overfishing, there will not be enough food or money from our marine resources in the future.
- Managing or looking after our marine resources is important for our community well being.

The WorldFish Center works with a number of communities under the SILMMA network conducting research and facilitating marine resource management activities.

The organisation is also motivated to empower Solomon Islands' rural people to look after their marine resources. Providing information and training workshops is one avenue to achieve this.

Overall, the SILMMA training was a great opportunity for enhancing and building the capacity of our local women interested in marine resource management. It not only created a platform for these women to share and gain knowledge, but also gave them the confidence to educate other women and children in their own and neighbouring communities.

Women have nothing to do with fish, or do they?

A. Ride[1]

Women are not well represented in what might be considered conventional places of power and authority.

This is the second installment of a three-part series of blogs about the challenges that face the people of Malaita in the Solomon Islands, and the steps they are taking to secure their future in partnership with WorldFish and local organisations.

What would you imagine would be the key topics of a stakeholder consultation for a program on aquatic agricultural systems? Making money from fish and farming? Yes. Sustainability? Yes. But also one of the key topics is gender, perhaps a surprise given that the participants in the CGIAR Research Program on Aquatic Agricultural Systems (AAS) stakeholder consultation held 6–9 November 2012 were from, and talking about, an island that has among one of the most traditional parts of the Solomon Islands — Malaita.

In the words of the Malaita Chazon Development Authority Director Patrick Taloboe, "we all know its women who manage money well and can develop villages". However, women are not well represented in what might be considered conventional places of power and authority — parliament and traditional chiefly governance systems. At the same time Malaitan women are often vocal advocates for their causes, leading national and local NGOs and they are also highly successful managers of some of the best known Solomon businesses.

But what has this to do with a research program on aquatic agricultural systems? Well quite a lot according to gender champion Ranjitha Puskur, senior scientist at WorldFish. She describes how the AAS program aims to approach gender in a different way to some initiatives that have gone before: "AAS has a big emphasis on gender. Most projects aim to integrate gender into their activities; AAS has ambitions to take it a step beyond and

Women removing the shell from mangrove mudshells in Malaita, Solomon Islands. Photo by Wade Fairley, 2012.

[1] Dr Anne-Maree Schwarz, PO Box 438, Honiara, Solomon Islands. Email: anouk.ride.com@gmail.com

catalyse transformational change. For example experience has shown that you might give women access to technology or credit but is that really benefiting women and contributing to household well-being if they don't have control over it and are not able to make decisions about how they use the income those inputs generate? Often agricultural research shies away from those more complex areas involving addressing social norms and attitudes, with people identifying this as a social change agenda. They ask: Is that really part of your organisations mission? But now we realise that if you don't address causes of inequalities leading to differential access to technologies, markets, inputs and services for men and women, or understand how decisions are made in the household, you will not achieve a sustainable outcome."

Paddling for mudshells in Malaita, Solomon Islands. Photo by Wade Fairley, 2012.

How to do it this? One of the things is to look at what has worked in other development sectors like health and education to bring about transformational change in gender roles, norms and attitudes, says Ranjitha: "For example World Vision is using a method called 'channels of hope' in Solomon Islands to address gender based violence, so we would like to explore opportunities to work together with such partners to learn from and adapt what they have been doing, to the aquatic-agricultural sector. At the stakeholder consultations it nevertheless came out as a key issue — many people were concerned about the high levels of gender based violence and how gender issues had implications for nutrition, health and livelihood issues".

For Clera Rikimani, head of the women's division of the Malaita Provincial Government there is great need to focus not just on women, but on disadvantaged women in development work: "There are two sorts of women — those that are comfortable with their husband and family; they are better off than women who stay without family, I found problems come up when the family is in bad shape, mummy and daddy separate for example. So, in my work I concentrate now on women who really need the help — single mothers and widows". Because their need is greater, they also tend to respond to capacity building and training better says Clera: "One thing I found before with women who are comfortable, there is no incentive to change, you give them training, then next time another training but everything is just the same! I found the moment I shifted to the other women to raise them up I had a good experience doing things, they responded well, even to the extent that one woman is running a small business now. I found with those sorts of women any advice you give them has a big impact on their life".

One thing that came through in the community consultations for the Aquatic Agricultural Systems program is that men and women may have different motivations for getting involved in managing aquatic agricultural systems. Men look more at the land and sea for ways to make income, but women, were often more worried about how the land and

sea could provide adequate nutrition for their children. This mix of needs and visions for land and sea in Malaita will provide an important balance as the AAS program goes forward.

At the AAS Program's stakeholder consultation that involved government, NGOs and other stakeholders perhaps the least controversial item of discussion was the idea that women were a central part of rural livelihoods and needed to be empowered to enhance their incomes and nutrition. So maybe those old ideas about women having nothing to do with fish, for example being bad luck to go out fishing, have indeed changed, leaving the way ready for development of aquatic agricultural systems that benefits men, women and the next generation.

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Secretariat of the Pacific Community, Marine Resources Division, Information Section
BP D5, 98848 Noumea Cedex, New Caledonia
Telephone: +687 262000; Fax: +687 263818; cfpinfo@spc.int; http://www.spc.int/coastfish