Asian Fisheries Science
The Journal of the Asian Fisheries Society

GENDER IN AQUACULTURE AND FISHERIES:

ENGENDERING SECURITY IN FISHERIES AND AQUACULTURE

SPECIAL ISSUE

Gender in Aquaculture and Fisheries: Engendering Security in Fisheries and Aquaculture

Papers from the 6th Global Symposium on
Gender in Aquaculture and Fisheries
3-7 August 2016
11thAsian Fisheries and Aquaculture Forum
Bangkok, Thailand

Special Issue Publication 30S (2017)
Asian Fisheries Science

Guest Editors

Nikita Gopal
Meryl J Williams
Siri Gerrard
Susana Siar
Kyoko Kusakabe
Louis Lebel
Holly Hapke
Marilyn Porter
Anne Coles
Natasha Stacey
Ram Bhujel

The Journal of the Asian Fisheries Society

Gender in Aquaculture and Fisheries: Engendering Security in Fisheries and Aquaculture

Guest Editors

Nikita Gopal
Meryl J Williams
Siri Gerrard
Susana Siar
Kyoko Kusakabe
Louis Lebel
Holly Hapke
Marilyn Porter
Anne Coles
Natasha Stacey
Ram Bhujel

ISSN 0116-6514

Reference:

Gopal, N., M.J. Williams, S. Gerrard, S. Siar, K. Kusakabe, L. Lebel, H. Hapke, M. Porter, A. Coles, N. Stacey and R. Bhujel. 2017. Gender in Aquaculture and Fisheries: Engendering Security in Fisheries and Aquaculture. Asian Fisheries Science (Special Issue) 30S. 423 pp.

Credits for Photos in GAF6 Collage: (left to right): Jecelyn Pastor (Philippines), Supaporn Anuchiracheeva (Thailand), Nadine Nembhard (Belize), Irna Sari (Indonesia), Susana Siar (Costa Rica).

CONTENTS

SHORT COMMUNICATIONS

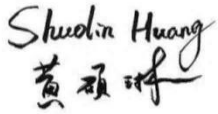
Message from the Past and Current AFS Presidents

The 11th Asian Fisheries and Aquaculture Forum, held 3-7 August, 2016 in Bangkok, Thailand, included the 6th Global Symposium on Gender in Aquaculture and Fisheries (GAF6). This was the eighth women/gender and fisheries Symposium of the Asian Fisheries Society (AFS). AFS also became the first fisheries and aquaculture professional body to move from talk to action by formally creating the new Gender in Aquaculture and Fisheries Section.

We are pleased to note that GAF6 was the largest AFS GAF event yet, and attracted the largest number of papers of any theme at 11AFAF. GAF6 continued the pattern established in GAF5 in Lucknow, India, of varied session formats suited to the topics. In this regard, we commend the new GAF 101 training workshop on gender research methodology and the student's art event.

This volume is the fourth Special Issue on gender in aquaculture and fisheries published by the Asian Fisheries Science journal. In 2012, 2014 and 2016 we published Special Issues containing papers from GAF3, GAF4 and GAF5. The papers in the present Special Issue cover gender in the Voluntary Guidelines on Small Scale Fisheries, aquaculture development, fish value chains, climate change and disasters, and in social and fish sector norms.

We congratulate the Co-editors and the authors for producing this Special Issue. A special note of thanks to Nikita Gopal, the chief editor and the head of the Programme Sub-Committee for GAF6 for providing the leadership to produce this Special Issue on gender in aquaculture and fisheries, which we are pleased to commend to you.



Shuolin Huang
Past President (2013-16)
Asian Fisheries Society

Joykrushna Jena
President (2016-19)
Asian Fisheries Society

Acknowledgements

The 6th Global Symposium on Gender and Fisheries (GAF6) was held during 3-7August 2016 in Bangkok, Thailand at the 11thAsian Fisheries and Aquaculture Forum (11AFAF). The event, the biggest yet of our gender in aquaculture and fisheries (GAF) symposia, was supported by many organisations and individuals who have helped us progress GAF issues over nearly 20 years. We wish to especially thank the Asian Fisheries Society and its Council, the Local Organising Committee of 11AFAF in Bangkok under the leadership of Dr Cherdsak Virapat, Director General of the Network of Aquaculture Centres in Asia-Pacific (NACA) for full support in the overall hosting of GAF6.

We acknowledge with gratitude our key sponsors. The AquaFish Innovation Lab of the United States was a Platinum Sponsor. Our Gold Sponsors were the Thailand Department of Fisheries and the Asian Development Bank. Our Silver Sponsors were the Network of Aquaculture Centres in Asia-Pacific and the United States Agency for International Development Oceans and Fisheries Partnership (USAID-Oceans).

The GAF6 programme was conducted in partnership with the following institutes and agencies: Asian Institute of Technology, University of the Philippines in the Visayas, Aquaculture without Frontiers, Marketing Seafood and the Southeast Asian Fisheries Development Center (SEAFDEC).

We also gratefully acknowledge the technical support of the Food and Agriculture Organization of the United Nations. Support towards the Fish Industry, Gender and Social Development Panel was provided by the French Agency for Development (Agence française de développement, AFD).

The GAF6 began with the GAF 101 half day training workshop, resulting from recommendations of previous GAF events. This workshop was attended by nearly all the presenters at GAF6. It was designed, led and delivered

by Marilyn Porter, Holly Hapke, Kyoko Kusakabe and Susana Siar. In addition to contributed papers, special theme sessions were held on: *Implementation of the gender elements of the Voluntary Guidelines on Small-Scale Fisheries; Gender in fish trade and value chains; Focus Thailand and Mekong Region: GAF in Thailand/ Mekong Region; Regional updates on gender in fisheries and aquaculture; Panel on the Fish Industry, Gender and Social Development.* Several regular sessions were also held.

A feature of GAF6 was the art competition for Thai junior and senior high school students, held on 4 August 2016. The competition was organized by the Faculty of Fisheries, Kasetsart University, the Network of Aquaculture Centres in Asia-Pacific and the USAID Oceans and Fisheries Partnership. This was a first such event for GAF and was premised on involving youth to raise awareness on gender sensitivity and advocacy.

The publication process for this Special Issue has been similar to that used in past GAF events. The patience of the authors and co-authors of the published papers and their attention to making the necessary revisions is greatly appreciated. We also gratefully acknowledged the help rendered by Prof. Mohamed Shariff, Editor of the Asian Fisheries Science journal for his guidance and suggestions in finalising the papers in this Special Issue.

This Special Issue could not have been achieved without the excellent work of our many reviewers to whom we are very grateful. They have met our schedules and accommodated us in bringing out this Special Issue.

Disclaimer

The contents of the papers and other articles of this Special Issue represent the views of their authors. They do not represent the views, position or policies of the Asian Fisheries Society or any of the other organisations acknowledged above.

Gender in Aquaculture and Fisheries: Engendering Security in Fisheries and Aquaculture
*Asian Fisheries Science Special Issue **30S** (2017): 1-30*

ISSN 0116-6514
https://doi.org/10.33997/j.afs.2017.30.S1.001

Guest Editorial: Engendering Security in Fisheries and Aquaculture

NIKITA GOPAL[1*], MERYL J WILLIAMS[2], SIRI GERRARD[3], SUSANA SIAR[4], KYOKO KUSAKABE[5], LOUIS LEBEL[6], HOLLY HAPKE[7], MARILYN PORTER[8], ANNE COLES[9], NATASHA STACEY[10] and RAM BHUJEL[11]

[1]ICAR-Central Institute of Fisheries Technology, CIFT Junction, Matsyapuri P.O., Cochin – 682 029, Kerala, India
[2]17 Agnew Street, Aspley, Queensland, 4034. Australia
[3]Center for Women and Gender Research, UiT The Arctic University of Norway, P.O.box 6050 Langenes, 9037 Tromsø, Norway
[4]Regional Office for Asia and the Pacific, Food and Agriculture Organization of the United Nations, 39 Phra Atit Road, Bangkok 10200, Thailand
[5]Gender and Development Studies, School of Environment, Resources and Development, Asian Institute of Technology, P.O. Box 4, Klong Luang, Pathumthani 12120, Thailand
[6]Unit for Social and Environmental Research, School of Public Policy, Chiang Mai University, Chiang Mair 50200, Thailand
[7]Department of Geography, Planning & Environment, Brewster Bldg A227, Mail Stop 557, East Carolina University, Greenville, NC 27858 USA.
[8]Department of Sociology, Memorial University, St. John's, Canada NL A1C 2Z1.
[9]International Gender Studies Centre, Lady Margaret Hall, Oxford University, Oxford, England.
[10]Research Institute for Environment and Livelihoods, Charles Darwin University, Darwin, Australia.
[11]Aqua-Centre (Centre for Aquaculture Development), School of Environment, Resources and Development, Asian Institute of Technology, P.O. Box 4, Klong Luang, Pathumthani 12120, Thailand

This Special Issue of Asian Fisheries Science journal comprises 25 papers and a report based on the presentations and posters of the 6th Global Symposium on Gender in Aquaculture and Fisheries (GAF6) held during the 11th Asian Fisheries and Aquaculture Forum, August 2016, Bangkok,

* Corresponding author. Email address: nikiajith@gmail.com

Thailand. GAF6 was the eighth women/gender Symposium organised by the Asian Fisheries Society (AFS). For each previous event, the proceedings or selected papers have been published (Williams et al. 2001; Williams et al. 2002; Choo et al. 2006; Choo et al. 2008, Williams et al. 2012; Gopal et al. 2014; Gopal et al. 2016).

The present Guest Editorial introduces the collection of papers and reports from GAF6 and considers its outcomes. We take the theme of GAF6 - "Engendering Security in Fisheries and Aquaculture" – literally, meaning that "engender" is to cause to exist or to develop. In terms of engendering security, we have a primary focus on the many facets of security for women: as individuals, as members of households, communities, and operating at the political level, nationally and internationally. However, we do not neglect totally the issues facing men and communities in fish value chains. Also, we ask ourselves, what gender issues are being overlooked in the current studies? As recent gender-related work of the Food and Agriculture Organization of the United Nations (FAO) and topics in GAF6 presentations and sessions resonated with each other, we briefly cover FAO gender and fisheries/aquaculture work in our Guest Editorial. Finally, we provide an overview of the Special Issue papers.

Throughout, most of the emphasis is on women's conditions and lack of gender focus in research and policies in countries outside the Organisation for Economic Co-operation and Development (OECD), although we acknowledge the need to better integrate the longer legacy of gender and fisheries research in OECD countries, such as Neis et al. (2013).

But first, we discuss the steps taken by the Asian Fisheries Society to formally establish its Gender in Aquaculture and Fisheries Section.

Gender in Aquaculture and Fisheries Section of the Asian Fisheries Section

In the Guest Editorial to our previous GAF Symposium, we reported how the informal group that had established and developed the Asian Fisheries Society's activities on women/gender in aquaculture and fisheries decided to continue the "long journey" towards gender equality and equity by creating a formal Section of the Society (Gopal et al. 2016). We are

delighted to report that the formalisation process is now well advanced. The Gender in Aquaculture and Fisheries Section (GAFS) was formally launched in January 2017 and began enrolling members. In April 2017, a set of self-nominated Inaugural Officers began establishing the basics of GAFS, leading to the election of the first full Executive Committee in September. The Inaugural Officers and the Executive Committee have led the ratification process for the Section By-Laws, developed a policy and priorities for partnerships and the Section's activities, and canvassed for revitalising the membership arrangements within the parent body, the Asian Fisheries Society. We hope that this institutionalization will visualize and make gender issues important in everyday life, research and politics so that women's and men's conditions not only in Asia, but also worldwide, will be improved.

GAFS helped sponsor two events in 2017, namely the panel session on Gender Issues in Giant Freshwater Prawn at Giant Prawn 2017 in Bangkok in March, and the GAF-India event held during the 11th Indian Fisheries and Aquaculture Forum of the Indian Branch of AFS (November 2017). GAFS also partnered with the new International Association for Women in the Seafood Industry (WSI) during its launch in August in Iceland at the World Seafood Congress 2017.

GAF6: Engendering Security in Fisheries and Aquaculture

Security (and insecurity) may arise from many different circumstances. In fisheries and aquaculture, GAF6 was most concerned with food security and nutrition, legal rights and politics, access to resources and industry opportunities, fair livelihoods, dignified work, safety within the household, and resilience in the face of natural and climate change related disasters. In engendering security, policies, practices, beliefs and norms interact.

Are current policies and practices engendering security?

Security for all parties with a stake in fisheries and aquaculture puts the spotlight on the small-scale sector and on people who labour in large operations such as fish processing factories and on fishing vessels. Human rights, including women's rights and equality politics within the fisheries and aquaculture sectors, are at the heart of security concerns. If we look at fisheries and aquaculture policies that may address the rights of people in

small-scale operations and labourers in large industrial operations, we find a patchy record.

Supporters of gender equality in fisheries laud the fact that gender equality is included in the 2014 Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines). Although this is welcome policy attention, implementing the Guidelines is the current challenge. The GAF6 session presentations on the SSF Guidelines and the case studies in Kleiber et al. (2017) showed that the legacy of history means that women are not presently active in fisheries decision-making, they are often invisible in most fisheries statistics, statistics on gender barely exist or are less developed and women's interests are excluded from national policies in countries all over the world, no matter the national record on gender equality in society. Many of the current national fisheries policies are based on early global fisheries instruments, such as the Code of Conduct for Responsible Fisheries, which were silent on gender equality (FAO 2012). Non-government organisations and women's groups advocating for inclusion, nevertheless, has resulted in women being recognised in some national fisheries policies. Yet even in these cases, financial resources may not be allocated, and/or expertise not available to address the needs, for example in Lao PDR fisheries and aquaculture (GAF6 report, this volume)

In the case of engendering security for labourers in larger fisheries operations, policy action tends to come from international bodies such as the United Nations International Labour Organization (ILO) and the United Nations Industrial Development Organization (UNIDO) which have taken actions on labour laws. Although relevant, fish sector companies rarely heed the requirements of other international policy instruments such as CEDAW (the 1979 Convention on the Elimination of all Forms of Discrimination Against Women), unless they are specifically implemented in national laws made explicit for industry.

In many non-OECD countries, women are the majority of workers in fish processing factories and will benefit if the ILO and UNIDO (and CEDAW) policies are adopted in national labour laws, for example, see Nuruzzaman and Uddin (this volume) for occupational safety and health

issues in Bangladesh shrimp processing. Often, progress is slow, for example when the companies give priority to other imperatives such as reducing costs and meeting export standards. Even where the basic instruments for worker safety are specified, such as the ILO C188 Work in Fishing Convention, 2007 (ratified in 2016), workers may not be covered if they are working in insecure jobs at piece rates or on short contracts.

Formal recognition of women in fisheries policy has been a long time coming. Despite 40-50 years of research and development work on women and gender in fisheries covering many countries, the FAO Small-Scale Fisheries Guidelines (2104) have become the first global fisheries instrument to make women's situations and challenges more visible and also given the opportunity for new tools to improve their conditions. In other policy arenas, such as climate change adaptation (Williams et al. in press), fish product certification, and aquaculture, much more is needed to achieve even this level of visibility. For example, virtually all aquaculture policies lack gender equality provisions, so a necessary first step should be advocacy to persuade the best practice, product certification bodies, and NGOs to include gender equality provisions. Beyond advocacy, early trials indicate that suitable tools are needed to address gender. In shrimp aquaculture, Peters et al. (2016), examined the still weak progress in considering gender in shrimp aquaculture enterprises. Oxfam's Gender Transformative and Responsible Agribusiness Investments in South East Asia (GRAISEA) program tested gender transformative approaches in Indonesia and Vietnam using participatory social impact assessment. In the tests, this assessment tool, already used in Aquaculture Stewardship Council (ASC) certification, was considered underdeveloped with respect to gender and gender action learning was added to augment the tool.

The 15-year global policy framework of the Sustainable Development Goals (SDGs), agreed in 2015, was designed to end poverty, protect the environment, and ensure prosperity for all. It was designed for use in government, the private sector and civil society agencies and in communities. In a recent issue of *Yemaya*, Kusakabe (2017) and Williams (2017) argued that the SDGs should receive greater attention in fisheries and aquaculture, especially SDG 5 - *"achieve gender equality and empower all women and girls."* Is this an early sign that SDG 5 is not penetrating

fisheries policy and that progress will be difficult? At present, most of the attention from agencies concerned with fisheries and aquaculture is on SDG 14 – "*conserve and sustainably use the oceans, seas and marine resources for sustainable development.*"

Recent evaluations of gender in major research, development and environment funding institutions revealed the long and hard road for gender and gender equity. Each evaluation concluded that, while some progress had been made in mainstreaming gender, progress was slow and major challenges remained (Independent Evaluation Office of the Global Environment Facility 2017; Independent Evaluation Department Asian Development Bank 2017; CGIAR-Independent Evaluation Arrangement 2017).

Securing fair livelihoods in fish value chains

Definitions are powerful in that they can include or exclude women as legitimate participants and stakeholders in the fish sectors. Policy within aquaculture and fisheries tends to focus exclusively or predominantly on production, rather than the entire value chain. Hence, since women are more concentrated in post-harvest and service activities, they are often excluded from consideration. Not counted in official statistics, women's contributions to food security, nutrition, livelihoods, and foreign exchange are not recognized. Using a fish value chain approach has started revealing women's dependence on the fish sectors from harvesting/farming through to post-harvest processing and marketing. More studies use the fish value chain approach, and these studies are showing that although women are able to make a living from the fish sector, they lack access to social security, health, decent work, and official recognition, and they have lower incomes than men, or their labour is considered as part of family labour, and is not compensated. In a few instances, such as the women traders in General Santos tuna markets, Philippines (Raymundo Pavo, this volume) and the women mollusc collectors in Costa Rica (GAF6 report, this volume), women have successfully challenged existing taboos, established their own spaces and rights.

Lack of sex-disaggregated and reliable statistics in most countries is a big challenge for the realization of women's empowerment and gender

equality in the fish sectors. Without knowing how many and where women are in the fish value chain, and the conditions they face, women's contribution will continue to be unrecognized, and, as well, monitoring and evaluating the impact of actions and interventions will be difficult. This is slowly changing with the inclusion of sex-disaggregated statistics for a few countries in The State of the World Fisheries and Aquaculture 2016 report (FAO, 2016a). However, even beyond the challenges of statistics, much more needs to be done to secure fair livelihoods for women in fish value chains. We need to understand where and why in the fish value chain inequalities exist. This also means challenging the pervasive notion that women are best suited for low-paid processing and other low-paid postharvest work because they have nimble fingers and engage naturally in such work as an extension of their household responsibilities.

Climate change and the forces of change in coastal communities

Guidance on gender equality is given in the United Nations Framework Convention on Climate Change. "Gender equality" is Guiding Element (e) in the "Guidelines for the preparation of national adaptation programmes of action" (UNFCCC 2001) but it is weakly developed (Williams et al. in press). In climate change adaptation in fisheries and aquaculture, gender is almost always ignored, e.g., in fisheries vulnerability assessments, while the discourse focuses on technical and biophysical aspects that appear to necessitate technical solutions. Based on evidence from papers on gender and climate change and/or in natural disasters in AFS GAF publications, Williams et al. (in press) found that social and fisheries sector norms frustrate gender-sensitive climate change responses. Further, action is constrained by poor data and the low level of knowledge of gender divides in the economy and society. Often, women are assumed to be vulnerable and their agency is ignored; alternatively, women are portrayed as virtuous and expected to shoulder additional adaptation responsibilities. Neither version of women's roles leads to appropriate actions. Instead, using a gender lens in vulnerability and other assessments will expose issues that were otherwise ignored, permitting better targeted actions and highlighting new options. Williams et al. (in press) found that gender-blind adaptation risked intensifying existing gender inequalities. Gender-sensitive research also demonstrated, again, the importance of looking at the whole fish value

chain, and diversifying livelihoods as a strategy to help communities cope with disasters and declining resources.

The results of vulnerability assessments are used in setting priorities for National Adaptation Plans (NAPs), including sectoral plans and adaptation projects. If they incorporate gender indicators, the results can be used to inform gender budgets for adaptation. Gender priorities, however, must not focus only on women in isolation, but also include the complexity of gender roles and relations. Fisheries and aquaculture institutions must be transformed if they are to have the capacity to integrate gender into climate adaptation. Staff will require education in basic gender equality concepts, and institutions should hire gender experts and encourage internal gender champions.

Realising security will require the transformation of sector and social norms

Social and fish sectoral norms present major constraints to secure rights and livelihoods for women in fish value chains, despite some interventions seeking to empower women. Because women's roles in fisheries and aquaculture activities are overlooked or under-appreciated, their livelihood needs are often ignored also or they are completely excluded from development assistance programs. Women-headed households are rendered particularly vulnerable to economic dislocations when markets shift, natural disasters strike and resources decline because, in addition to exclusion, they often lack access to assets such as land, credit and technologies to mitigate the impacts. Despite the important role women play in ensuring household food security and successful adaptation to ecological disruptions, gender norms and ideologies within the family, workplace and society constrain women's activities and access to economic opportunities, and thereby limit their livelihood options and security. As several studies presented at GAF6 revealed, in many societies, male family members control women's activities and restrict them from working outside the home or participating in fisheries and aquaculture projects. When women are allowed to work, they are relegated to the most marginalized positions, and they experience discrimination and harassment in the workplace with few rights and protections from the State.

Considerable debate has ensued about how to best advance women's needs and transform gender norms and relations. Can women-only organisations by themselves successfully challenge and transform prevailing dynamics? Or, must gender transformative processes engage both men and women? If the former, what kinds of support do women's organisations require? If men are to be engaged in gender transformative processes, how might this best be accomplished? While some studies suggest that women's organisations, if properly supported, can accomplish much to advance women's economic interests, others reveal that social and cultural change within the sector requires the engagement of both men and women. Although more research is needed to deepen understanding of best practices for promoting women's empowerment, it is evident that real progress in securing gender equality in fisheries and aquaculture will not be achieved unless gender norms are transformed.

FAO's gender activities

The Food and Agricultural Organization of the United Nations (FAO) continues to gradually increase its attention to women's empowerment/gender equality in fisheries and aquaculture. It is improving data on gender in fisheries and aquaculture statistics (Jennifer Gee and Kathrin Bacher, present volume), producing high quality knowledge products and undertaking, with partners, key field activities. We highlight three recent sets of products and activities: a fact sheet, the SSF Guidelines handbook, and studies on women in aquaculture supply chains in Bangladesh and Indonesia.

In the first product, FAO consolidated nearly 20 years of its own knowledge and experience on women and gender equality work in fisheries in a fact sheet "Promoting gender equality and women's empowerment in fisheries and aquaculture" (FAO 2016b). The fact sheet provided advice to policy makers on how to integrate gender into fisheries projects, gave examples of gender-sensitive indicators, and highlighted lessons FAO had learned.

Second, in order to support the implementation of the SSF Guidelines, FAO published "Towards gender-equitable small-scale fisheries governance and development. A handbook" (FAO 2017a), which was

informed by an online survey, two regional workshops and an expert workshop (Correa 2017). In leading the preparation of the handbook, FAO drew on the International Collective in Support of Fishworkers (ICSF) which had been a key partner during the consultations for the SSF Guidelines. FAO is carrying out a series of national workshops, namely in Tunisia, Ghana, Burkina Faso and Cote d'Ivoire, to raise awareness about the SSF Guidelines and empower people to use them as a tool to improve, in particular, women's social and working conditions, as well as their post-harvest, marketing and trade activities.

In the third example, FAO led the "Women's empowerment in aquaculture production systems in Asia: Comparative case studies and synthesis from Bangladesh and Indonesia," as part of the Blue Growth Regional Initiative for Asia and the Pacific. The case studies also comprised part of the CGIAR Research Program on Fish Agrifood Systems (FISH). Results from these studies were presented at GAF6 and have since been published through FAO and WorldFish (FAO and WorldFish 2017; FAO 2017b; Sari et al. 2017). In Bangladesh, the case studies were on homestead pond aquaculture production systems (in 3 districts) and shrimp processing factories in several locations (Choudhury and McDougall 2016). In Indonesia, the studies covered small-scale shrimp farming and homestead-based milkfish processing (Sari et al. 2017). Women's involvement in aquaculture suffered from the structures of prevailing societal and household norms, but brought positive outcomes such as greater financial freedom, and negative outcomes such as greater daily workload. The studies also provided insights to overcoming the barriers through connecting interventions in multifaceted approaches.

Which gender issues are not getting attention?

The most acclaimed fishery and aquaculture research often lacks a gender focus. This is also the research that is published in the most highly cited journals. Studies and projects on women/gender equality in fisheries and aquaculture are very poorly funded, and many of those presented at GAF6 and published in this Special Issue were conducted in the course of other studies and/or on small budgets. Public calls for project proposals on our theme are rare. What topics, therefore, are being overlooked or ignored

as a result of the *ad hoc* nature of the field? We propose seven topics that may be neglected but emerging. The Gender in Aquaculture and Fisheries Section of the AFS could help generate greater interest in these topics.

The first is domestic violence or violence against women (VAW) in fishing communities (e.g., Hoang et al. 2013). Domestic violence is not just an issue in stressed communities, although it may be a particular hazard in such circumstances. The issue of VAW is largely ignored throughout the sector and the mainstream focus on VAW doesn't seem to recognise the particular issues for women in fishing and fishing communities. The structural violence that leads to men controlling much of the capital and women into *status quo* or even to poverty also is important.

Second, fish processing in general needs more attention. Women's and men's roles are often described, but quantifying the extent of fish processing as well as how much this contributes to food security, surprisingly, is not well documented. Trends in the general industrial economy also emerge in fish value chains. For example, in OECD and some non-OECD countries, labour agencies hire migrant workers, creating different working conditions for migrant and local workers, whose union-negotiated rights may be threatened.

Third, changes in fishing communities caused by declining fish catches, coastal degradation, and river modification need attention. What can women and men in fishing communities do? What are the coping mechanisms or alternative livelihoods that they can pursue, including migration, and how does this impact the households and communities? Another dimension that has been noted and merits greater attention is the link between women and small fish. In depleted fisheries resources, small fish, juveniles of larger species and small fish species, predominate and many of these are the domain of women traders. Fisheries conservation aims to protect small and juvenile fish, advantaging the larger traders who are usually men. Conservation biologists, however, are starting to recognise the gender aspect of these strategies (McClanahan and Abunge 2017),

Fourth, the gender implications of the relations between fishing and agriculture or aquaculture are very complex, since, depending on the location, women's roles differ. Within a community, fishing and

agriculture/aquaculture may conflict over water use or sea territory use. In specialised discourse on water conflict between agriculture and fishing/aquaculture, women's roles and needs in these sectors can be ignored. For example, women might fish in paddy fields and small canals, which would benefit from water diverted to agriculture rather than being kept in large reservoirs.

Fifth, the impacts of women's success in technology adoption on intra-family conflict and household asset ownership merits greater exploration. This issue is particularly central to the development of aquaculture and women's participation. The simple assumption that women-focused projects will, if successful, naturally lead to greater women's empowerment and economic status is more complex in reality. For example, in Bangladesh, Scarborough et al. (2017) found that fish polyculture introduced through women-only groups was associated with an increase in the gender asset gap rather than a narrowing.

Sixth, and the most challenging of all, is the question posed above: how to advance women's needs and transform gender norms and relations? Recognizing that gender norms are deeply held and that even well targeted gender interventions may fail to deliver genuine gender equality and social change, many have proposed the need for "gender transformative change." The pathways to such change are far from clear.

Seventh, today's global fisheries need a focus where the conditions in the OECD and non-OECD countries may be studied in relation to each other. However, with a few exceptions such as the Too Big to Ignore project, research with a focus on such global processes and their effects on gender relations and women's and men's conditions are lacking and seem to be very difficult to organize and achieve.

We also ask what happens to well qualified women after gaining their academic degrees in fishery and aquaculture sciences. Do they get the same opportunities as their male colleagues, for example, in publishing as discussed by Morgan Chow and colleagues in this volume, and to what degree do they manage to promote gender issues and interests in their jobs?

The Special Issue

The papers in this Special Issue addressed four main themes in engendering security in fisheries and aquaculture. The first was whether current policies and practices were engendering security; second, why women were not better positioned in aquaculture; third, fair livelihoods in fish value chains; and fourth, climate change and the forces of change in coastal communities.

Current policies and practices for engendering security

A lack of gender-disaggregated data for the fisheries and aquaculture sectors has long hampered efforts to fully understand women and men's roles in these two sectors. As a result, women have often been invisible to policy makers, and the failure to consider women's roles and gender-specific constraints on improving fisheries and aquaculture productivity has resulted in massive losses in both sectors in terms of production, household food security and income (Dey de Pryck 2013). In "Engendering Statistics for Fisheries and Aquaculture," Jennifer Gee and Kathrin Bacher report that gender reporting on fisheries employment statistics is slowly improving. In 2016, FAO, for the first time, released a selection of sex-disaggregated statistics for employment in aquaculture and fisheries. These statistics revealed that women play an active and important role in the secondary sectors of aquaculture and fisheries. Women are found in all positions and roles and make up on average half - and in some cases, up to ninety percent - of the workforce in processing (FAO 2016a). Significant differences, however, characterize women and men's work in these sectors. Whereas most men are full-time employees in the fishery sector, the majority of women work part-time or on an occasional basis. Women may also be more engaged in small-scale or subsistence fishing or aquaculture, splitting their time between work and their family obligations. Understanding the implications of such differences is necessary to formulate good policy. One of the major challenges, however, is that gender reporting on employment in fisheries and aquaculture varies substantially between countries and regions. At present only 30 % of the countries reporting data to FAO collect gender-disaggregated data. Yet, as Gee and Bacher argue, informed policy making depends on high quality information. If gender-mainstreaming efforts to

foster the capacity of women in fisheries and aquaculture communities are to be successful, a strong foundation of gender-disaggregated data is required.

Resource sustainability is paramount in securing the future of fisheries and those who depend on fish value chains. As exploitation has long run ahead of resource replenishment, the race to protect resources has become urgent, often causing severe and sudden restrictions on current fishers, such as that which has happened in Thailand as a result of the European Union's yellow card issued for not taking sufficient action against illegal fishing. Khamnuan Kheuntha's paper, "When a Fisherman Can Not Fish: Impact of the 2016 Legal Reform on Male Fishermen in Phan Thai Norasing Fishing Community, Samut Sakhon Province," provides a detailed assessment of the local impacts on men and women. In Phan Thai Norasing village, the local coastal fishermen's masculinity has been built on their identification as independent, self-managed breadwinners, catching fish and krill (Sergestid shrimp for shrimp paste made by the women) at sea and supporting their families on the income won, despite the vagaries of the weather and catches. In 2015, the Thai government's reaction to the yellow card resulted in major, enforced legal reforms, including a strict ban on push nets traditionally used by these fishermen. With their previous fishing impeded, the way men perceived themselves changed and the restrictions caused them and the women in their households to adapt their fishing strategies. The women helped the men maintain their masculine role as fishermen, albeit operating on the margins of legality, at the expense of their own exhaustion from the extra burdens, such as maintaining a night time lookout for approaching fisheries officers.

In a study carried out in Central Philippines, Liberty Espectato and colleagues found women were more aware of Marine Protected Areas (MPA) than men. Women were slightly more likely than men to value the sea as a source of food and livelihood, were more knowledgeable about MPA rules and regulations, and were more likely to believe marine resources should be managed sustainably for future generations. The authors suggest that this makes women a good target for social marketing programs aimed at improving resource management; but they also warn care needs to be taken not to multiply women's burdens.

Why are women not better positioned in aquaculture?

Eleven papers are concerned with aquaculture, representing an increased interest in gender studies in aquaculture compared to our previous conferences and proceedings. As aquaculture has burgeoned, however, women have not secured equal places with men. A common assumption is that modern aquaculture does not carry the same historical gender roles as fisheries. This assumption does not withstand scrutiny. Aquaculture's gender roles and relationships mirror the same patterns of ownership, rights and power as in the general economy. Women typically function in small-scale, near-home, low technology aquaculture, or in lowly paid jobs in industrial operations. Often, these places for women are accepted by women themselves as normal. Notwithstanding the greater opportunities that women and their societies could obtain from aquaculture, through their own agency and with expert help from research institutes, NGOs and development agencies, even small-scale household aquaculture can fulfil important subsistence roles and satisfy multiple security needs, especially food security and nutrition.

Ayesha Siddiqa and colleagues' paper "Women's participation in aquaculture in southwest Bangladesh" reported on women's participation in aquaculture in rural households in the districts of Khulna, Sathkhira and Bagerhat under a USAID supported AIN (Aquaculture for Income and Nutrition) Project of WorldFish. The project surveyed 450 households, 50 % of which were assisted under the project. In 74 % of the households, women participated in aquaculture. Women's participation varied by aquaculture type: in homestead-based aquaculture, women's participation was highest (89 %); in commercial fish culture, 69 %; and in commercial shrimp culture 36 %. The survey found that increased awareness and better capacity building initiatives were important in increasing women's participation in the aquaculture activities

The direct link between the uptake of aquaculture and the food and nutritional security of farmers is usually assumed rather than examined. In southwest Bangladesh, Shahroz Mahean Haque and her colleagues studied the benefits of mud crab (*Scylla serrata*) fattening and culture ("Improving

the livelihood for marginalized women households in southwest Bangladesh through aquaculture"), where nearly 40 % of the facilities were owned and operated by women. Notwithstanding the high value of their products, a baseline survey in the Satkhira, Khulna, and Bagerhat regions revealed that most of the mud crab farmers had only 5 years average schooling and were consuming poor diets low in animal protein. An intervention that integrated tilapia into mud crab culture tested traditional mud crab fattening and mud crab and tilapia stocking and culture, using mixed sex tilapia. The intervention was also accompanied by nutritional education. Half of the tilapia farmers sold their tilapia in the market and the others used the tilapia for direct household consumption. In both test groups, small tilapia were fed to the mud crabs to reduce reliance on wild-caught trash fish as feed. The tilapia-mud crab fattening system produced greater overall production of mud crabs and increased the nutrient-rich foods for the farmer's households. Overall, the integration of tilapia provided a more sustainable method for growing mud crab while also enhancing the livelihoods and nutrition of farmers. This study showed that simple links between aquaculture production and household benefits should not be assumed.

In many countries, ornamental fish farming is considered a suitable option for women's fish farming. Bharat Yadav and Arpita Sharma's paper, "Gender roles analysis of ornamental fish enterprises in Maharashtra State, India," examined the Rainbow Revolution scheme that was launched in 2007, benefiting 305 men and women. The authors interviewed people on 30 farms in their study of gender role profiles of the ornamental fish producers to understand the differences between men and women's access to and control over resources for ornamental fish farming in the northern coastal Maharashtra districts of Thane and Mumbai. Men spent significantly twice as much time in the ornamental unit (8 hrs.day^{-1} average) compared to women (4 hrs.day^{-1} average). Of the 30 farms, 22 were owned by men and 8 by women, and men had higher access to and control over resources. The prevailing social hierarchy, demographic factors, and the access to special training on ornamental fisheries were the major factors influencing who took up ornamental fish farming. The authors suggested that women's roles could be improved by targeting women to increase their ownership and provide training programmes to make the enterprises more equitable and sustainable.

Alice Ferrer and colleagues paper, "Participation, roles, and attitude towards mariculture operation among men and women in mariculture areas in the Philippines," is based on a survey of 785 households, 48 focus group discussions and 138 key informant interviews in seven mariculture areas – three in Luzon, two in Visayas and two in Mindanao. The study described the gender division of labour in mariculture and found that, although men take up a large chunk of mariculture work, women also take part, but women's contribution is often unpaid and under-recognized. Even when women feed fish while men fish, women's work is not paid while men's is. Women find their opportunity cost of getting involved in mariculture high because it is time consuming. Mariculture requires visits to cages and pens in a boat and this demands concentrated time, which women do not have with their high workload in attending to household needs. Although women are willing to participate in mariculture many obstacles impede them in doing so.

Alita Roxas and colleagues studied the milkfish value chain in the Balingasag Mariculture Park in Misamis Oriental, Philippines, and found that few women were operating fish cages in the medium to big categories, and only men could formally become livelihood beneficiaries in the small-scale category, although their wives worked with them in the group operations. Hired workers in the medium to big fish cage operations were dominated by men, whereas in the small-scale operation, the wife and male children helped in the grow-out period. Trading and brokering was dominated by men, who sold the fish to wholesalers and retailers who were mainly women. The analysis showed that men captured most of the value addition created along the chain. To increase women's participation in fish cage operations, the Bureau of Fisheries and Aquatic Resources built a processing plant and trained women to produce frozen and deboned milkfish for supermarkets and institutional buyers. However, because of the low volume of processing, no regular supervision was given and the women were unable to comply with food safety and other requirements.

Reynold Tan studied consumer acceptance of aquaculture products in the Philippine marketplace ("Comparing awareness and behaviour towards food consumption trends: Gender differences among milkfish, *Chanos chanos* (Forsskål 1775) purchase decision makers in the Province of Iloilo,

Philippines"). He compared awareness and behaviour of milkfish purchasers in Iloilo with respect to consumer trends such as food safety, organic food, sustainability in production, good agricultural practices, traceability, local production, support to local farmers and food labels. Consumers in five municipalities and one highly urbanized city were surveyed. On awareness, except for food safety, no significant differences were found between male and female purchasers for the eight consumption trends. On whether purchase behaviour conformed to food consumption trend awareness, however, a statistically significant difference was found between women and men for all eight food consumption trends. Different behaviours were greatest on the issue of food safety, with males having an average of 5.9 (true of me) vis-à-vis 5.2 for females (somewhat true of me).

In Nepal, women play active roles in adopting and promoting small-scale aquaculture. As aquaculture has been effective in improving family nutrition and also generating good income, more people, especially women and their groups, are attracted towards it. But in Nepal suitable land for aquaculture is limited. Therefore, Madhav Shrestha and his colleagues made efforts to utilize unused riverbanks of the foothill areas ("Women in riverbed aquaculture for livelihoods in foothills of Nepal"). According to them, construction of stronger and higher dikes on the riverside helped farmers to control the flood. Farmers also grew fruits, pulses and vegetables on the dikes and generated attractive income. Recently, with project support, 53 families constructed 90 such ponds. The project also provided training to the marginalized ethnic women who were able to produce 82 kg.family^{-1} of fish on an average, which is substantial in a country where per capita consumption of fish is only about 2 kg.capita^{-1}.year^{-1}. There are many rivers and unused riverbeds where construction of fishponds could create new opportunities.

In Nepal, most small-scale fish farmers including the afore-mentioned project farmers feed their fish rice bran mixed with mustard oilcake. As nutrients are not adequate, fish grow slowly. Manufactured feeds are neither cheap nor of good quality. Realizing this constraint, Sunila Rai and her colleagues ("Involving women in field-testing of periphyton enhanced aquaculture system for nutrition security") have tried to explore

alternatives, such as growing periphyton on bamboo sticks in the pond itself. They conducted a participatory trial involving 37 women organized in two cooperative groups. In addition to the major carps, they also stocked small indigenous fish, often considered as unwanted weed fish. Results were encouraging: 50 % reduction in feed cost, 22 % more fish production, and 2 times higher gross margin. Fish farmers could easily apply the idea.

These two case studies from Nepal serve as examples of how women can be empowered to overcome specific problems and help promote aquaculture and make it sustainable using indigenous knowledge, e.g., growing small fish with the carps, and locally available resources.

In seaweed farming in some locations, women are major participants, even leaders, but official statistics often fail to record this, such as in Nusa Tenggara Timur Province (NTT), Indonesia, according to Ria Fitriana ("Gender's participation in seaweed production - examples from Indonesia"). Her study in three districts (Alor, Rote, and Kupang) that are indicative of NTT seaweed, used a value chain analysis. Across socio-economic classes and different ethnic groups, her study showed that men and women contributed similar amounts of labour to most processes in seaweed production. To improve production and quality, both women and men farmers needed enhanced skills in reducing post-harvest losses.

Imelda Joseph and A. Gopalakrishnan studied the impact of cage fish culture on household livelihoods ("Cage farming headed for equal opportunity in aquaculture development in Kerala, India"), focusing on the Pizhala area of Kadamakudy Panchayat in Ernakulam district, Kerala. The Indian Council of Agricultural Research-CMFRI (Central Marine Fisheries Research Institute) and the Kerala State Fisheries Department disseminated technologies in a village which is presently dominated by capture fisheries. Before the farming intervention, women were trained in cage farming, along with men and youth of the village, through an awareness-raising programme. Cage farming has opened up a better avenue for the development of aquaculture, as well as social benefit and equal opportunity, supporting similar previous results in nearby areas.

Morgan Chow, Hillary Egna and Jevin West report on the first preliminary gendered analysis of authorship of peer reviewed aquaculture publications in the JSTOR Corpus database archive comprising approximately 2 million papers (1913-2016) ("Towards assessing gender authorship in aquaculture publications"). The aquaculture industry has grown considerably in the last 3 decades, and approximately half of the papers on aquaculture have been published since 1990. The results of the analysis show gender disparity in scholarship. As is common across fisheries and other natural and social sciences globally, women remain underrepresented as authors in the aquaculture discipline. Women represent 16 % of aquaculture paper authorship across all positions (e.g. first, middle, last author) with 11 % of women representing single authored papers since 1990. The possible reasons for this are discussed in the study, including such factors as lower levels of training and participation in active publication by women in the aquaculture discipline. Low publication numbers have flow-on effects which ultimately can impact on the ability of women to gain promotion and secure employment in academia. These figures also are not consistent with the reported number of women working in aquaculture research. The paper identifies areas for further research to calibrate the publications data to the number of women graduates and active researchers over time, and compare the aquaculture data with those in related disciplines to obtain a clearer and more complete picture on scholarship by women and men in fisheries and aquaculture.

Seeking fair livelihoods in fish value chains

Gender equality is one of the bases of fair livelihoods. In her Extended Abstract, "Women in the seafood industry: Different countries, diverse level of knowledge and awareness," Marie Christine Monfort summarized her seafood industry study (Monfort 2015) carried out in Croatia, Egypt, France, Iceland, India and Senegal. The knowledge of women's participation, gender-based roles and power distribution, awareness of inequalities and barriers against women, and correctives measures and initiatives is incomplete and variable across countries and industry sectors. The quality of data was not linked to the countries' levels of economic development. India and Senegal, for example, had among the better records, perhaps resulting partly from efforts supported by gender sensitive

development aid agencies. In economically more developed countries such as France, however, the knowledge of the participation of women in the seafood industry was “dramatically poor.”

Myra Iguban and Alice Ferrer from the University of the Philippines Visayas focused their attention on the different (and unequal) roles that men and women play in the important local Sergestid shrimp industry (“Roles of men and women in Sergestid shrimp (*Acetes spp.)* value chain in Oton and Tigbauan, Iloilo Province, Philippines”). The authors provide a detailed account of exactly how this fishery is conducted including all the tasks involved, rather than simply describing the capture phase. Using a variety of methods, the team explored and described how all the tasks associated with the shrimp fishery were broken down by gender, as well as other variables. While the division of labour by sex was less extreme than in other fisheries, men still dominated the capture segment, while women were predominate in processing and trading activities. The paper insists that we take a broad view of ‘fishing’ to include the other vital parts of the process and thus give women’s roles their true importance and value.

In small scale coastal fisheries, such as those in the Philippines, post-harvest processing is dominated by the work of women, and yet gendered divisions of labour and needs have received little attention. Encarnacion Emilia Yap and her colleagues proposed a comprehensive approach to technology transfer in such situations (“A model for gender-based post-harvest fisheries technology transfer initiatives in the Philippines”). They sought a new intervention model that could furnish responsible livelihoods and capacitate women. Their study started from a rapid assessment of fisheries resource and coastal community needs to create the basis for skill training modules for the women of Carles, a coastal town in northern Iloilo, Philippines. They assessed the status of the coastal resources, the roles women and men played in the community, opportunities and constraints for alternative livelihoods activities and the practicality of a gender-based post-harvest fisheries model for technology transfer projects to improve the women’s economic conditions. Early uptake and impact evaluations were positive.

Despite such innovative efforts, in the Philippines coastal barangays (villages) often have high levels of food insecurity and undernourishment, according to Feljean Cagape and his co-authors in their Extended Abstract "Food security practices of 4Ps women in urban coastal areas of Iloilo City, Philippines". The 4Ps programme was the *Pantawid Pamilyang Pilipino Program* or Bridging Program for the Filipino Family. Noting that poor nutritional outcomes may have complex causes, the authors studied women in coastal barangays and found they were basically food consumers, buying daily food from local eateries (*carinderias*), and risking their health from less nutritious prepared meals. The women's food security roles were limited to purchasing, budgeting, and cooking once a day. *Carinderias* were abundant and food production space, e.g., for gardening, was limited. The authors recommended enhancing the women's fish vending and processing, such as setting up a common market for the fish vending and related activities. Further, women and men could be educated in better meal planning and advance budgeting to lessen their reliance on expensive and unhealthy food, and government agencies could provide support for gardening and financing the food and nutrition security activities.

This Special Issue has two papers, of a contrasting nature, that address the post-harvest segment of the value chain in industrial scale fisheries. Typically, gender/women receive little attention in this segment of the value chain. One paper addressed the health and safety of workers in shrimp processing in Bangladesh, and the other women in the Philippine tuna landing port of General Santos.

Mohammad Nuruzzam and Mohammed Helal Uddin's paper, "Occupational safety and health (OSH) risks for the female workers engaged in the shrimp processing industry in Bangladesh," is a welcome addition to this Special Issue as too few studies have been published on this topic. The authors contend that OSH risks are emergent issues for female workers in the Bangladesh shrimp processing industry. Following several serious accidents in the Bangladesh garment industry, the Bangladesh government, United Nations Industrial Development Organization (UNIDO), International Labour Organization (ILO) and the local shrimp factory owners have taken the issues seriously. The authors found that since shrimp were handled in

cold conditions on the ground floors of, usually, two-storied buildings, shrimp processing was less risky in terms of fire and building safety. But, in such cold, damp conditions without good clothing and protection equipment, workers risked health problems and diseases such as colds, coughs, asthma, backache and musculo-skeletal pains. Other OSH risks included faults in the electric lines to processing machines, high sound levels that can impair hearing, and vibrating machines. Risks of explosion and toxic gas leaks from compressors and ammonia gas cylinders were high and could cause breathing ailments or even kill. Female workers suffered more than their male counterparts from several illnesses and occupational diseases and also suffered lower wages and less leave and privileges. Since the majority of the shrimp processing workers were female, OSH risks need additional monitoring.

Raymundo Pavo and Larry Digal's ethnographic study, "Women's space in the fish Port Tambler Complex and the value-chain nodes of the fishing industry in General Santos City, Philippines," investigated the points of convergence with and divergence from the value-chain nodes of the tuna fishing industry. The General Santos City tuna industry supports at least 42,000 jobs but women fill few of these whereas male workers dominate. Using the concept of social spaces, the study showed that women occupied spaces in the fish port complex, demonstrating their agency and capacities by earning income, as friends to fellow workers, and as allies in the fish marketing processes. Their spaces were marginal, however, compared to those of the men, and these spaces did not interface fully with the tuna value chain nodes. Nevertheless, the women did not consider themselves as marginalised. They expressed hope for better livelihood opportunities. With enhanced capacities, the women could see beyond their current spaces and situations in the fish port complex and more critically evaluate their opportunities.

Climate change and the forces of change in coastal communities

Marieta Banez Sumagaysay makes a plea for a full understanding of the Water-Energy-Food nexus in coping with the effects of climate change on women's fish drying activities. She studied the coastal village of

Duljuganin in an area of particularly high vulnerability in the Phillippines, a country already high on the Climate Risk Index. Here, women's fish drying was vulnerable to variations in expected sunshine and the costs of non-solar energy, as well as increasing difficulties in accessing sufficient water for cleaning and preparing the fish. More erratic drought and flood both adversely affected supplies from local wells. Human factors were also involved. Locally there was also competing pressure on the wells for domestic use. Meanwhile, from beyond the local municipality, the demand for dried fish was increasing, due to a larger population with increased purchasing power. The demand was facilitated also by improvements in packaging. The women, therefore, had opportunities to increase their incomes by increasing production and engaging with this expanding market. The fish drying process is described in useful detail, emphasizing the women's vigilance and the commitment required to cope with increasingly variable day to day fluctuations in weather conditions. Climate change is thus actively affecting the process, although the women themselves seemed to have an inadequate understanding of the intricate interrelationships involved in the Water-Energy-Food nexus. The author recommends training both for the women fish driers themselves and for the other 'players', the professional and administrative bodies concerned.

Mary Barby P. Badayos-Jover, in her paper "Security in adversity: coastal women's agency in the aftermath of Haiyan" described a case of a coastal village in Bayas, Philippines, after the 2013 typhoon Haiyan. Women in villages were disappointed because post-disaster assistance tended to target men's needs, e.g., providing boats, and neglected women's needs. Women came together and formed groups for squid processing as well as for financial support through mobilizing external assistance. Such women's agency transformed gender norms and created a space where women articulated their needs.

B. Shanthi and colleagues used the socio-economic and gender analysis approach to look at the changes experienced by men and women after the 2004 tsunami in coastal villages in Tamil Nadu, South India. Fish marketing was important for women during the pre- and post- tsunami periods. Post-tsunami, many women engaged in aquaculture activities and

participated in the National Rural Employment Guarantee Act Programme, which is a 100 days rural employment scheme. Men fished regularly prior to the tsunami; however, after the tsunami they experienced poor catches and had to travel long distances to fish. The fishing villages also experienced seawater intrusion into freshwater ponds and drinking water. The study found that women's workloads increased because of their participation in the new livelihoods activities and men's migration to cities to look for work. There were also changes in decision-making within the households, in which women had to make decisions by themselves, whereas before most decisions were made jointly with their husbands. After the tsunami, participation in women's self-help groups increased because men encouraged women's membership due to the benefits that were available to members.

Sun-Ae Ii studied the impacts on fishing livelihoods of men and women fishers in J Village, Simpo Harbour, Gimje City, South Korea. The fishers' livelihoods were removed by the Saemangeum Seawall Project, a major land reclamation scheme that began construction in 1991 and is ongoing. The highest project priority was economic development, but the environmental reconstruction removed the basic fishing and shellfish livelihood rights of women and men fishers. The fishers were compensated, but not sufficiently for their future needs. Assistance was not given to help them create new livelihoods, leaving many fishers with meagre incomes. The number of people living in J village declined and those who remained became more dependent on farm labouring. Strains developed within the community, damaging the cultural cohesion in J Village. The impacts of the reclamation differed between women and men, and on people of different ages. Although public conflict and controversy accompanied the Saemangeum Project from its conception, most were concerned with environmental issues. Within organisations representing the fishers, members' views were not united and the organisations lacked the capacity to represent the fishers' concerns.

Climate risk is pervasive. In the Extended Abstract reviewing several of their recent studies, "Gender and Emotions in the Appraisal and Management of Climate-Related Risks in Inland Aquaculture," Louis Lebel and Phimphakan Lebel reported that fish cage farmers growing tilapia in

rivers in northern Thailand faced climate-related risks such as droughts and floods. As women made significant farming contributions, how they perceived risk was important. Gender differences in risk perception and management were not explained by gender differences in attitudes to risk but the studies found gendered differences in feelings around risk-taking. The appraisal of risks involved both analysis and emotions. Modest gender differences and emotions both influenced risk-taking and decision-making and thus were significant factors in how climate-related risks are managed.

Conclusions

The 6th Global Symposium on Gender in Aquaculture and Fisheries (GAF6) on which this Special Issue is based was another milestone in the progress towards engendering security in aquaculture and fisheries. We are encouraged by the number and range of papers in this volume, complemented by other papers presented at GAF6 and published elsewhere. As befits an applied field of research, most of the work published represents on-the-ground efforts to empower women and men to improve their livelihoods. These applied studies are complemented by others of a deeper theoretical and more exploratory nature addressing women's and men's personal perceptions of themselves within the fish sectors.

In the present Guest Editorial, we have examined engendering security through looking at the adequacy (and inadequacy) of policies and practices, the importance of fair livelihoods and decent, safe work in fish value chains, and the impacts of change in coastal communities. We have also reviewed recent directions of work on gender in fisheries and aquaculture by FAO and noted the cautious self-assessments of progress on gender in the programs of the Asian Development Bank. Global Environment Facility and CGIAR. We conclude that realising security will require making better use of Sustainable Development Goal 5 (gender equality), and the transformation of the fish sectors and social norms. This is a prescription that presents enormous challenges and requires much more organisation by those who hold the vision. Small steps, such as the creation of the Gender in Aquaculture and Fisheries Section of the Asian Fisheries Society and other like-minded networks can help set us on the pathway.

Seven gender issues were identified as not receiving sufficient attention: violence against women, fish processing, impacts on women of changes in resources and climate, linkages between fisheries, aquaculture and agriculture, household impacts of women's success in technology adoption, how to transform gender relationships and norms, and the effect of global processes on gender relations in the fish sectors.

In closing, we celebrate what the present Special Issue contains, including many papers that address some of the above issues. We commend the papers examining women in aquaculture including the human nutrition side, reflections on climate change and disasters and explorations of women's and men's identities in the current realities of the sectors in major market complexes and under displacements from past fisheries.

Acknowledgements

This Special Issue is made possible by the efforts of all the authors, reviewers and supporters of GAF6. Please also see the Acknowledgements for a full list of those who supported GAF6 and helped in the production of this Special Issue. For this Guest Editorial, we gratefully acknowledge additional inputs on the FAO programme from FAO experts Jennifer Gee, Jiaxi Wang, Nicole Franz, Rebecca Metzner and their colleagues

.

References

CGIAR-Independent Evaluation Arrangement. 2017. Evaluation of Gender in CGIAR. – Volume I: Evaluation of Gender in Research. Rome, Italy: Independent Evaluation Arrangement (IEA) of CGIAR. 93 pp.

Choo, P.S., S.J. Hall and M.J. Williams (eds.). 2006. Global symposium on gender and fisheries. Seventh Asian Fisheries Forum, 1–2 December 2004. WorldFish Center and Asian Fisheries Society, Penang. 174 pp.

Choo, P.S., B.S. Nowak, K. Kusakabe and M.J. Williams. 2008. Guest Editorial: Gender and fisheries. Development 51:176-179.

Choudhury, A. and C. McDougall. 2016. Women's empowerment in aquaculture: Case studies from Bangladesh. https://genderaquafish.org/events/2016-gaf6-august-bangkok-thailand/gaf6-program-abstracts-and-ppts/. Accessed 13 November 2017.

Correa, M. (ed). 2017. Towards gender-equitable fisheries. Proceedings of the Expert workshop on gender-equitable small-scale fisheries in the context of the implementation of the SSF Guidelines, 28–30 November 2016. FAO Fisheries and Aquaculture Proceedings 54, 61 pp. FAO, Rome, Italy.

Dey de Pryck, J. 2013. Good practice policies to eliminate gender inequalities in fish value chains. Food and Agriculture Organization of the United Nations Rome, pp 97.

FAO (Food and Agriculture Organization of the United Nations). 2012. Evaluation of FAO's support to the implementation of the Code of Conduct for Responsible Fisheries. FAO Office of Evaluation, Rome. Pp 144.

FAO. 2016a. The State of World Fisheries and Aquaculture 2016: Contributing to food security and nutrition for all. Rome. 200 pp.

FAO. 2016b. Promoting gender equality and women's empowerment in fisheries and aquaculture. Rome. 12 pp.

FAO. 2017a. Towards gender-equitable small-scale fisheries governance and development – A handbook. In support of the implementation of the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication, Prepared by Nilanjana Biswas. Rome, Italy. 154 pp.

FAO 2017b. Women's empowerment in aquaculture in Bangladesh and Indonesia: insights from four case studies. FAO Regional Office for Asia and the Pacific, Bangkok. 4 pp.

FAO and WorldFish. 2017. Women's empowerment in aquaculture: Two case studies from Bangladesh. Prepared by: Afrina Choudhury and Cynthia McDougall with Surendran Rajaratnam (WorldFish) Technical support: Clara Mi Young Park (FAO) and Cynthia McDougall (WorldFish). FAO and CGIAR Research Program on Fish, Bangkok. 112 pp.

Gopal, N., M.J. Williams, M. Porter, K. Kusakabe and P.S. Choo. 2014. Gender in aquaculture and fisheries: Navigating change. Asian Fisheries Science (Special Issue) 27S. 268 pp.

Gopal, N., M.J. Williams, M. Porter and K. Kusakabe. 2016. Gender in Aquaculture and Fisheries: The Long Journey to Equality. Asian Fisheries Science (Special Issue) 29S. 246 pp.

Hoang, T.A., T.T. Quach, T.T. Tran. 2013. 'Because I am a man, I should be gentle to my wife and my children': positive masculinity to stop gender-based violence in a coastal district in Vietnam. Gender and Development, 21:81-96.

Independent Evaluation Asian Development Bank. 2017. Thematic evaluation: Asian Development Bank Support for Gender and Development (2005–2015). 72 pp.

Independent Evaluation Office of the Global Environment Facility (GEF). 2017. Evaluation on gender mainstreaming in the GEF. 52nd GEF Council Meeting, GEF/ME/C.52/inf. 09. 67 pp.

Kleiber, D., K. Frangoudes, H.T. Snyder, A. Choudhury, S.M. Cole, K. Soejima, C. Pita, A. Santos, C. McDougall, H. Petrics, and M. Porter. 2017. Promoting gender equity and equality through the Small-Scale Fisheries Guidelines: Experiences from multiple case studies. In: The Small-Scale Fisheries Guidelines: Global implementation (eds, S. Jentoft, R. Chuenpagdee, M.J. Barragán-Paladines and N. Franz), pp 737-759. Springer International Publishing, Cham, Switzerland.

Kusakabe, K. 2017. Gender equality in and through fisheries. Yemaya 54:5-6.

McClanahan, T.R. and C. Abunge. 2017. Fish trader's gender and niches in a declining coral reef fishery: implications for sustainability, Ecosystem Health and Sustainability, 3:6, 1353288.

Monfort, M.C. 2015. The role of women in the seafood industry. GLOBEFISH Research Programme, 119, 67 pp. http://www.fao.org/3/a-bc014e.pdf. Accessed 14 November 2017.

Neis, B., S. Gerrard and N. G. Power. 2013. Women and children first: the gendered and generational social-ecology of smaller-scale fisheries in Newfoundland and Labrador and northern Norway. Ecology and Society 18(4): 64. http://www.ecologyandsociety.org/vol18/iss4/art64/ Accessed 24 December 2017.

Peters, H., T. Reemer, L.T. Sam, L.D. Xuan, D.T. Ha, T.T. Hien, M.B. Santosa and H. Soelistyowati. 2016. Identifying gender inequalities and possibilities for change in shrimp value chains in Indonesia and Vietnam. GAF6 paper, https://genderaquafish.files.wordpress.com/2016/06/graiseagaf6paperfinaldoc.pdf Accessed 6 November 2017.

Sari, I, C. McDougall, S. Rajaratnam and C.M.Y. Park. 2017. Women's empowerment in aquaculture: Two case studies from Indonesia - Engagement, outcomes, and constraining and enabling factors for women in shrimp farming and fish processing. FAO, Rome and WorldFish, 114 pp.

Scarborough, W.J., B.J. Risman and C. Meola, 2017. Women's-Group Fishponds in Bangladesh: Using Gender Structure Theory to Examine Changes in the Gender Asset Gap. Socius, 3:1-9.

UNFCCC (United Nations Framework Convention on Climate Change). 2001. Guidelines for the preparation of national adaptation programmes of action. UNFCCC Conference of the Parties 7th Meeting, Marrakech, Morocco, Decision 28, 7 p.

Williams, M.J. 2017. Gender equal fisheries. Yemaya 54:2-4.

Williams, M.J., M.C. Nandeesha, V.P. Corral, E. Tech and P.S. Choo (eds.). 2001. International symposium on women in Asian fisheries: Fifth Asian Fisheries Forum. Asian Fisheries Society, 13 November 1998, Chiang Mai, Thailand. WorldFish Centre and Asian Fisheries Society, Penang. 181 pp.

Williams, M.J, N.H. Chao, P.S. Choo, K. Matics, M.C. Nandeesha, M. Shariff, E. Tech and J.M.C. Wong (eds.). 2002. Global symposium on women in fisheries: Sixth Asian Fisheries Forum. 29 November 2001, Kaohsiung, Taiwan. WorldFish Centre and Asian Fisheries Society, Penang. 201 pp. Asian Fisheries Science Special Issue 29S (2016): 01-17 17

Williams, M.J., M. Porter, P.S. Choo, K. Kusakabe, V. Vuki, N. Gopal and M. Bondad-Reantaso. 2012. Gender in aquaculture and fisheries: Moving the agenda forward. Asian Fisheries Science 25S. 276 pp.

Williams, M.J., A. Lentisco, M.B. Badayos-Jover, C. Pedroza-Gutiérrez, K. Giri, S. Siar, N. Gopal, B. Shanthi, A.J. G. Ferrer, M. Bañez Sumagaysay and A. Sharma. (in press). Gender as the missing link for improving climate change adaptation in fisheries and aquaculture. In: Proceedings of FishAdapt: Global Conference on Climate Change Adaptation for Fisheries and Aquaculture (J.E. Johnson, C. De Young and C Virapat eds). FAO/Network of Aquaculture Centres in Asia-Pacific Conference, 8-10 August 2016, Bangkok, Thailand. FAO Fisheries and Aquaculture Proceedings, Rome.

RESEARCH PAPERS

Gender in Aquaculture and Fisheries: Engendering Security in Fisheries and Aquaculture
*Asian Fisheries Science Special Issue **30S** (2017): 33-58*

ISSN 0116-6514
https://doi.org/10.33997/j.afs.2017.30.S1.002

Research Paper

Women's Space in the Fish Port Tambler Complex and the Value-Chain Nodes of the Fishing Industry in General Santos City, Philippines

RAYMUNDO R. PAVO* **and LARRY N. DIGAL**

University of the Philippines Mindanao, Mintal, Tugbok District, Davao City 8022, Philippines

Abstract

This study uses ethnography to describe the spaces of women in the Fish Port Tambler Complex of General Santos City, and investigates the points of convergence with and divergence from the value-chain nodes of the tuna fishing industry. As host to a key local industry, this fish port in General Santos City was estimated to generate at least 42,000 jobs in 2014. This landscape of jobs, however, needs to be sex disaggregated and direct observation in the fish port shows the limited spaces that women fill-in and the dominance of male workers in the vicinity. Guided by the standpoint of Henri Lefebvre on social spaces, the results of the present study showed that as women occupied spaces in the fish port complex, they demonstrated their agency and capacities as income earners, as friends to fellow workers, and as allies in the fish marketing processes. Although their spaces were marginal compared to the kind and extent of spaces that men had in the area, and, largely, their spaces did not interface with the conceived formal value chain nodes in the tuna industry, these women did not consider themselves marginalised in the Fish Port Tambler Complex. The ethnographic result of the study, when viewed through the gender lens of Longwe (1991), however, is interpreted either as a manifestation of hope for better livelihood opportunities, or as a call for increased capacities to enable these women to critically see through their current spaces and situations in the fish port complex.

* Corresponding author. Email address: rpavo77@gmail.com

Introduction

General Santos City is called the tuna capital of the Philippines. Tuna is mainly traded and shipped in the General Santos City Fish Port Complex which is the second largest port in the country. 6 of the 7 tuna canneries of the country are located in General Santos City. The canned tuna processing industry in the Philippines is now the second largest processor in the WCPO next to Thailand. The tuna industry generates about USD 300 million annually of exports and 200,000 jobs from direct and indirect employment (Amerkhan 2016). The latter figure is estimated based on the UN-FAO State of World Fisheries and Aquaculture report in 2012 which estimated 3 to 4 related jobs created for every person engaged in capture fisheries in 2010. In General Santos, around 42,000 jobs were directly engaged in tuna fishing in 2014 which translates to more than 200,000 jobs generated.

However, women and fishing ports are an under-investigated topic in relation to others in the Philippines fisheries sector. To date, no recent study on the country's eight regional fish ports has been done in the last 16 years with the exception of Israel and Roque's (2000) unpublished study on the historical development of fishing ports in the Philippines, and Obsioma's (2014) unpublished work on the roles of women in the fish port complex in General Santos City. Analysis of these works, however, reveal that Israel and Roque's work settled with an overview or general descriptors of the main features and structures of the fishing ports in the country, while Obsioma's work did not consider the spatial perspective in its analysis of the roles of women in the fishing port in General Santos. Moreover, the interface between women spaces in the Fish Port Tambler Complex and the value-chain nodes in the tuna industry in General Santos City is a research project that was yet to be conceptualised and explored.

The Fish Port Tambler Complex was constructed in 1998 as a regional port (Philippine Fisheries Development Authority, 2016). Along with studies of Asian fish ports (Lee et al. 2008) which focuses on the difference between Western and Asian port perspectives, and maritime anthropology which tilts towards the shipboard lives of fishers and lives in the the fishing industry (Acheson, 1981), the present study seeks to open a unique space of inquiry different from the focus in maritime anthropology and Asian fish port studies.

More to the point, the paper looks into the physical spaces of the fish port complex from the perspective of women's participation, roles and stories in the fish port in General Santos City.

Obsioma's research (2014) inferred the following points which this paper built from. Her work specifically noted that: (1) women's spaces in the fish port are yet to be adequately recognised; (2) the assigned spaces to women are economically marginal; (3) the spaces that women fill-in in the port largely do not interface with the value-chain nodes of the tuna fishing industry in General Santos City; and (4) women, despite the marginal spaces that they occupy, cultivate locales of productivity as they subsist in the disciplinal structures and forces in the fish port as a livelihood space.

Building on these findings, this study will explore: (1) what spaces do women workers in the Fish Port Complex of General Santos City occupy?; (2) how do women workers figure in the value chain nodes of the tuna industry in General Santos City?; and (3) using Lefebvre's (1991, reproduced in 2014, see Lefebvre 2014) perspective and the lens of women's empowerment and gender equality framework of Longwe (1991), why do women continue to subsist in their spaces in the fish port complex?

Methodology

The study is based on field work, field site mapping, key informant interviews, and semi-formal focus group discussions. The combination of these tools provides a qualitative description of the situation and experiences of women as they subsist in the Fish port complex and interface with the value chain nodes in the tuna industry in General Santos City (Blasco & Wardle, 2007).

To help prepare the platform for the analytic section of the research, we will examine 4 ethnographic data sets: (1) description of the spaces and dynamics in the fish port complex, (2) description of women's participation in the various spaces in the port, (3) discussion on the possible overlaps between women's roles in the port and the value-chain nodes of the tuna industry, and (4) description of stories and experiences of women that illustrate the meanings

that women attach to their spaces in the fish port complex of General Santos City.

Field site mapping included drawing the port spaces on-site with input from key informants. Selected key informants also had at least one year's work experience in the port to help ensure the depth of their stories, and focus group discussions were conducted on-site, coupled with semi-formal discussions to allow other women and fish port workers to join in the discussion. In addition to the results of this ethnographic study, secondary data were consulted from published and unpublished research to contextualize women's work in the fishing industry. The results of the ethnographic section are then analyzed using Lefebvre's theory on social space as lived, conceived, and perceived space. In addition, Longwe's reflection on the meaning and implications of occupational sex segregation (1991) to occasion a gender analysis of the spaces of women in the fish port complex will be used.

Results

On Women Workers in Production Areas

Inequitable economic arrangement is a women's and gender issue that subsists in many production areas in the Philippines. This is an intersecting concern in the fields of agriculture, urban and rural factories, small-scale and large-scale mining operations, plantations, fishing industries, and other sectors of work. A common problem that women workers deal with is the lack of representation, and an almost trivial attribution of their contribution to the household, local, and national economies (Philippine Commission on Women, 2015). In mining, for instance, women miners are generally invisible to local government since the term miner is generally understood as referring to a man. While large-scale mining operations thrive, women generally find themselves habitually scouring for traces of gold and other ores through small-scale mining but continuously contributing to the local economy.

In Luisiana, Laguna, women hat weavers construe their work as a domestic task, rather than formal labor, despite the economic contributions to family income and sense of economic security that the weaving provides to the community (Dungo 2005). In other agricultural sectors, some women are

starting to blur the categorical distinction between home and productive work. But women are still pulled by the cultural expectation to prioritise household chores over paid work (Dungo 2005). In this respect, socio-cultural expectations and economic arrangements still tilt in favour of the interests of male workers while industries remain sceptical of the worth or value of women's productive work.

Unequal division of labor by gender is also found in the fishing industry (FAO 2013). In particular women's significant contributions are overlooked (Obsioma, unpubl. data, 2014). The misrepresentation of women's contribution in the local and national economy leads to a lack of support for women fisheries workers to improve their working conditions (Demmke, 2006, Kleiber, 2014). Despite the positive contributions of women workers through various economic activities, the following question is in order: why do women's productive efforts and capacities remain inadequately recognized?

Women's work is often reduced to the private-household or domestic space. In a globalized setting where the boundaries of production continuously expand, and where productive work is no longer confined to traditional public realms (Banez-Sumagaysay, 2003), private spaces, which are often referred to as the household are no longer delineated from the public spaces. In a globalized setting, the reproductive household space needs to be acknowledged as space where women produce and re-produce, and where women work and get paid.

In the fishing industry, the blurring of boundaries and spaces in the Asia-Pacific also emerged through women's creative entrepreneurial efforts. For example, in the Pacific women have introduced new tuna products in the tuna-based industry (Demmke, 2006). These contributions change the economic image of women as low skilled workers. Social institutions must re-think the way women are construed in the economic landscape.

Despite such feats, the challenge, however, persists as the number of studies on women's participation in various production areas reveal disproportionate programs to help change inequitable structures and biases against women (Kleiber, 2014). This means that the opportunity to re-think situations, and women's work remain needing attention and interventions

(Banez-Sumagaysay, 2003). Inspired by women's capacity to challenge the ill-regard for women's work, the continuing challenge is to give credit and accord support where it is due: to women's creative and productive gifts and capacities in economic-livelihood spaces.

On Women Workers in the Tuna Industry

The inequitable economic arrangement that favours men over women is present in the tuna industry. A study conducted by Obsioma (unpubl. data, 2014), identified the spaces and economic positions that women hold in the following value-chain nodes of the tuna industry in General Santos City: (a) hand-line fishers; (b) purse-seine fishers; (c) tuna cannery workers; and (d) local processing companies. These spaces are less rewarding given the issues that women workers have to deal with: (a) occupational hazards; (b) in case of contracted work, below minimum salaries with no overtime differential payment schemes; (c) uncertainties with regard to security of work due to contractualization; (d) absence of security against sexual harassment and discrimination; and (e) lack of better job opportunities, since work assigned to women mostly requires low level skills with corresponding low range salaries. An initial look at the work issues of women at the fish port in General Santos City reveal the tuna industry's marginal treatment of women in its economic landscape.

A possible reason for the marginalization is the industry's exclusion of women in its economic agenda. In a study on women in the fisheries sector of the Pacific Islands, Demmke (2006) identified the following restrictions that limit women's economic choices: (a) socio-cultural beliefs; (b) family obligations; (c) lack of skills and experiences; (d) lack of direct access to credit and finances; (e) transport restrictions; and (f) poor market facilities. Some of these constraints are also re-affirmed in Obsioma's study (2014): (a) socio-cultural norms; (b) hostile working environment in the Fish port complex; (c) lack of gender awareness programs and policies in the fish port; (d) hazardous working environment in canneries; and (e) lack of skills and experience. Between Demmke and Obsioma, the commonalities with regard to restricting conditions suggest that women's development is yet to be mainstreamed in the economic agenda of the tuna industries.

On Value Chain Nodes

The values chain nodes reflect the complex processes where value is created and added in a series of activities. In the tuna industry of General Santos City, its key value chain nodes pertain to the following 3 main sections or units: inputs, production, marketing, which includes the roles of *jambolero* (a form of broker described below), broker, and/or labourer, traders/wholesalers, exporters, canneries, processors, retailers, and consumers-canned/fresh. Here is a description of these nodes:

An input supplier is a major player in the value chain spectrum and these include ice plants and the financiers for the fishing operation. Ice is a primary supply used during fishing trips and in transporting fish to provinces and cities. There are 3 ice plants within the General Santos Fish Port that supply ice to fishing vessels and trucks that bring fish to other areas in Mindanao. Financiers are equally important actors in the chain, since most boat operators require large amounts of capital during fishing trips. Depending on the size of the fishing vessel, the amount needed by boat operators range between Php 2,500 – Php 6,000 for small scale fisher folks, Php 400,000 – Php 800,000 for medium hand line fishing operations, and around Php 6,000,000 for purse-seine fishing operation. Financiers for fishing operations are mostly male rather than female.

For production, the 3 types of fishing methods used for harvesting tuna in the Philippines are purse-seine, ring net, and hand line (Barut and Garvilles, 2005). Purse-seine and ring net vessels belong to the commercial sector; while hand line vessels are part of both the commercial and small-scale sectors. Purse-seine and ring net use large nets that target skipjack tuna for canning and for the fresh domestic market. Hand line vessels catch large fish such as yellowfin, bigeye, albacore and blue marlin which are intended for domestic and export markets. People involved in fishing operations include the boat captain or skipper, the mechanic, and the fishers. Personnel involved in fishing are all men. Based on a survey conducted in General Santos Fish Port by the UP Mindanao Tuna project, no females were allowed to board. The explanation given for this exclusion is that the work is rigorous, and there is concern about sexual harassment during the 7 to 25 day duration of a single fishing trip.

Fish are unloaded at the General Santos Fish Port (GSFP), the major tuna unloading port in the Philippines (Barut and Garvilles, 2005), particularly in markets II and III for purse-seine vessels and market I and II for hand line vessels. As a key fishing port, the GSFP also provides post-harvest infrastructure for both commercial and small-scale fisher folk. The actors also involved in post-harvest are labourers. Labourers unload and haul fish from fishing vessels for weighing, sorting or classifying. The labourers for such kinds of work are all men who carry big tuna with weight ranging from 15 – 50 kilograms and *banyeras* (tubs) full of fish weighing around 27 kgs.

Marketing includes sorters, classifiers, checkers, *jamboleros*, traders/wholesalers, exporters, processors, and retailers. Sorters are mostly women who sort smaller fish according to size. This task does not require strength. Classifiers grade large tuna for export by using a metal tube that is inserted in the tuna to extract a meat sample. This occupation is male dominated since most of them were previous workers in processing plants and were trained for 3-6 months. Such backgrounds provide men with more experience in handling raw tuna, which men can use in assessing the quality of tuna. Checkers record the number, weight and quality of large tuna, and monitor the number of *banyeras* that were unloaded from the fishing vessel. They are also in charge in monitoring the prices and sales. For this task, women are mostly hired by companies, since women are also less likely to fight with other workers. *Jamboleros* function as the middlemen between the traders and buyers. They negotiate with the traders, and sell the fish to domestic buyers. Men and women are *jamboleros*, but in most cases they are men. There are instances wherein both a husband and a wife are *jamboleros* who alternate working at the fish port. Traders-wholesalers are individuals or company representatives who lease a space in the landing areas in the fish port complex. In these spaces fish are unloaded, sorted, classified, and checked. *Jamboleros* also buy fish from them. Exporters, who are usually male, are situated in market I and buy larger fish such as yellowfin tuna, albacore, blue marlin, etc. for export. They buy class A and B quality fish and ship the whole fish minus the head, tail and gut for export. For export, however, only class A fish are transported, and class B fish are sold domestically. Canneries are owned by large companies that process and pack for export. Canneries use smaller skipjack tuna for canning. The majority of the workers in canneries are women who work on the assembly line. Other processors in General Santos city

produce frozen cuts. There are mainly men hired for frozen cuts processing, rather than women, because men are assumed to have the strength required for cutting large tuna. Some processors also manufacture value-added tuna products such as *chorizo* (in sausage form), *embutido* (processed luncheon meat form), and nuggets. These processors are usually micro, small and medium enterprises (MSMEs) and hire more women than men. Tasks of these women include loining, slicing, skinning, and packing which usually do not require great physical strength. Retailers are usually found in the wet market section and sell fish by kilogram. They buy fish from truckers and traders. Some retailers perform other functions such as cleaning and slicing. Both men and women do the same tasks in retailing. In terms of numbers, more women are seen retailing since their husbands/partners are the ones responsible for buying the fish from the fish port. This differentiation in tasks, however, needs further study to determine the contextual reasons for such unfolding.

In the fish port complex, the value chain nodes that are physically or tangibly worked out within the premises of the port include: inputs, production, marketing, traders/wholesalers, and canneries/processors. In addition, the exporters, retailers, and consumers are usually located outside the port, since these actors and processes build-on the activities within the fish port complex. Retailers and exporters, for instance, do not have direct access to the quality of tuna in the port as it is tested by the *jambolero* but simply rely upon the information of their contact.

Theoretical Framework

In "Production of Space", Lefebvre (2014) distinguishes 3 kinds of social space: spatial practice, representations of space, and representational space.

For spatial practice Lefebvre holds that "The spatial practice of a society secretes that society's space; it propounds and presupposes it, in a dialectical[1] interaction; it produces it slowly and surely as it masters and appropriates it. From the analytic standpoint, the spatial practice of a society is revealed through the deciphering of its space" (Lefebvre 2014). He adds that the space of

[1] Dialectial is defined as "a method of examining and discussing opposing ideas in order to find the truth" (Merriam-Webster Dictionary)

social relations, given its gradual accretion and appropriation, has a cohesive nature although it does not necessarily follow that such relations subsist as coherent forms, for instance, inequitable modes of production (Lefebvre 2014). The concept's accretion and appropriation, however, may have misleading tones when not understood against Lefebvre's notion of dialectics, which underscores the "bringing together of the conflictual and contradictory, and the linking to theory and practice" (Lefebvre, 1996). Lefebvre values the open-ended movement of the dialectics which can be fragmented, on-going, and in transit (Lefebvre 2014).

Representation of space, meanwhile, is characterized by Lefebvre (2014) as a "conceptualized space, the space of scientists, planners, urbanists, technocrat subdividers and social engineers, as of a certain type of artist with a scientific bent – all of whom identify what is lived and what is perceived with what is conceived." The philosopher adds that space as conceived tends to be verbally articulated in signs which have been long thought of or worked out on an intellectual, rather than emotianal level. As a conceived space, this pertains to the way privileged posts and vantage points influence the way spaces are determined. An architect, for example, has the capacity to influence the kind of buildings which shall be built around the city and in turn, contribute to the ethos of the city. If architects underscore the restoration of old buildings, ensuing built structures in the city will eventually create a nostalgic, contextual, and historic feel to its milieu.

For representational space, Lefebvre (2014) reckons that this social space leans towards "coherent systems of non-verbal symbols and signs". He further specifies that representational space is "space as directly lived through its associated images and symbols and hence the space of 'inhabitants' and 'users', but also of some artists and perhaps of those, such as a few writers and philosophers, who describe and aspire to do no more than describe." Coming from a symbolic stance, this kind of space highlights the lived meanings of a society which acquires a value and commands a set of meanings through time. For instance, Bisaya farmers and Lumad farmers, different ethnicic groups in Mindanao who are immigrant and ancestral peoples, respectively, will have unique symbolic appropriations of the land that they till. The Lumad farmer often connects his farming to his ancestors who paved the way for the activity to subsist until the present times. This appreciation of the network of meanings

that subsist and regulate the way farms and lands are lived and experienced point to the overflow of meanings that hover and condition traditional farming systems. For the Bisaya settler who went into farming, the non-articulated meanings of the land and farming as a communal activity may be approached simply as arbitrary constructs and as constraints to the Bisaya's understanding and appreciation of the symbolic value of land, farming and the community in an indigenous farming community (Pavo, unpubl data, 2014).

Since the present study privileges the spaces and experiences of women, it is also conceptually hinged on Longwe's (1991) welfare, access, conscientization, participation and control (WACPC) framework of empowerment, which serves as a standard against which the occupational sex segregation in the fish port complex is assessed. Given that this framework underscores the connection between gendered experiences and the socio-political world, it also looks into how gendered constraints, especially on women, are magnified given assumed and unrecognized dispositions towards women. As a gender analytic frame, it is also important to note that such concepts may be considered within the purview of a feminist standpoint epistemology as Longwe's (1991) interrogations demonstrate how women regard and value their spaces, experiences and questions differently from men. Also, reminiscent of Foucault's (1967) understanding of power, the discussions of Longwe (1991) are reminders of the intricate relation between contexts of women, sites of domination and locales of opportunities to articulate agency and resistance. This is a line of thought which also helps theoretically situate this paper's description of locales of women's agency and power as they subsist in women's spaces in the fish port complex.

Ethnographic Data 1: Women Space in Markets I and II

Market I. Where do women figure in market I? At first glance, the location suggests that it is a male-dominated space. Starting with the shipping vessels, one can see male fishers resting or going about their house keeping tasks, and male labourers transporting the tuna catch to the display area in market I. Also, a few male *jamboleros* stand near the *tarima* (display area) with their testers (aluminum rod-sticks), which they use to check the quality of tuna meat. Amongst the *jamboleros*, we only saw one female *jambolero*, distinguished by the tester that she was carrying. Unlike her male counterpart,

she, however, did not use her stick to scrape-off tuna meat but simply waited for the assessment of the tuna meat by a male *jambolero*. From an observer's point of view, such a difference in action may mean that the woman *jambolero* has hesitations in assessing the tuna using her stick, or she may feel that she is not in a position to make an assessment when there are men already doing the meat evaluation.

In our interview, the informant shared that she is a *jambolero* and started taking part in the work in 2006. She further specified that she actually works in the port as *jambolero* alongside her husband. As a *jambolero*, she explained that her primary task is to check the quality of the tuna which she will deliver to her clients in various parts of Mindanao. She added that her products reach as far as Davao City. With regard to her relation with her clients, we asked if the goods, once delivered, are paid in cash. "*Dili pwede utang"* (Credit is not possible) was how she answered the query. She noted that her clients are good payers, however; and she acknowledges the need to take extra care of them by assuring the quality of tuna that she delivers. In market I, they also rented out a canopy with 3 big *icabakan (*containers). But she specified that the tuna they have bought from market I do not really last long in the containers as there is a big demand for tuna in many parts in Mindanao.

Just in front of market I, 3 women also gathered, squatting while waiting for something or somebody from the shipping vessel. We approached them with a sense of hesitation, since we were unsure if they were the wives of the fishermen. So, initially we inquired as to why they were stationed in the docking area of market I. One woman replied that they were there waiting for an instruction from the boat's captain, or operator if they will be allowed to go on board the shipping vessel. She continued that after the unloading of large size tuna, it is possible to find some skipjack left inside the vessel. These fish are about 2 to 4 kilos, which the women can buy from the operator and sell in market II. After such a remark, we asked them if they were *jamboleros*. Her companion uttered this line: "*Small-time lang man ni amua kung naay nadakpan nga gagmay lang nga isda"* (Our venture here is small-scale, which only concerns small fish). Although they were not keen in identifying themselves as *jamboleros*, their descriptions of their space and intent in market I actually interface with how *jamboleros* work in this market – reserve fish, add price, and transport the fish to another location for selling. Unfortunately, we

did not see this process reach fruition because the 3 women decided to leave the port of market I, once the operator announced that there were no skipjack in the "Pak-an". Hence, the 3 women, after looking at their cell phones, explained that they needed to go home and attend to some domestic chores in the household. One of them, however, added that they have been doing these jobs for the past ten years, and frequent the port of market I about 5 times a week.

Given the interviews with women, their narratives reveal two types of women *jamboleros*: large-scale, and small-scale. While the former confined herself to tuna which is at least 30 kilos, the latter confined her interest to smaller sized tuna which are around 2 to 3 kilos. The disproportion in size is also consistent with the trajectory of the transportation of the tuna. While the first type of *jambolero* ferries the tuna to cities within or outside General Santos City, the small-scale *jambolero* sells the fish to market II, which is a few meters away from market I. The difference in money involved between the 2 kinds of *jambolero* may also be imagined from the kinds of negotiations involved between the first type of female *jambolero* and the 3 women. But in both instances, the term *jambolero* is explained by the informants as "*mag-jamble o magpatung-patung"* (to *jamble* or add price and gamble). Another mentioned the term *panipis* (to make thin), "*kay laway ang puhunan"* (one only needs to make use of one's saliva when negotiating prices). With such descriptions, *jambolero* as a term appears to pertain to acts and the art of negotiating between the interest of the operators of fishing vessels, and the *jambolero's* role of delivering quality tuna to clients or retailers as in the case of the large scale *jambolero*s, and prospective customers/buyers within market II as in the case of the small scale *jamboleros*.

In addition to the *jamboleros*, women checkers also figure in market I. Their tasks revolve around these concerns: record the number of tuna on display in a bay/area; also record the weight per tuna; and cross-check with the *jamboleros* the number of tuna that have been transferred to their container bins, or trucks. As checkers, it is important to specify that they work as the port's administrative staff. This is to distinguish them from the checkers which *jamboleros* may sometimes hire to assist them in tracking their reservations. When a male labourer was asked, "why do women work as checkers in market I?", he retorted that the task is light, and it does not require physical labour, which he considers apt for women. The female checker, upon hearing such a

remark, did not make any fuss with the given statement. She agreed and even added that the physical demand of transporting large size tuna would be dangerous to women's health.

In an adjacent corner, we spotted a woman gathering entrails from a "*bagan*" (blue marlin), which she said is sold at 10 pesos per piece. The woman added that the internal organ is processed into a "*dayuk*" – a fermented version of the organ, which can be sold at 35 pesos per bottle in the market. We then asked if other women also gather entrails or organs which are then converted into other products. She expressed that it all depends on the quantity of blue marlin caught. At some point, some of her friends join her to check if other edible entrails or organs are available, which they can also sell in market II. Given that we only saw women demonstrating their interest for entrails, this question was soon asked: Do men engage in this kind of transaction? The informant explained that it is usually women who look for organs which are bought and processed. Her answer, while not directly answering the question, somehow gave the impression that men's roles in market I are usually well-defined, which also means that unexplored roles and spaces in the fish port can serve as avenues for other women to discover or develop income generating activities and transactions in the spaces of market I.

Market II is busier than market I and its modes of transaction and labour are more varied. In addition to the male labourers, market II features female sorters. As the male labourers transfer and unload baskets of fish to an "*ayagan*", a group of women begin the cycle of segregating fish according to kind and quality. As sorters, they need to be swift in their judgment in deciding which fish goes to what tub. A quick look at the baskets beneath the "*ayagan*" showed how fast such tubs were filled. From an entrepreneur's perspective, the segregation process appeared crucial – as an informant explained, since it determined the price of the fish. The price, which the scaler announced, was information which *jamboleros* awaited and relayed to their retailers.

We also interviewed a female checker in the area and asked if sorting was exclusive to women. She said: *"ga-an na sya nga trabaho, ang sa lalaki kay bug-at"*(such work is light unlike men who need to lift heavy things). "*Mas metikuloso pud ang babae kaysa lalake"* (also, women are more attentive to details than men). This was another reason why women were assigned to such

tasks, according to the checker. Upon encountering a checker who was taking a short break from her work, we inquired about the prices that were usually pegged per tub. She said that for good quality fish, the cost was Php 3,900.00; if the set of fish was slightly bruised, a tub was sold for Php 2,500.00. "*Pero kung lata na ang isda*" (If the fish is already deformed), "*ang presyo kay Php 1-1,200.00 kada tub.*"(the price is between Php 1-1,200.00). When asked further why some fish become highly deformed, the informant explained: "*kana nga isda ang nasa ubos sa pukot, ug sa sulod sa lantsa sa pila na ka-adlaw*" (such fish are those that are at the bottom of the fishing net, and have been stored inside the fishing boat for days).

With regard to sorting, we also observed that women used their bare hands, and that they needed to stand for hours continuously, waiting until the last catch has been sorted. Was it better if women used gloves as protection from sharp and spiky fish parts while sorting? The checker clarified that it entirely depended on the person. In some cases, sorters used gloves, while others preferred to sort with their bare hands. A woman sorter also shared that she once tried using gloves, but she eventually decided to dispose of them, since she felt that it became difficult to get a good grip, and hence made the sorting process more laborious. She added that since speed was a factor in sorting, some just proceeded in their tasks, not minding the discomfort, and at times pain, that they felt with their hands.

Upon noticing a woman taking charge of the display of bread, we also inquired if she was a sorter and was maintaining a small business stall in the port for additional income. The enlister clarified that the bread on display was from Makalipay bakery, the owner-renter of the bay-space which we were observing in the port. The enlister was quick to add that they were not allowed to sell other goods in the place. The selling of bread was part of the owner's way of assisting the labourers so they needed not go to the cafeteria of the port, which was about 20 m from their working station. While the unloading and sorting of fish continued, some labourers also availed of the bread and paid five pesos for each piece.

We also asked about the educational backgrounds of the labourers and sorters. The checker of Makalipay Fishing Bay narrated that except for one labourer, everyone in the group was either a high school graduate or a college

level student. The only labourer who finished a degree in education, however, failed in the licensure exam for teachers (LET) 3 times. Given their educational backgrounds, we prompted the enlister with this question: "how much do these workers earn each month?" She described this payment scheme: from the net income of the monthly transactions in the fish port, the labourers would divide among themselves the 3 % profit while the 97 % would go to the owner who would then allocate an amount for the next fishing expedition. For this company, the enlister said that there were 70 of them working as labourers, sorters, and checkers. From the 3 %, a male labourer usually gets around Php 7,500.00 while the female sorters received an estimated Php 5,000.00. The question that followed centered on the differences in payments. The enlister reiterated the point that the work of male labourers was more physically demanding than sorting. The female workers in the area who listened to the remark agreed with it.

After the interview with this respondent, we also discovered a group of old women selling fish just beside the delivery and sorting area of the port. These women had their small table where small fish on display, a chair, and two to three small ice boxes. Intrigued by their presence, we inquired if they were actually allowed by the port's administration to sell fish within the port's premises. The informant shared that she has been selling in the same space for the past ten years. She replied: "*gitagaan mi ug pwesto*," (these spaces were given to us by the administration). "*Naa pud koy I.D."*(I also have an I.D.). She added that she pays Php 1,000.00 for the annual renewal of her I.D. The informant also specified that she typically began selling fish in her space at 8:30 a.m. and continued until 11:30 a.m. After these hours, she would pack her things and ensure that her area was clean. She then stored her tables, chairs, and ice boxes in a nearby section. When asked where her fish display came from, the informant said that it was from the fish landings delivered to the port. Usually, her contacts would inform her of some excess catch, which could still be sold.

Ethnographic Data II: Fish Port as Market Place – Its Meaning for Women

How do women construe markets I and II, in the fish port complex? Through semi-formal small-group focus discussions, 2 small groups of women shared how women figure in the markets, and what the markets in the port mean

to them. Women, according to the participants in a semi-focus group discussion, worked in the port as: tub holder/checkers, sorters, checkers, cashiers, vendors, *jamboleros*, canners and operators.

"Tub checkers" traced the whereabouts of tubs and conducted the daily inventories of the number of tubs available. The informants mentioned that each tub costs around Php 450.00. This price explains why tub checking has to be one of the tasks in the port, especially when a large number of fishing vessels unload their fish in market II.

"Sorters" segregate the kinds and quality of fishes. Usually, 3 categories were used: high quality, medium quality and low quality. The prices were proportional to the kind and quality. This type of sorting was peculiar to market II , since the kind of sorting that was operative in market I took on a different form. In market I, classifying the kind of tuna meat was done either through "*tusok*", or "*laras*". "*Tusok*" means that the broker and/or classifier extracted a flesh sample to test the quality of the meat. For this classification type, tuna meat was sold at Php 360.00 kg^{-1}. For "*laras*", the tuna meat's quality was not tested and the price was set for the barrel or tub as Php 250.00 kg^{-1}. Between the 2 types of sorting, women performed the first round of sorting in markets I and II, while a few women engaged in sorting as *laras* in market I.

"Checkers" oversaw the number of tuna on display per aisle or Bay in market I, or the number of trays while taking note of the price per tray per Bay in market II. Also known as enumerators, they were contractual employees of the port in the case of market I but were organic members of a Bay in the case of market II. This is why in market II, the checker also saw to it that the actors in each Bay were performing according to their expected functions. "Cashiers" informed the *jambolero* of the price of the fish per tub in the case of market II. In market I, however, there was no visible cashier since payments were made either through checks or the bank. In market II , the cashier also kept a record of the number of tubs, and the payments made. "Vendors" in market I created a cell phone loading center, which was signaled by posting like this: "available load here, all networks, contact Mae". In market II, there were bread vendors as well as fish vendors .

"*Jambolero*" sold tuna fish per kilo to local wholesalers or local market retailers, adding a price premium. The informants specified that usually the

jambolero followed the price set by the classifier, as in the case of market I, and the cashier, as in the case of market II. When asked if the *jambolero* could change the price range set by the classifier, the group pointed out that the price range needed to be upheld or observed. A *jambolero* also frequented the Bays/Areas to find cheaper rates. *Bahis-bahis* was a term that pertained to the *jambolero's* need to frequently walk around in search of more favourable price arrangements in the port.

Women also worked in the canning of tuna in a nearby facility. When asked if they also hoped to work inside the canning facility, the marketplace participants retorted that it was better to work inside the market for these reasons: "*mas hayahay sa gawas*" (it is more relaxing to work in the market than inside a plant/facility); "*walay mubadlong*" (no one will reprimand); "*makagawas-gawas*" (from time to time, one can take a breather by going out of the market space); "*merienda*" anytime (one can eat food/snacks anytime); and "*mas okay sa gawas kay sige naay mubantay sa sulod*" (inspectors frequent the canning facility and its activities, hence it is better to work outside).

Interestingly, the semi-focus group discussion did not include women operators in the list of work and functions that women do in the port. The interview with an operator, however, provided some details of an operator's work, namely: as owner of the boat and/or as financier of a fishing venture, the task was to ensure that the boat's engines were in good condition, and to bring the fish to a Bay/Area where the price was fair and good. In the case of the informant, she cited the Bay of Eiambao or Diego Scaler. This was actually the first Bay in market II or the Bay nearest to the cooperative canteen of the port for employees. The informant specified that Diego Scaler, at the time of interview, valued a kilo of skipjack at Php 60.00, wherein Php 58.00 went to the operator, while Php 2.00 was the income of the scaler.

Following exploring the tasks and functions performed by women in markets I, and II, the next part of the small group discussion focused on the meaning of the market for women. The conversation revolved around these key points: the market as a source of income; (2) a productive place; (3) "*kun asa libre ang isda*" (a place where fish can be freely acquired); (4) as a family of friends; and (5) "*alalay sa bana*" (as a form of assistance to their husbands).

As a source of income, the informants specified that the markets in the port could provide money to support their daily expenses, "*pamasahe*" (fares), and "*pang-eskwela*" (tuition for their kids' education). This was why one informant said, "*makabuhi ang trabaho diri labi na nga single parent ko*" (work in the market can support our expenses especially as a single parent). This was why the market was also construed as productive. The participants clarified that: "*naa steady income diri, ug dili mahutdan o mawad-an kay adlaw-adlaw naay habwa ug isda gikan sa bangka*" (there is steady income in the market given that, every day, fishing vessels unload their catch). This is perhaps the reason why the market was reckoned as a productive space given a certain assurance that fish abounded and fishing vessels would always have something to unload in the market areas. When asked if they were worried that the count of fish would eventually dwindle, the group said that such a possibility was something which they should not yet agonize about. In relation to construing the market as a productive space, the discussion also reached the idea that the market was a space where one could get free fish, hence free food: "*Naa gyud miy gamay nga isda nga mauli sa amo pamilya*" (we are almost always certain that we can bring home fish, hence, provide food for our families).

In addition to the economic gains and a sense of food security, the market was also considered as space to gain new friends and a sense of family. The participants used these words to describe this point: "*pahalabilo*" (socialization), friendship, "*dili na maulaw*" (no longer shy to socialize), and unity. With these descriptions, the informants magnified the importance of eventually being able to find a group of persons with whom one could share certain experiences.

Lastly, the market, with the economic and social opportunities that it carried, was construed by the women as a way of assisting their husbands in providing food and money to the family. As a participant specified: "*kung ang bana lang kay kulang, dapat duha gyud*" (if the husband is the sole source of income, money will never be sufficient, hence both husband and wife should work). In this case, the group also took pride in their capacity to be of help to their families despite the stress that they experienced while working in the markets: "*naa may income maskin stress*." With the following constructions of the markets, the discussion ended with the claim that the market had always been of help and assistance to their families. And given such narratives, the

participants in the semi-formal focus group discussion reiterated the point that the family remained the primary reason why women worked in the market, looked forward to a day's work, and braveed the difficulties that may unfold in the spaces of markets I and II.

Analysis of Ethnographic Data

Women Space and Value-Chain Nodes Intersect

Given the complex layers of the value-chain nodes in the tuna fishing industry, the spaces that women occupied and the functions that they performed in the fish port intersected on a few nodes (Table 1).

Table 1. Intersecting nodes of port functions

	MARKET I	**MARKET II**
Women's spaces/functions intersecting with the Value-Chain Nodes	Operator of a Company *Jambolero*	Individual Operator *Jambolero*
Women's spaces/functions that do not intersect with the Value-Chain Nodes	1. Checker 1 (as port's administrative staff) 2. Checker 2 (as enlister of the *Jambolero*) 3. Collector of Fish Entrails (*magdadayuk*) 4. Sun/Globe/Smart Cell phone loader	1. Tub Holder/Checker 2. Checker 2 (as enlister of the *Jambolero*) 3. Cashier 4. Fish Vendor 5. Sorter 6. In-charge of bread vending 7. Port Staff
Potential Unrecognized Value-Chain Node	Collector of Fish Entrails which is transformed into *Dayuk*	

The areas where women's space interfaced with the value chain nodes can also be gleaned through the maps of markets I, and II, of the fish port complex. These intersections are as follows:

Women's space interfaces with the activities and functions of fishing vessels such as "*Unay*" (mother boat), "*Pak-an*" (unmotorised carrier boat) and "*Pumpbot*" (pump boat) either as operators of a company or as an individual operator. Does this description contradict the previously held observation that women do not interface with fishing vessels given that the fish port is regulated by the myth that women bring bad luck to fishing ventures, and that women

may also not be physically apt to survive in fishing expeditions? Given this query, it is important to note that the perceived physical limitations of women workers in the fish port complex rather points to the economic difficulties experienced by many women, rather than on the physical differences between men and women.

What the cases of the overlap in the study reveal, however, is that women's space only interfaces with the value-chain nodes in the tuna industry of General Santos City as operators of a fishing vessel and as *jamboleros* since people in these nodes have economic capabilities, while many of the other spaces that women occupy in the fish port complex are considered as marginal to the value-adding opportunities in the tuna industry.

Discussion

Women's Space and Lefebvre

Using Lefebvre's (2014) notion of space, women's space in the fish port complex can be regarded as in intersect of space as lived, perceived, and conceived. These are some of the key analytic points of the dynamics in the fish port complex through Lefebvre's point of view:

Built according to the conceived plan of the port's engineers and architects, the notion of the value-chain nodes may also be regarded as part of the conceived space. This means that the value-chain process is a category which is not organic to the cognitive map of the women informants. As a category, it may belong to the planners of the port who imagined and constructed the port to facilitate the processes in the value-chain spectrum. The *jambolero,* for instance, knows that her work overlaps with the retailers and operators outside the fish port complex but this knowledge is only considered part of her function within the port. This means that the notion of the value-chain is something which the planners of the port had facilitated in the construction and arrangement of the port. The *jambolero,* however, only thinks of fish port in relation to his/her space and role within the port itself.

For space as perceived, the port has been transformed into gendered space and creative space. Gendered space refers to the sections of the port that

have become women's spaces and men's spaces, respectively, where women and men perform certain tasks or functions. These roles and locations, as the informants suggested, are regulated by cultural perceptions of differences between women and men. These gendered-perceived spaces are, in this respect, equipped with symbolic meanings as women consider the port as an extension of their homes. In this case, women magnify and strengthen the ties or strings that connect their households to the port. As a creative space, the women in market II also had found ways to circumvent the basic rule in the fish port that disallowed small businesses inside markets I, and II, through these economic endeavours as: bread vendor, fish vendor, and cell phone loader. As these economic engagements are formally not allowed, some of the women informants talked about introducing new informal rules. When interviewed on the reasons for carving out such spaces, they noticed that as long as your economic activity could be of help to others, the administration allowed you to proceed. One just needed to ensure that no complaints arose with the presence of these small economic activities.

With regard to lived space, the women informants stressed that what was more important than the economic gain were the core values such as honesty and trust in the fish port. For these women, such values functioned as pillars of success or as guarantees that they could continue to find work in the fish port complex. One informant, for instance, reiterated the point that if in one of the transactions, a *jambolero* misled a trader about fish quality, this would be forever remembered by the people who worked in the fish port. Such deceit would never go unpunished and people would avoid them. This was the reason that Cadiz Bibo, a *jambolero,* also proudly stated that working over a long time in the port meant having secured the trust of fellow workers and retailers. In this case, the length of stay in the fish port was proportional to the level of trustworthiness of the individual.

Since we are talking of lived or symbolic spaces, the notions of honesty and trust appear marginal to the value-chain process but are actually central to the fish port. Because through such values, a *jambolero* explains that if trust and honesty were violated, this would also signal the end of one's economic relation to retailers, scalers and operators in the fish port complex.

Women's Space and Longwe

With the perspectives of a female *jambolero* and a pumpboat owner in the fish port, the interface of their spaces with 2 value chain nodes can stand for empowering and fulfilling women spaces. While such points of overlap require financial capacities, the *jambolera* informant can be an example for women to go up in the ladder of economic opportunities in the fish port complex. Previously working as a checker, she picked up the skills to become a *jambolera*, a position she has now held for 9 years. Should women workers have better access to financial capital through loans to become *jamboleros* in the future? This is a direction which may be seriously considered to facilitate more opportunities for women working in the port. Also, the generosity that hovers around the fish port complex with regard to the fish catch is a feature that may have its roots in the cultural expectation of becoming part of and member of an organic community. As relations of trust are cultivated and friendships are formed, acts and gestures of generosity among workers and operators are demonstrated and shaped by the receptivity of the workers to each other's needs – specifically women, who work hard to earn decent money for their families.

Jan Cadiz Bibo, a *jambolero* since 2007, for instance, regards the fish port as space where one can have a good and enabling livelihood. She specified that in the port, if one would only work hard and be fair in transactions, money would eventually just flow. The informant particularly stressed the importance of honesty as a core value if ever one wanted to improve one's economic situation. With honesty, one gained the trust of the retailers, and it was necessary if ever one wanted to expand in the enterprise. With the positive contributions of the fish port to the life of the informant, she added that she actually already lived in the port. This meant that she already considered the port as an extension of her home. As an operator, another informant, Ritche Corto also found it rewarding to work and live in the port. She had worked in the port since 1998, and she had found that work in the port was not that demanding or difficult – "*tama-tama lang, di kaayo kapoy*". As owner of a pumpboat with two engines, she saw herself staying in the port until she grew old. This is how she explained why working in the port was rewarding.

The literature on women in the production area, particularly the fishing industry, often describes the marginalization of women. However, we found that in the port in General Santos City women did not couple marginalization with their spaces. While women inhabited fewer spaces in the port than men, the informants consider their livelihood spaces rewarding and important. In hindsight, such observations may be attributed to the fact that the informants were working, earning money and did not have harassment issues in the fish port complex. The health related issues that women experienced were also confined to these problems: "*sakit sa hawak*" (muscle pain around the waist); "*matunok ang kamot sa isda*" (pricked by fish spikes specifically for sorters); and "*na-slide kay wala nagbotas*" (tripped or lost one's sense of balance, since the checker did not put on her boots). Since these issues did not affect the over-all sense of well-being of the informants, the port remained a viable livelihood option for women.

Another reason for the positive framing of the fish port can be traced back to the way women workers acknowledged the port's capacity to provide other opportunities. For instance, the women informants underscored that one can always bring home a kilo of fish for the family. This guarantee created a sense of security for providing food for the family, and a relief from additional costs when buying fish from the local markets. As one informant expressed, "*basta naa ka diri, kay naa gyud kay isda na mauli pagkahapon*" (as long as one works and stays in the port, one is assured of bringing fish after a day's work). Hence, this type of generosity may also have conditioned the possibility of women regarding the port as an enabling space. Despite the limitations in income for most women when compared to the income and opportunities for work for men, the practice of 'fish-giving' mitigates some economic worries. In fact, the informant during the interview was carrying two small sized fish – "*piritol*", which she would take to her family later in the afternoon.

The positive frame accorded to the fish port when gleaned from Longwe (1991), however, left us with 2 ideas: that the stories either stand as manifestations of hope for better livelihood opportunities, or as a call for increased capacities to enable these women to critically see through their current spaces and situations in the fish port complex. Women seemed to only value their material welfare, since the port was able to provide opportunities for this, but they may still have desired better economic opportunities which the

current occupational sex disaggregation in the port was unable to provide. Hence, these women still thought and worked within Longwe's notion of welfare – which is still only the first stage in her welfare, access, conscientisation, mobilisation, control empowerment frame, since they were the secondary bread winners in their families, and the fish port upheld higher economic value to men's spaces and work. With these counter-insights to what the ethnographic data holds, the gender analytic frame points to the need to un-pack the deep-seated biases in the fish port complex that remain unfavourable to the potentials and capacities of women workers and spaces. In the midst of poverty and lack of better economic opportunities, the seeming contentment of women workers in the fish port could be studied more in relation to the specific context of poverty in the area, to the level of material welfare, and the level of access which may have conditioned these women to positively acknowledge their sense of access to their current spaces in the fish port. This was part of the paper's insight that conditions the need for more studies in fishing ports in the Philippines as gendered spaces and biases predominantly remain unchecked. Following Longwe's framework, women in the first port, if they are to attain higher levels of empowerment, would need to eventually participate in conscientization and decision-making processes in the use of space in the fish port.

Acknowledgements

This study was made possible by the Commission on Higher Education fund support for the Sustainable Development of the Philippine Tuna Value Chain Project under the Higher Education Regional Research Center - UP Mindanao.

References

Acheson, J. M. 1981. Anthropology of fishing. Annual Review of Anthropology 10: 275-316.

Amerkhan, M. 2016. Jobs value chain analysis on Tuna. Mindanao Jobs Report. World Bank, Manila. 80 pp.

Banez-Sumagaysay, M. 2003. Indicators of discrimination against women in farm homes and in the agricultural labor market. Review of Women's Studies 13: 25-48.

Barut, N. and E. Garvilles. 2005. Philippines fishery report. In 1st Meeting of the scientific committee of the Western and Central Pacific Fisheries Commission WCPFC–SC1,

pp. 1-12. National Fisheries Research and Development Institute (NFRDI), Bureau of Fisheries and Aquatic Resources, Philippines. https://spccfpstore1.blob.core.windows.net/digitallibrary-docs/files/86/861b4476737fadf4cc56f0e8e337d75b.pdf?sv=2015-12. Accessed 12 December 2015.

Blasco, P.G. and H. Wardle. 2007. How to read ethnography. Routledge, New York. 224 pp.

Demmke, P.T. 2006. Gender issues in the Pacific Islands Tuna industry. Forum Fisheries Agency, Honiara, Solomon Islands. FFA Report 07/21. 51 pp.

Dungo, N.G. 2005. Negotiating patriarchy and globalization: Dynamics of women's work in an agricultural economy. Review of women's studies: Special Issue on Gender, Globalization, Culture, and the Economy 15: 41-66.

FAO (Food and Agriculture Organization of the United Nations). 2013. Good practice policies to eliminate gender inequalities in fish value chains. http://www.fao.org/. Accessed 26 December 2015.

Foucault, M. 1967. Of other spaces: Utopias and heterotopias. http://web.mit.edu//allanmc/www/foucault1.pdf. Accessed 13 December 2016.

Kleiber, D.L. 2014. Gender and small-scale fisheries in the central Philippines (Doctoral dissertation).file:///E:/ubc_2014_november_kleiber_danika.pdf. Accessed 15 December 2015.

Lee, S., D. Song and C. Ducruet. 2008. A tale of Asia's world ports: The spatial evolution in global hub port vities. Geoforum 39: 372-385.

Lefebvre, H. 1996. Writing on cities. Selected, translated, and introduced by E. Kofman and E. Lebas. Blackwell, Massachusetts.129 pp.

Lefebvre, H. 2014. Production of space. (first published in 1991, reproduced in: The people, place, and space reader (eds. J.J. Gieseking and W. Mangold), pp. 298-294. Routledge, New York.

Longwe, S. 1991. Gender awareness: The missing elements in the third world development project. In: Changing perceptions: Writings on gender and development (eds. T. Wallace. and C. March.), pp. 149-158. Oxfam, Oxford.

Philippine Fisheries Development Authority. 2016. http://pfda.gov.ph/. Accessed 20 January 2016.

Obsioma, Sarah. 2014. Equity in the tuna value chain: Enhancing men and women participation in the tuna industry of General Santos City, Philippines. Unpublished working paper. School of Management, University of the Philippines Mindanao, Davao City. 10 pp.

Philippine Commission on Women. 2015. http://www.pcw.gov.ph/. Accessed 16 January 2016.

State of World Fisheries and Aquaculture report: 2012. FAO Fisheries and Aquaculture Department, Food and Agriculture Organization of the United Nations, Rome, 2012.http://www.fao.org/3/a-i2727e.pdf. Accessed 12 January 2016.

Gender in Aquaculture and Fisheries: Engendering Security in Fisheries and Aquaculture
*Asian Fisheries Science Special Issue **30S** (2017): 59-81*

ISSN 0116-6514
https://doi.org/10.33997/j.afs.2017.30.S1.003
Research Paper (Revised)

When a Fisherman can not Fish: Impact of the 2016 Legal Reform on Male Fishermen in Phan Thai Norasing Fishing Community, Samut Sakhon Province

KHAMNUAN KHEUNTHA*

Department of Gender and Development Studies, Asian Institute of Technology, PrathumThanee, Bangkok

Abstract

In the village of Phan Thai Norasing, Samut Sakhon Province, Thailand the livelihoods of villagers revolve around fishing-related activities in which men concentrate on fishing and women on on-shore activities such as sergestid shrimp (*Acetes* spp.) processing. Here, masculinity has been constructed around the status of the breadwinner. The men must fish to catch targeted species and earn sufficient income. Working at sea also provides the fishermen with an important sense of being their own boss. However, traditional fishing is uncertain and unreliable with fluctuations of weather, uncertain volumes of catches, especially for traditional fishermen who use fishing boats not larger than 10 gross-ton. Since 2015 in Thailand, the yellow card issued by the European Union for not taking sufficient measures against illegal fishing has become an issue in Thai fisheries, leading to massive legal reform and tightening legal enforcement. Such legal amendments brought about a strict ban on push nets which have been traditionally and extensively applied by fishermen in Phan Thai Norasing village. Previous studies have shown how changes in law that hinder men from fishing can impinge on the way those fishermen perceive themselves as men. This paper, set in Phan Thai Norasing fishing village, portrays how the legal amendment effects hindered the capability of fishermen to maintain their masculinities. The research illustrates the adaptive strategies of fishermen in this village in response to the change in law, and the impacts of the quick enactment of new laws on men and women.

* Corresponding author. Email address: paikhamnuan@gmail.com

Introduction

In 2015 the European Union (EU) issued a yellow card to the Thailand fishery sector as a warning against the illegal, unreported and regulated (IUU) fishing (European Commission 2015). Thailand was denounced for not taking sufficient action to monitor, control and sanction illegal fishing activities. In order to eradicate IUU fishing activities, Thailand had 6 months to release coping mechanisms and amend its domestic laws according to international standards (European Commission 2015). In response to the EU warning, the Thai government has amended the law and established a new division operated by the Thai Royal Navy called the Command Centre for Combatting Illegal Fishing (CCCIF) in collaboration with other departments such as Department of Fisheries, Department of Natural Resource, Department of Labour to deal with IUU practices, such as exploitative fishing, uncontrollable fishing equipment and unmonitored fishing fleets. Also, the Royal Ordinance of Fisheries (2015) has replaced the Fisheries Act 1947 as the principal fisheries law. With this swift change in regulation, push netting for *I-Kong* (*Acetes* spp.) for making Thai food ingrediants called “dry shrimp” which is the staple source of income for Phan Thai Norasing fishing villagers, was completely banned in 2015. Unlike previous similar efforts of the government to ban this equipment, this time the law was actually imposed.

In previous studies, there was evidence that a change in regulations related to fishing disrupted the continuity of livelihoods in fishing communities and hindered men from conforming to the hegemonic traits of masculinities. This can affect fishermen’s perceptions of themselves due to the suspension of fishing which is predominately a men’s activity (Davis and Gerrard 2000; Hall 2004). Men in the fisheries sector may become enclaved in fishing that catches certain target species as their main source of income. When men cannot comply with that conventional trait, and hence be able to support their families, their sense of masculinity can be affected, leading to a new division of labour within their households (Davis 1993). Based on those ideas, the questions to be answered in this article are: if changes in the law affect the continuity of livelihoods in this village and men cannot fish, how does it affect those men who are expected to earn incomes through fishing? What are the coping strategies of those men? Does not the amendment of the laws affect women? The main hypothesis here is that reformed law could challenge the male’s sense

of masculinity when they cannot earn sufficient income from fishing, the main trait of their identity.

This paper studies the impacts following the vast and significant 2015 legal amendments in Thailand fisheries. The livelihoods of fishermen in Phan Thai Norasing and the relationship between men and fishing will be described to provide an overview of the fishing village, and also how gender is affected when fishing activities are disrupted by bans of equipment.

Methodology

The methodology of the study was qualitative, using in-depth interviews as a research tool. The interviews were undertaken with both men and women of 11 households which had fishing in their main livelihood portfolios in Phan Thai Norasing village. The interviews were applied to 10 men and 12 women in order to gather information concerning how they have been impacted by the recent legal reforms. The youngest male respondent was 32 years old and the eldest was 67 years old, and the youngest female respondent was 24 years old and the eldest 65 years old. Twenty out of 22 respondents were married; only 2 male respondents were bachelors. Most of the respondents obtained only primary school education. Only 2 female respondents had above the primary school level.

The interviews were initiated by interviewing the leader of Phan Thai Norasing fishing group, an officer of the provincial fisheries office and a leader of a small-boat group as key informants, in order to collect a broad base of information. The questions for in-depth interview consisted of three parts including the interviewees' livelihoods before promulgation of the new laws, gender roles and relations within a fishing household, and the impact of the new laws focusing on gender impacts. The questions for the leader focused mainly on an overview of the village historical changes and the catch species of fishermen in this village.

Snow-ball sampling was applied for the data collection. I tried to select people deploying different sizes of fishing vessels. The majority of villagers deploying small fishing vessels of not larger than 10 gross-tonnage (GT) and were classified as doing traditional fishing. There were only 2 boats larger than 10 GT still operational in this village. All interviews were conducted in the

fishermen's houses. Follow-up interviews were frequently deployed because the richness of data varied depending on the level of familiarity of the researcher with the respondent. Seven interviews were conducted with female and male respondents in the same households separately, but sometimes they preferred to be interviewed together.

To develop rapport with the villagers, the researcher needed to visit this village frequently to understand their daily-life and the characteristics of their fishing activities as well as to conduct follow-up interviews. To a large extent, such observations could be used to visualize the concentration of men and women in particular activities. Data collection was made more difficult because several fishermen spoken to were suspicious that University students would write about their occupation in a negative way. Many fishermen believed that previous studies conducted by Thai universities had contributed to the legal reform and their current trouble.

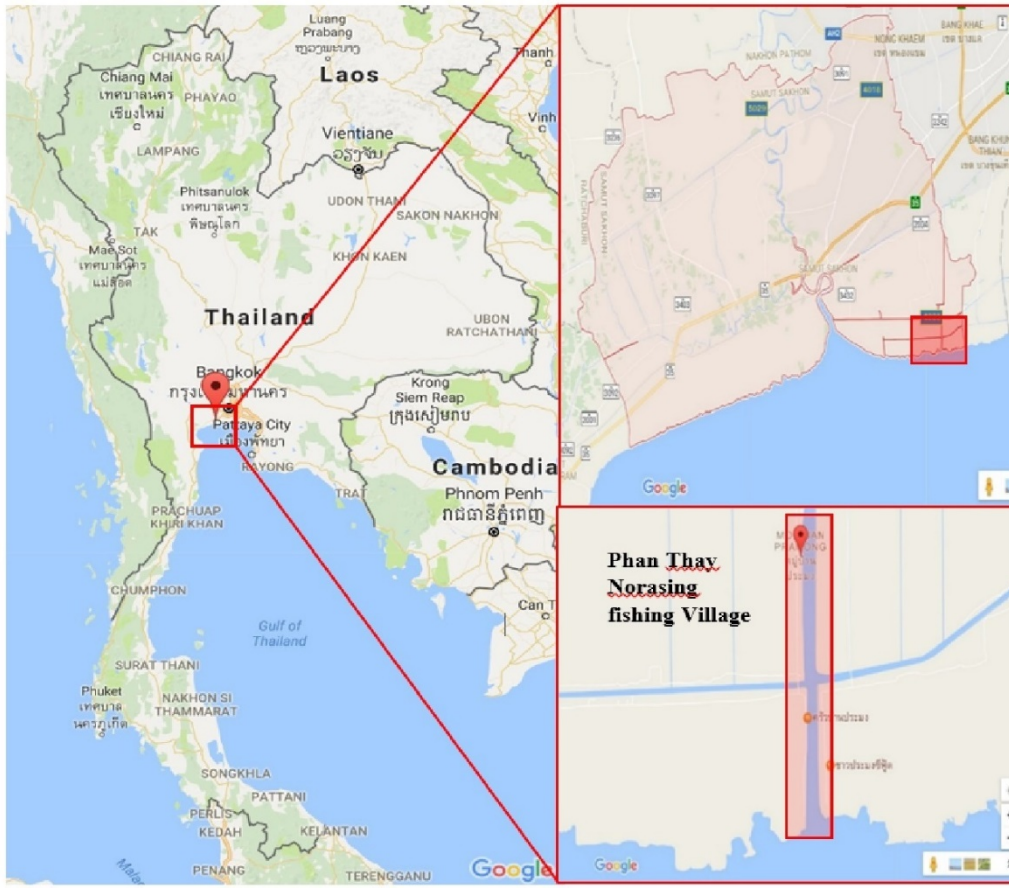
Results

The study Site: Phan Thai Norasing fishing village and its livelihood activities

The Phan Thai Norasing fishing village is located in Samut Sakhon province which is one of the most significant port provinces in the Gulf of Thailand. The geographic characteristics of the Gulf of Thailand seabed range from mud, sand and shell in the upper eastern area to silt in the estuary in the northern area where Samut Sakhon is situated (Phasuk 1987). Even though exact data regarding the population of the fishing village were not available, the data collected by the head of Moo (neighbourhood) 8 in the village estimated about 80 households. Meanwhile, in Moo 4, there were about 50 households based on estimation of each respondent. Interestingly, in the past, Moo 8 used to be a part of Moo 4. Due to the growth of the population, they have been split for public administrative reasons. In total, Phan Thai Norasing fishing village consists of 130 households.

Most of the people in Phan Thai Norasing fishing village earn their living through fisheries collecting growing green mussel (*Perna viridis* (Linnaeus 1758)) and recently fishing for mussels in small boats not larger than 10 GT. Only a few villagers have fishing vessels larger than 10 GT. In this

village, small boats are crucial for the inhabitant's livelihoods because these provide a way for commuting and generating income. Those fishermen using boats smaller than 10 GT call themselves traditional fishermen. Because of the short periods of fishing trips, the distance from the coast to the fishing grounds, and the limited capacity of their fishing gear, they participate only in small-scale fisheries (SSF).



Source: Google Map

Fig. 1. Map showing location Phan Thai Norasing fishing village located in Samut Sakhon province

As Béné et al (2007) state, the concept of SSF is complex in the sense that it can mean various sorts of fishing vessels ranging from single person canoes to more than 20 m trawlers, irrespective of the purpose of catching. The technology deployed to alleviate the labour intensity on board is the crucial aspect used to distinguish what is 'small-scale'. In Thailand, the terminology of SSF can be understood as traditional fisheries. Prior to law reform in 2015, the definition of traditional fisheries was quite obscure and did not differentiate

whether these should be distinguished by their deployed technology or size of boats. After the legal amendments, SSF has been clearly defined by the size of the boat, which must not exceed 10 GT whether using an engine or not. This is the definition from the Royal Ordinance of Fishery 2015 and the definition applied by the National Statistics Institution (NSI) (Lymer et al. 2008; Royal Ordinance of Fishery 2015).

The main catch species in this area are sergestid shrimp and fish, the latter in small proportions. According to villagers, the sergestid shrimp caught can be distinguished into two types, a smaller one called in Thai "Keuy" which can be processed to shrimp paste and the one called "Keuy Kong" or "I-Kong" which can be processed into dried shrimp (Fig. 2). Each of these species is caught using different equipment.

Keuy (Juvenile *Acetes*) | I-Kong (*Acetes*) | Juvenile shrimp (*Penaeus*)

Fig. 2. The difference in size of Keuy, I-Kong (both *Acetes* spp.) and juvenile penaeid shrimp.

Two types of push nets deployed in this area can be distinguished, according to the target species, the locally known green or blue net for catching the "Keuy" (*Acetes* spp.) for processing into shrimp paste and the red net for catching the "I- Kong" (*Acetes* spp.). In this village I-Kong is the staple income resource (Fig. 2).

The nets differ in the knots they use. The green net has no knots and its meshes are small to prevent *Acetes* shrimp from escaping (as in a mosquito net). Boats using these nets cannot move quickly. A boat deploying a green net for a long time or moving too quickly risks tearing the net due to the water pressure within the bag. The red net, by contrast, has larger meshes and knots which enable the fishing vessels to move slightly more quickly so they can reach the I-Kong which swim faster than the Keuy. It is noteworthy that a main reason that I-Kong is the most crucial income resource is their availability. In comparison to the sergestid shrimp for making shrimp paste which are abundant from June to November, I-Kong are found year round, and are most abundant from April

to September. Gill nets are not normally utilized in this village. They are considered as a sideline rather than the staple income earning activity.

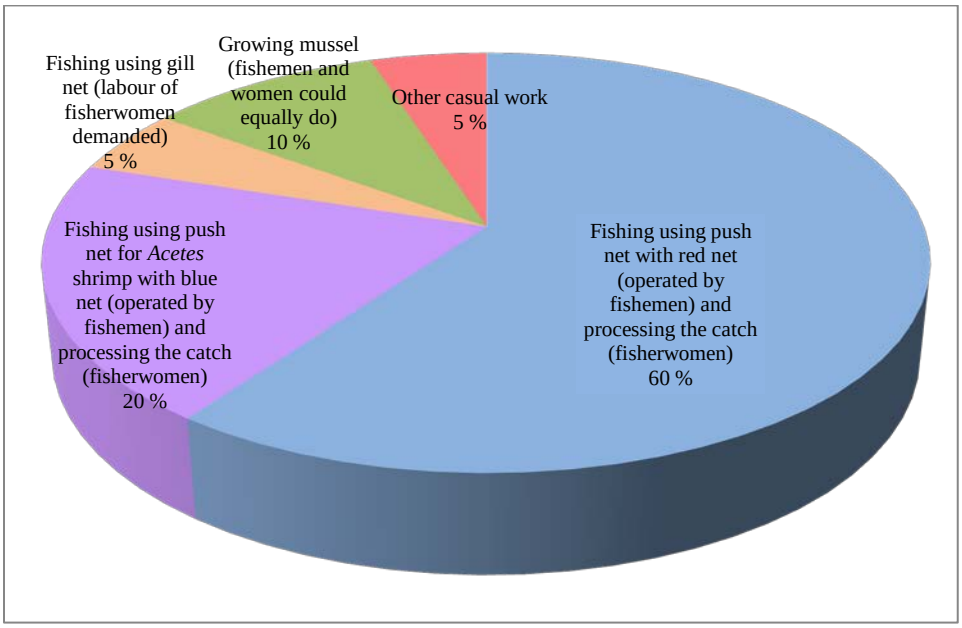


Fig. 3. Proportion of incomes earned by each equipment measured, based on 5 small-scale fishing households using push nets.

Due to the similarity between sergestid shrimp and penaeid shrimp (Fig. 2), outsiders mistakenly think that the villagers are catching juvenile Penaeid shrimps, challenging staff of Department of Fisheries and fishermen on the species. As the head of fishermen groups shared:

"A board member of the Department of Fisheries came to this area and alleged that we caught juvenile shrimps because sergestid shrimp and juvenile penaeid shrimp are very similar. Then, I dared him to bring sergestid shrimp to Bangkok and grow them. If it can grow up and becomes a big Penaeid shrimp, we would stop catching them altogether. Yet, definitely it cannot, because sergestid shrimp and Penaeid shrimp are different species."

Besides the sergestid shrimp and finfish fisheries, the village is also well-known for growing mussels on bamboo poles along the coastal seabed and in the grand canal next to their houses. For growing mussels, fishermen need a concession from the local government and are taxed for using the area. However, for the small-scale fishermen, growing mussels are not the main income earning activity. Not everyone can take up this activity, because of its

demands of high investment. For instance, if they invest 20,000 THB (Thai Baht) or USD 588 for the bamboo poles, they could potentially gain around 50,000 THB or USD 1,470, after deducting costs of harvesting, cleaning and sorting. This income does not enable them to survive for the whole year with this single activity.

It is worth noting that breeding natural mussels through using bamboo poles not only generates additional income for the villages, but can also mitigate bank erosion which used to be one of the village's main problems. Besides its function as preventive a tool, the bamboo poles in the coastal area can stand as a reef which can shelter juvenile marine species, because the fishermen cannot fish the area. Fishermen believe that this mussel growing field can perform two functions by being a shelter for marine creatures and an alternative income resource.

In addition, the fishing and mussel growing generate additional jobs related to processing paste or dry shrimp, crews working for large fishing vessels, net weavers, retail ice sellers for products landed, casual labourers who plant and repair bamboo poles for mussels and so on. For instance, processing small shrimp to paste is demanding of labour and generally carried out by women. At first glance, it looks easy but is not in practice. Once the sergestid shrimp is transferred from the boat, it needs to be salted and sorted and strained. Subsequently, it needs to be dried in sunlight. While drying, it has to be flipped over to ensure that the small shrimp is thoroughly dry. When it is completely dry, stains and dust must be removed before grinding and being fermented for about 6 months. These processes cannot be achieved by only one person; hence, women from other households are usually called to finish this back-breaking work.

Despite the availability of income earning activities, the jobs are unpredictable and seasonal. Most of the respondents encountered difficulty in calculating their exact incomes earned by each activity. Unpredictable weather conditions and water pollution were considered the main challenges. Samut Sakhon province is a hub of manufacturing which can affect the quality of water owing to the release of waste water from the factories to the stream which accumulates and passes through the grand canal in their village. Thus, fishermen need to be familiar with seasonal changes, actively aware of the

unpredictable arrivals of their catch species and able to deploy suitable fishing nets to make the catch. Ultimately, they always need to prepare their boats, nets and their bodies to be in a good shape for fishing trips. The survival of fishing households depends on the ability of men to catch sergestid shrimp and the efficacy of women to manage the household finances as well as process the catch of their husbands.

Traditional fishermen who use fishing boats smaller than 10 GT lack cutting-edge devices such as sonar and radar. Furthermore, their boats cannot withstand extreme high tides, winds and fluctuating weather condition of the coastal area. Thus, for those traditional fishermen, experience in fishing, familiarity with the coastal area, peer networks through which they share information of the availability of sergestid shrimp and fish schools, and even luck are necessary for the success of each fishing trip. Larger boats, in contrast, have various fishing equipment such as radar, sonar and mechanized cranes along with large boats that enables them to remain safe at sea and reach targeted catch species comfortably.

Living under difficult circumstances

The actual circumstances of people living in small-scale fishing communities tend to be overlooked by the government and their needs ignored (Ellison and Allis 2001). Moreover, the fishing-dependent community itself is considered a poor community and one in which the members are hampered by limited natural resources (FAO 2007). The level of income is not a sufficent measure for understanding poverty (Kabeer and Whitehead 2001; Allison and Horemans 2004). Poverty, especially in small-scale fishing communities, is related to exclusion from various basic services, being politically rejected, and experiencing the social reality of being invisible at the policy level (Allison and Ellis 2001; FAO 2007; Robbles-Zavala 2014). The Phan Thai fishing community is an excellent example of this. Only recently did infrastructure such as electricity, concrete roads and running water reach this village. Locals over 30 years old recall having to buy fresh water from a foreign boat, and, even though the water quality was questionable, they had to drink it or stay thirsty. Mr Kim (60) mentioned:

"In the past, this area did not look like nowadays. In my lifespan, I have never imagined having running water in my home. I used to carry water with a big bucket for drinking and, after crossing a great bridge, by the time I reached home only a half of it remained in the bucket. In summer, I had to take a bath with sea water and clean my body again with a little fresh water. If it rained, it was as if God blessed us because it was moist. Later on, there was a boat carrying water that was sold in this village. However, the water was not clean enough for drinking. Sometimes, it was red like blood. Local government tried to drill wells to find underground water but their equipment during that time was not advanced enough. Just like water, electricity also did not reach this area, so we relied on lamps".

Similar to Kim, the younger generation people also had the same experiences. Mr. King (30) informed:

"When I was young, I remember a boat coming along the canal to sell water in this village. For those households located at the back of the village, water was saltier and was more dirty. I had to go to school by boat because cars could not reach my home at that time. The road during that time was just two concrete sheets placed on the ridge of the fish pond and secured by ropes. The road needed to be repaired once a year. Villagers would contribute their own money and labour for fixing the road. Fresh fruits and vegetables were difficult to find as well. They would have a boat carrying foods such as vegetables and snacks only once in a while. Every child including me would look forward to seeing that boat. The current good-looking concrete road has just been constructed in the last 2 years".

Feelings of being abandoned by their government were widespread among the traditional fishermen of Phan Thai Norasing. Ms. Leaw (60 years old), leader of a small-boat group, reflected after she achieved a meeting with the government to compromise on prohibition of red nets after enactment of the IUU-related laws:

"Uncle Montree joined the meeting arranged by the Department of Fisheries with me. He would talk on our behalf because a person like me, who did not even conclude primary education, would not be believed. In the meeting, they talked only about commercial fisheries which applied to big

boats. Finally when uncle Montree went to talk about our problem from the strict enforcement of IUU-related regulation, they (the organizers) just shut uncle Montree's microphone off and told him that time's up".

Besides the historical difficulty and their weak voice in negotiations with the government, the fishermen's lives also face the challenge in earning their living due to the scarcity of the necessary capital enabling them to diversify their livelihood portfolios. In Phan Thai Norasing fishing village, the villagers do not have land titles that would enable them to plant cash crops. Most of the respondents received only primary school education, and this was not sufficient to empower their upward mobilisation. These fishermen have little feasible chance of finding alternative work and they tend to turn to the sea as their last resort, and the place with which they are familiar.

Men and fishing in Phan Thai Norasing fishing village

To understand the relation between men and masculinities in this fishing village, masculinities are considered as "the social roles, behaviours and meanings prescribed for men in any given society at any one time" (Kimmel and Aronson 2004: 503). This term, as with the definition of gender, emphasizes not only the biological destiny but also the perceived masculinities as social production constructed by social institutions (Kimmel and Aronson 2004). Within this idea, masculinity per se cannot be understood in the singular, but rather they are diverse and hierarchical. On top of the hierarchy, there is a hegemonic masculinity pattern which is "the currently most honoured way to be a male" (Connell and Messerschmidt 2005).

In fisheries, men and women are clustered in different fishing activities. According to FAO (2014) men are frequently understood as fishers who sail out to fish in the sea; whereas, women occupy the on-shore activities such as fish processing, trading the catch and conducting other necessary reproductive works. Similar to such notions, gender roles in Phan Thai Norasing fishing village conform to such patterns where men go to fish out to a distance allowed by their fishing boats and gears. Women, in contrast, mainly play the role of sergestid shrimp processers enabling them to juggle their productive and reproductive work within their communities. Women go along with their male counterparts on fishing trips only when their labour is in demand.

Native men learn how to fish when young, usually from their fathers or their male relatives both in traditional and commercial fishing. They also learn how to use the stars to navigate, when the weather changes and the need to be familiar with the geography of the coast to avoid rocks and shallow areas which can damage their boats. Fishermen have to look after their boats regularly and deliberately because they are the most crucial equipment for gaining a living. The knowledge related to fishing is not systematically taught in any educational institution so traditional knowledge of fishing techniques is passed down from father to sons in each household. Sometimes, fishers' sons do not use the same boats as their fathers.

After following their fathers or their male relatives for a time, young males start fishing alone. The first time when a man goes out by himself is a memorable experience as Kim (65 years old) who has been working as a fisherman since the age of 14, reflected:

"I was excited when I fished alone. Before that, I needed to accompany my uncle. Whatever he had asked me to do, I had to comply. Yet, if I went alone, I can say that I catch those fish by myself through solely my skill from this place and that place".

"Freedom" and "No employer" are key words to explain specific characteristics of fishermen, especially traditional fishermen in the Phan Thai Norasing area. Even though many men from fishing households decided to work in different kinds of factories outside the village at some time in their lives, tight regimentation could drive them back to work as fishermen who could decide whenever and wherever they would sail out to fish. A traditional fisherman called Mai, who used to work in a factory outside the village, shared what drew him back to the village:

"After 5 years of working outside, I decided to come back to the village to work as a traditional fisherman. I like the sense of freedom and I feel that I have autonomy to choose when I should work. No one will point their fingers at you and order what you have to do. If you are hard-working, you will have money".

In Phan Thai Norasing fishing village, the ethic of working hard has been given the highest value among the men. Men are expected to be appropriate breadwinners who earn sufficient income through fishing for their households. Female respondents' answers confirmed that this factor is a quality taken into account when selecting a husband. However, it does not mean that working as a fisherman looks "cool" from the women's perspectives, but rather that it connotes economic security. Meanwhile, in this village, fishing and other occasional fishing-related labours such as repairing boats, nets or processing harvested mussels are other sources of incomes. It could be said that their main sources of income rely on their boats, the sea and their physical strength.

In the fishing community, fishing has been given the highest priority, over even education. Connell and Messerschmidt (2005) highlight the hierarchical characteristics of hegemonic masculinity over other forms of masculinities. In the context of the Phan Thai Norasing fishing village, hegemonic masculinity could be understood as a fisherman who could sail out independently to conduct fishing without the restriction of the rules, and be his own boss. This notion has been reflected in the following quotes:

"My son, as soon as he finished his primary school, he told me that he decided to drop out from school and enroll for non-formal education because he did not want to study. He wanted to sail out. Some people here might have their bachelor degree, but have decided not to go to any other places because they want to be their own boss". (Now, female, 40 years old)

Similar to Now (female, 40 years old), Aye (male, 39 years old) said that:

"Most of the children would work on their own fishing boats because most houses in this area have a fishing boat; mostly they preferred not to be an employee. If I have to do other work, it might make me suffer because I am used to the boat. In the village, there were people who have a bachelor's degree who sail out to fish as well".

As native fishermen learn fishing from their relatives, they have advantages over those who move from the inland to the coast. Those who have been fishing since they were young are able to intuitively recognise the availability of target species. They are adept at controlling the engine and their

push nets simultaneously. On the contrary, new arrivals need time to reach that level of skill. Na (female, 35 years old) shared her stories of assisting her husband in fishing trips:

"I did not originally grow up in this village. It took us years before we could be skilled. When I helped my husband, I needed to leave my house around 4.00 p.m. and returned around 6.00 a.m. of the following day. I had to accompany my husband because we are not originally from this village. The locals could sail out to fish alone, but my husband and I needed to help each other".

For the new inhabitants in the village, the labour of women is sometimes necessary when sailing out to fish. These women help their husband to operate the engine while their husbands are fishing. New fishermen are expected to catch fish in amounts at least equal to their neighbours. Due to the small size of this fishing village, news related to their success or failure is circulated easily. Men are compared for their target species catches.

Due to the absence of electronic technologies in small fishing boats fishermen must manually locate the target species, and for this peer networks are necessary. Whenever a fisherman successfully finds a school of sergestid shrimp, he informs his friends by mobile phone. Because small boats are vulnerable to fluctuating weather conditions (tides, winds), fishermen whose boats get into trouble, e.g., capsize, need peer help to deal with such unexpected circumstances. In addition, rituals and religious beliefs highlight physical and behavioural self-discipline to mitigate the impacts of these uncertainties.

For fishermen, drinking is prohibited during Buddhist holy days. They also have to undertake social work, e.g., cleaning temples, donating food to the monks, and praying at the shrine for successful fishing trips. King, a fisherman who consistently follows these practices shared the reason behind this:

"Our work (fishing) is a sinful work because we need to kill other living things to gain our living. So, we need to make a merit in order to reduce our sins".

On fishing trips, rules of respect for the goddess of the sea "Mae Ya Nang" are followed. Some of the rules are: a call to the goddess to board the

boat (ritual performed only by males); taking off shoes before boarding; and abstaining from sexual intercourse on-board. Any infringement of the rules can affect the catches or even risk having a fatal accident at sea. In some areas of Thailand the beliefs concerning the goddess of the sea completely forbids women from working on boats. But in this village, women can accompany men on fishing trip and can help their husbands or their male relatives in fishing trips when their labour is needed.

Effects of IUU-related regulations on the fishing community

In 2015, when Thailand was issued a yellow card by the EU, the Thai government responded harshly. The Thai military rulers decided to abolish the prior Fisheries Act established in 1947 and replace it with the Fisheries Act 2015, and subsequently, the Royal Ordinance of Fisheries 2015. These new laws have been strictly enforced. The new law characterises traditional fisheries based on the size of boats, which must not exceed 10 GT, and other specific definitions with respect to fishing gear. The Thai Royal Ordinance of Fisheries 2015, coupled with the regulation of the National Council for Peace and Order 24/2015, clearly outlaws "Push net utilized by mechanised boats except push net for small shrimp with mechanised boats in accordance with the formats of tools, sizes of boats, fishing techniques and fishing ground determined by the relevant regulation of the Command Center for Combating Illegal Fishing (CCCIF)". By this definition of the regulation, it is clear that any kind of push net is no longer legally permitted. Nevertheless, in 2016 a compromise was made on the use of the blue net for catching *Acetes* (small shrimp) to make shrimp paste from May to December. This, however, does not compensate for the income loss owing to the ban of the red net. In other words, since the rapid change in the law in 2015, the fishing households in Phan Thai Norasing Fishing village cannot conduct fishing with the red net any longer. It direcly affects the incomes earned by small-scale fishing households in Phan Thai Norasing fishing village.

Small-scale fishermen's incomes fluctuate in response to weather conditions, availability of the target species and water conditions. In order to estimate the economic impacts, the researcher asked the respondents from each household to estimate the losses from their income through an imaginary scenario in which the respondents estimated their income based on the peak time in which the targeted species were the most abundant, and the weather

conditions were perfectly suitable during every feasible fishing trip. In addition, the measurement is based on the imaginary circumstance where all target species are available at the same time in a month, which is impossible in reality. In consequence, it is ultimately needed to bear in mind that the income measurement was conducted in an ideal imaginary scenario. In fact, the income of the fishing households is lower than the estimation in the Table 1.

Table 1. Estimates of the change in monthly income for Household 3 before and after the implementation of new fisheries laws

Activities	**Contributor**	**Income before the ban in USD (1 USD=34 THB)**	**Decrease in household's income due to the ban in USD (1 USD=34 THB)**
1. Fishing with push net (red net)	Male	1102.9	-
2. Fishing with blue nets	Male	165.5	165.5
3. Fishing with the gill net	Male	73.5	73.5
4. Growing mussel	Male/Female	122.3	122.3
5.Working in the mussel processing station	Female	7	7
6. Working in the small shrimp paste processing station	Female	14.7	14.7
	Total	1485.9	383

Source: In-depth interview to household 3, 2016

The yellow card and the military enforcement capacity of the government enabled the government to swiftly promulgate the new laws in order to legally abolish the push net. The government thus successfully controlled use of push nets after their first failed effort to control and abolish this fishing equipment in the 1980s (Nettasna 2014). However, the sudden change in the laws without consultation with the villagers and without mitigation measures for the small-scale fishermen affected has been a shock to this fishing village. Male traditional fishermen who are expected to earn sufficient income from fishing to support their households might be adversely affected by their inability to conform to the expected gender roles. Moreover, their capability to alter their livelihood portfolios is constrained by their low levels of education and the absence of other necessary capital such as land, cars and money.

When a fisherman cannot conform to his hegemonic trait

The failure to comply with the prevailing trait of masculinities can drive male fishermen to perceive themselves as incomplete men as King (male 32 years old) mentioned :

"The expectation of this community on the men is to earn sufficient income to support the family. When I cannot sail out to fish, I feel anxious […] I feel like I am an incomplete man and feel so bad about myself".

Even so, those men still make a huge effort to comply to the masculine standard by taking up casual labour such as harvesting shell in other people's ponds located near their village, fixing other people's boats or processing mussels when available. The capacity to earn some income would help them to maintain their sense of masculinity and maintain conventional gender roles in which males are income earners and women are nurturers. The men's efforts to do so, and their feasibility of diversifying their livelihoods are also constrained as expressed in group interviews of the 3 members of a fishing household:

Husband: "They told us to change our occupation without saying what should be an alternative. They just told us to change".

Wife: "Tell them (the government) to give us some land! I will plant some vegetables".

Elder daughter: "The fishing ponds around this area do not belong to the villagers".

Nevertheless, feelings of unease could occur when a man has to leave the role of provider to the wife's hands as stated by Aye (male, 39 years old) whose wife ran a small noodle shop and a small grocery nearby the shrine in the village. For him, relying on his wife's income brings him shame:

"I help my wife with running her shop, but I feel bad. I don't know how to explain it but it is different from when I can catch fish by myself".

Traditional fishermen's coping strategies

Among the fishermen in this fishing community, the coping strategy which is the most pervasive is to persist at fishing with the illegal red net to catch *I-Kong.* Due to the illegal status of this activity, fishermen needed to fish in a group and turn lights off while doing so at night. This demands familiarity with the geographical setting of the area, as Mod (male 39 years old) explained:

"I just turn the light off and just be in hurry. I am not afraid of the reef because I could remember the reefs because of sailing out when the sea water is down".

In addition, those fishermen need to be vigilant for any sound, as King (male 32 years old) mentioned:

"Once, I heard the engine of a boat. I needed to venture as quickly as possible and hide in the mangrove forest nearby for the whole night until I was sure that they left".

Even though they try their best to cope with this problem, it does not necessarily mean that they regain their incomes on a par to before the ban. Thus, male fishermen needed to find alternate income earning activities, such as fixing other people's boats or other jobs which allowed them to fish and avoid police surveillance. Leaw (Female 60 years old) mentioned his son's alternative income earning activities:

"My son would repair other people's boats. He will go to Mahachai dock (about 10 km from the village) and ask if the work is available. He might go about 1 or 2 weeks and receive about 2,500-3,000 Baht depending on how much they will give him. Or in the worst case, he might use the rod to fish on the bridge to get 100-200 Baht".

Apart from illegal fishing with red nets, fishing with gill nets is more frequently practiced. For fishing with gill nets, women's labour is needed. Nevertheless, income earned through fishing with gill nets is not high.

Fishermen with limited education and property must carry out physically demanding labour to earn income. Not all of them have the same level of

physical capacity and the weaknesses in their bodies as well as age can cripple their possible options as Dang (male, 56 years old), who has back pain that limits his capacities to carry out labour intensive work said:

"Currently, I cannot conduct any heavy work like road construction and other activities which require me to bend my back because I fell from the bridge twice […] Even though I want to work in a factory, but who will accept a guy at this age?"

Unexpected impact on women

Without it being noticed, the extensive illegal fishing has also adversely affected women in different ways. For example, to clandestinely and safely conduct illegal fishing activities, information from the shore is needed to inform of the location of the police. Here, the women assist the fishermen at sea. The role, however, puts an extra burden on women and deprives them of their rest at night time. Lew (female, 60 years old) and Nong (female, 33 years old) mentioned their inability to sleep during the night due to their husband's choice of conducting illegal fishing:

"When my son goes to fish in the night time, currently it is not only he who is deprived of sleep, but also people on-shore like me cannot sleep as well. I lay down and get up very often during the night time. I check my mobile phone all the time to be ready for the time when my sister (living in the village in which the patrolling boat anchors) informs me that those guys have moved. Then, I will call my son who is at the sea to tell his friends to come back as soon as possible. If he reaches home safely, then I will be able to sleep". (Lew, female, 60 years old)

"When my husband decides to sail out to fish, I cannot sleep at all. I am afraid that he will be detained by the police. If he gets caught by the police, what will I do? I do not have such money. I will feel relieved when I see my husband back in our home. Then, I will process the catch of my husband. […]. Sometimes, my husband asks me if I have slept. Yet, you know who will be able to sleep. It is like I do not sleep, like my husband". (Nong, female, 33 years old)

When their male counterparts are detained by the police for illegally fishing, women also need to carry the burden of getting bail for the detainees and it can directly lead to their exhaustion, as Now (female, 42 years old) mentioned:

"During that incident (when her husband was caught by police), I felt so exhausted by the struggle. I had to find the bailor because I cannot pay for the required money in cash because money is not what can be easily earned (around 50,000 THB or USD1470). In every procedure, it requires money, from going to the police station to the court".

Discussion

Changes in economic structure, law and regulation, and natural resource degradation are important factors challenging conventional gender patterns (Davis and Gerrard 2000; Hall 2004; Haque and Kusakabe 2005; Skaptadotiir 2000). In the context of fishing communities, the scenario in Newfoundland studied by Davis (1993) showed how the new policies were considered to favour the large companies instead of the village fishers, resulting in chronic unemployment among the local people. The boundary between men/sea and women/shore collapsed, men found themselves in circumstances in which they failed to perform tasks on their own. Instead of finding other sources of income, most unemployed men decided to stay at home and began doing housework which is traditionally considered a feminine job.

For fishing households in Phan Thai Norasing fishing village, fishing is not only the main source of income, but also the source of identity in which males and females construct their senses of masculinity and femininity through fishing activities. Such a notion is reflected by the identity as "*sea people*" utilized to highlight the relation between the villagers and the seas. Even though the government had permitted push nets for *Acetes* shrimp (blue nets), the loss to household income was still large. Men could not earn the same amount of income that they could before the enactment of the laws. The shortage of capital to enable fishermen to diversify their livelihood activities was accompanied also by their attachment to fishing as their job.

To cope with the shock of losing their jobs, men and women in the same housholds, including in fishing households, tend to have different adaptive strategies (Siar 2003; Hapke and Ayyankeril 2004; Hapke 2012; Bee 2016). In Phan Thai Norasing village, the men decided to pursue fishing with red nets despite their illegal status and its risks. They seemed to be struggling to retain the local hegemonic traits of masculinity, especially as alternative livelihood options were not available and they obtained no assistance to adjust. The women also performed a role in enhancing the men's ability to continue fishing, albeit illegally, even though they needed to sacrifice themselves in favour of the men. Here, the hegemonic pattern of femininity that Connell and Messerschmidt (2005) called the "emphasized femininity" had emerged.

Conclusions

The survival of fishing households in Phan Thai Norasing fishing village relies massively on fishing related activities in which catching *I-Kong* (*Acetes* spp.) for processing dried small shrimp is a staple resource. Fishing in this village, regardless of types, is labour-intensive and male-dominated work. The cases illustrate how men in the village emotionally or occupationally associate with fishing; it becomes an important part of their identity. Those male fishermen construct their sense of masculinity through fishing.

Restriction of fishing nets by IUU-related regulation resulted in a remarkable decrease of household income. The fishermen's incapacity to earn sufficient income is perceived as a failure according to their conceptions of masculinities. This causes those males to perceive themselves as incomplete men. In order to cope with the shock led by the laws, coupled with the shortage of capital, these fishermen opted for illegal fishing activities as their main pervasive adaptive strategies. Other income earning activities were considered as supplementary only. Surprisingly, women have played an important role in maintaining the male's role as a fisherman although it has cost them exhaustion and extra burdens.

Acknowledgements

To be honest, I do not know how to express my gratitude to the many ladies who support me all the time. I decided to set off based on the fact that

this paper was a part of my master thesis, so, first of all, I want to say thank you to Professor Kyoko Kusakabe for every cordial support she gave such as her encouragement to push me to submit this paper and her helpful advice which was given very frequently whenever I had a problem. Also, I would like to pass on my gratitude to Dr. Nikita and Dr. Williams for their support during GAF6 that taught me a lot in terms of how to work effectively and professionally. Later, I would like to thank Dr. Gerrard for her recommendation and sharing a long list of papers which really helped me when I tried to frame my proposal. Finally, I want to say thanks to my mom and sister for being by my side all the time, even though they have never read my work and cannot read my work. Yet, still they always respected my decision and encouraged me to work.

References

Allison, E. H. and B. Horemans. 2004. Poverty alleviation, sustainable livelihood and management in small-scale fisheries. International workshop on the implementation of international fisheries instruments and factors of unsustainability and overexploitation in fisheries. FAO, Siem Reap, Cambodia. 31pp.

Allison, E. H. and F. Ellis. 2001. The livelihood approach and management of small-scale fisheries. Marine Policy 25: 377-388.

Bee, B. A. 2016. Power, perception, and adaptation: Exploring gender and social–environmental risk perception in Northern Guanajuato, Mexico. Geoforum 69: 71-80.

Connell, R. W. and J. W. Messerschmidt. 2005. Hegemonic masculinity: Rethinking the concept. Gender and Society 19: 829-859.

Davis, D. L. 1993. When men become "Women": Gender antagonism and the changing sexual geography of work in Newfoundland. Sex Roles 29: 457-475.

Davis, D. and S. Gerrard. 2000. Introduction: Gender and resource crisis in the North Atlantic Fisheries. Women's Studies International Forum 23: 279-286.

European Commission. 2015. EU acts on illegal fishing: Yellow card issued to Thailand while South Korea & Philippines are cleared. http://europa.eu/rapid/press-release_IP- 15-4806_en.htm. Accessed 25 September 2016.

FAO. 2007. Increasing the contribution of small-scale fisheries to poverty alleviation and food security. FAO, Rome, Italy. 125 pp.

FAO. 2014. The State of world fisheries and aquaculture: Opportunities and challenges. FAO, Rome, Italy. 223 pp.

Hapke, H. M. and D. Ayyankeril. 2004. Gender, the worker-life course and livelihood strategies in a South Indian fish market. Gender, Place and Culture 11: 239-256.

Hapke, H. M. 2012. Capturing the complexities of globalization in fisheries: Gendered divisions of labour and divisions of labour and difference. Asian Fisheries Science 25S: 75-92.

Haque, M. M. and K. Kusakabe. 2005. Retrenched men workers in Bangladesh: A crisis of masculinities? Gender, Technology and Development 9:185-208.

Hall, V. G. 2004. Differing gender roles: Women in mining and fishing communities in Northumberland, England, 1880–1914. Women's Studies International Forum 27: 521-530.

Kimmel, M. and A. Aronson. 2004. Men and masculinities: A social, cultural, and historical encyclopedia. ABC-CLIO, England. 892pp.

Lymer, D., S. Funge-smith, P. Khemakorn, S. Naruepon and S. Ubolratana. 2008. A review and synthesis of capture fisheries data in Thailand – Large versus small-scale fisheries. RAP Publication 2008/17. FAO Regional Office for Asia and the Pacific, Bangkok, Thailand. 51 pp.

Nettasna, C. 2014. Review of Thai laws in relation to trawl fisheries, bycatch management project "Strategies for trawl fisheries bycatch management". Southeast Asian Fisheries Development Center (SEAFDEC). Bangkok, Thailand. 36 pp.

Phasuk, B. 1987. Marine fisheries in Thai waters, The future of Thai Fishery: The report of co-conference between Government and private sector June 4-6th 1987. Southeast Asian Fisheries Development Center (SEAFDEC) Bangkok**.** 323-404.

Robles-Zavala, E. 2014. Coastal livelihoods, poverty and well-being in Mexico : A case study of institutional and social constraints. Coastal Conseservation 18: 431-448.

Siar, S. V. 2003. Knowledge, gender, and resources in small-scale fishing: The case of Hond Bay, Palawan, Philippines. Environment and Management 31: 569-580.

Skaptadóttir, U. D. 2000. Women coping with change in an Icelandic fishing community: A case study.Women's Studies International Forum 23: 311-321.

Whitehead, A. and N. Kabeer. 2001. Living with uncertainty: Gender, livelihoods and pro-poor growth in rural-subsaharan Africa. IDS Working paper 134. Institute of Development Studies, England. 31 pp.

Gender in Aquaculture and Fisheries: Engendering Security in Fisheries and Aquaculture
Asian Fisheries Science Special Issue ***30S*** *(2017): 83-102*

ISSN 0116-6514
https://doi.org/10.33997/j.afs.2017.30.S1.004
Research Paper

Gender Differences in Participation, Roles, and Attitude towards Mariculture Operation: A Case Study in the Philippines

ALICE JOAN G. FERRER[1*], HERMINIA A. FRANCISCO[2], BENEDICT MARK CARMELITA[3], JINKY HOPANDA[3] and CANESIO PREDO[4]

[1]Division of Social Sciences, University of the Philippines Visayas, Miagao, 5023, Iloilo, Philippines
[2]Economy and Environment Partnership for Southeast Asia, University of Economics, Ho Chi Minh City, Phu Nhuan District, Ho Chi Minh City, Vietnam
[3]University of the Philippines Visayas Foundation, Inc., Miagao, 5023, Iloilo, Philippines
[4]University of the Philippines Los Baños, Laguna, Philippines

Abstract

Mariculture was envisioned to contribute to poverty reduction by increasing employment opportunities and income in the area where it is situated. This paper assesses the participation in mariculture of local men and women in seven mariculture sites in the country, the roles they perform, and their willingness to be involved in mariculture operation. The data used were collected through a household survey, focus group discussion, and key informant interviews conducted in January to August 2015. Results show that only 24 % of the 785 households had members with any participation in mariculture since it was established in the area. By site, household participation ranged between 5 % and 44 %. This was translated to only 228 individuals. Although the men dominated mariculture, the women had demonstrated that they can equally contribute to mariculture as an operator, caretaker or feeder. The majority of the study participants expressed they like having mariculture in their municipalities, particularly men from non-fishing households. The willingness to be involved in mariculture was also high, particularly among men from fishing households. The willingness to become a mariculture operator was higher among women than men. The women or local residents, particularly from households who are interested in mariculture, must be given support to start up small-scale mariculture operations towards increasing local employment and reducing poverty in mariculture areas. To increase women participation in mariculture, women stereotypes need to be overcome and also local legislations that will require a certain percentage of all mariculture

[*] Corresponding author. Email address: aj_ferrer2005@yahoo.com; agferrer@upv.edu.ph

harvests to be sold directly to local retailers and small processors, mostly dominated by women, are needed.

Introduction

Aquaculture has been practiced in the Philippines for centuries but it was only in the 1960s that fish farming started with common carp cage culture and in the 1970s with milkfish pen culture in Laguna de Bay (Yap 1999). Mariculture is the managed cultivation or production of aquatic (fish and other marine) organisms in brackish and saline water (Troell 2009). Simply put, it is aquaculture in (shallow or deep) coastal waters (Lopez 2006). It usually uses cages or pens for fin fishes, and it can be a monoculture or polyculture system. However, mariculture development in the country has been difficult to monitor and is largely unregulated in terms of stocking and feeding practices. Fish farmers used to install cages of any number and size just about anywhere. The situation inevitably led, in some areas, to mass fish kills in cages and other environmental problems (Escobar et al. 2013; Rosario 2008; San Diego-McGlone et al. 2008; Sumalde et al. 2002).

In the early years of the 2000s, the Philippine government, through the Bureau of Fisheries and Aquatic Resources, introduced the Mariculture Park Program in order to promote food and job security and improve income. As practiced in the country, mariculture parks differ from traditional fish farming. They entail cultivating high-value finfishes (such as milkfish, siganids, groupers, and red snappers) in large enclosures (pens, tanks or cages) in the open sea in municipal waters for food; this also includes seaweeds farming, aqua silviculture, mussel culture, oyster culture, sea ranching of lobsters and seahorses in coral reefs and seagrass areas (BFAR 2009).

Among the aquaculture sectors in recent years, mariculture (fish pens and cages and mariculture of oyster, mussel, and seaweed) contributes to about 80 % of aquaculture production, with seaweed farming sharing about 67 % of aquaculture production (DA-BFAR 2015). At present, fish pens and cages in brackish, fresh, and marine waters contribute 10 % to 12 % to total aquaculture production, but the potential for increase is high. In 2010, for instance, only 0.54 % of the 50, 150 ha of the 62 mariculture parks in the country was developed by 2,199 investors and the BFAR (Bureau of Fisheries and Aquatic Resources) (Salayo et al. 2012).

Mariculture parks aim to ensure food security and contribute to economic growth (Adora 2011). Its objectives are (Adora 2011, BFAR 2014, Rosario 2008): 1) to generate employment and alleviate poverty in the countryside; 2) to promote marine fish culture as an alternative source of livelihood for marginalized and sustenance fisherfolk; 3) to develop an area with appropriate equipment and infrastructure that will allow fishermen-farmers and investors to operate cost effectively and securely; and 4) to promote the use of environment-friendly inputs and farm management practices. Moreover, it was envisioned to develop the technical capacity of a pool of fisherfolks to support mariculture operations.

In line with this, an attempt is made in this paper to assess the case of 7 mariculture sites in the country. 3 questions are posed: What is the participation of men and women? What roles do they perform? What is their attitude towards mariculture? A gender lens was adopted to have a better view of the mariculture operation (Williams 2008). There is a deliberate focus on gender (with the data disaggregated into men and women), participation, roles, responsibilities, and attitude to have a better understanding of the situation towards finding a responsive action. The main purpose is to derive information that can guide in the design of policies that can contribute to increasing the involvement of local men and women in mariculture operation as livelihood opportunities and also in attaining the goal of creating a pool of workers to support mariculture operation.

Methodology

Study Sites and Classification of Mariculture Areas

Based on interviews with BFAR national and regional offices 7 municipalities in the 3 major island groups in the country were selected where there is an active mariculture operation (Fig. 1). 3 are from Luzon - Santo Tomas in La Union Province and Bolinao and Sual in Pangasinan Province (Region 1- Ilocos Region); 2 in the Visayas - Calape and Talibon in Bohol Province (Region 7 - Central Visayas); and 2 in Mindanao - Balingasag in Misamis Oriental Province and Lopez Jaena in Misamis Occidental Province (Region 10 - Northern Mindanao).

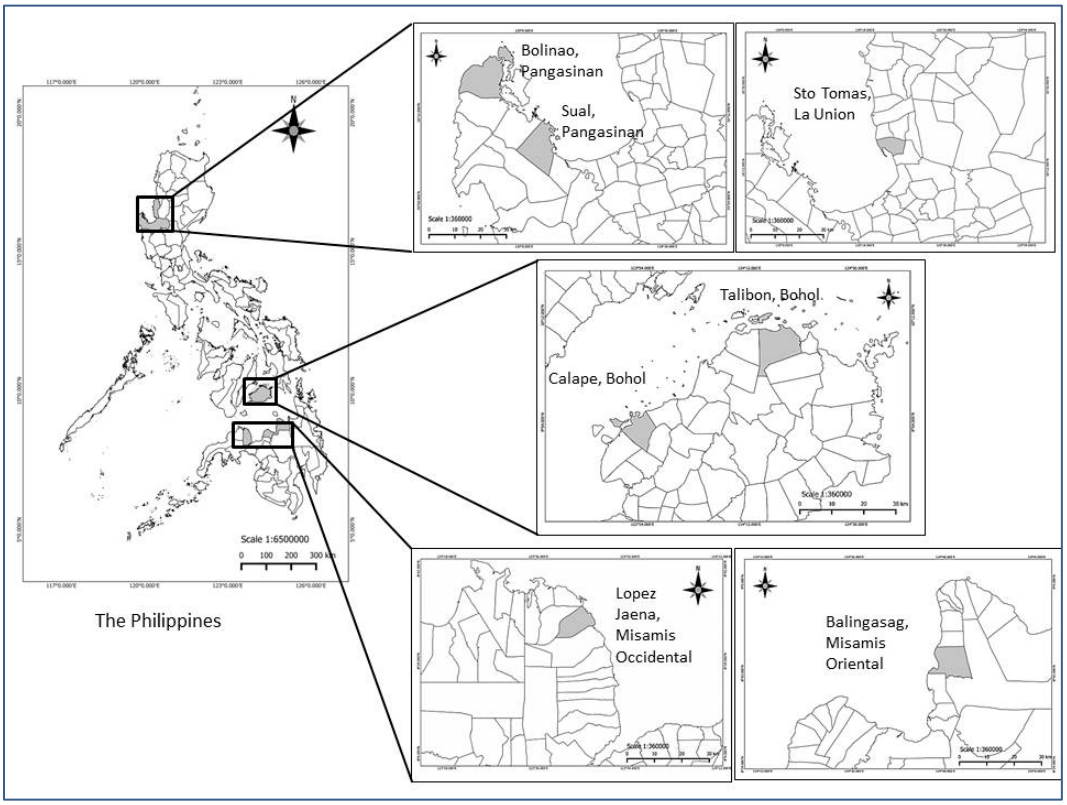


Fig. 1. Location of the Seven Study Sites in the Philippines

Data and Methods of Data Collection

The data for this paper were drawn from a larger data set collected using multiple field data collection methods from January 2015 to August 2015. The data set has data from 48 focus group discussions (FGDs) with 315 participants, household survey with 785 household participants, 138 key informant interviews (KII), secondary data, and observation.

The household survey covered 489 fishing and 296 non-fishing households in the 28 barangays (i.e., village) selected in 7 study sites. The survey participants were randomly selected from a list of fishing and non-fishing households in the selected barangays in the municipality (Table 1). They were in their 40s, the majority were males, reached almost the second year high school education, and were longtime residents of the barangays. Out of the 5 persons in their households, one had a source of income. Two-thirds were from fishing households.

Table 1. Profile of household survey participants

	Balingasag *(N=105)*	Lopez Jaena *(N=105)*	Sual *(N=120)*	Bolinao *(N=105)*	Calape *(N= 105)*	Talibon *(N=105)*	Santo Tomas *(N=140)*
Age (Mean)	47.29	43.88	42.00	44.03	42.41	45.39	46.67
Male (%)	50.48	50.48	50.83	53.33	69.52	60.95	76.43
Number of Years in School (Mean)	8.06	8.64	7.69	8.23	8.08	7.16	9.41
No. of Years in the barangay (Mean)	31.67	32.88	28.79	30.30	30.15	31.86	40.25
Household size (Mean)	5.56	4.88	5.24	5.22	5.25	5.35	5.41
No. of household members with income (Mean)	1.90	1.31	1.35	1.59	1.51	1.74	1.42
From fishing household (%)	62.86	61.90	58.33	61.90	61.90	61.90	66.43
From non-fishing households (%)	37.14	38.09	41.67	38.10	38.09	38.09	33.57

Data from the FGDs supplemented the data collected from the survey. Separate FGDs were held with the men and women in 22 barangays, while a mixed group of men and women were held in 5 barangays. The participants were selected based on criteria that they were residents of the barangay years before the establishment of the mariculture area, and have knowledge of mariculture in the area. Moreover, interviews of key informants who were caretakers, operators, and input suppliers were included in the study. Relevant secondary data were also collected. They were from BFAR Central Office and Regional Offices and their official websites, the local government of the study sites, and from other agencies' official websites.

In this study, the participation in mariculture (i.e., engagement in mariculture as a source of livelihood and income) and the roles performed by the men and women were identified and described in the input, grow out, and marketing segments. Quantitative data on the number of men and women employed was only available, however, for the grow-out segment such as the operator (i.e., owners of the mariculture business), caretaker, watcher, feeder, net mender, and net cleaner. Attitude, a predisposition to respond positively or negatively to a particular object (Bernstein et al. 1994), was focused on the study participants like or dislike of mariculture in their area, their willingness-to-be-involved, and the roles they are willing to perform.

Data Presentation and Analysis

Data are presented by study areas and in tabular and textual form. Data were analysed using descriptive statistics such as mean, frequency, and percentages. Chi-Square Test of Homogeneity was used to see if there is a significant difference in the attitude (e.g., they favor or not the presence of mariculture in their area).

Results

Participation of Men and Women in Mariculture Operation

Results of the household survey show that 24 % of the 785 households had members who were involved in mariculture operation in various capacities over the last few years (Table 2). This is translated to 228 individuals in 187 households. The level of community engagement varies by municipality, with only 5 % in Lopez Jaena to 44 % in Talibon. Of those involved, 92 % were men. In 2 municipalities, Bolinao and Calape, women did not engage in mariculture operation (ie., pen or cage farming) at all.

Table 2. Participation of households and individuals in mariculture operation

Study Sites	Households			Individuals with participation in Mariculture				
	Total Households	With participation	%	Men No.	%	Women No.	%	Total No.
Balingasag	105	31	29.52	55	96.49	2	3.51	57
Lopez Jaena	105	5	4.76	4	80.00	1	20.00	5
Sual	120	40	33.33	34	82.93	7	17.07	41
Bolinao	105	32	30.48	33	100.00	0	0.00	33
Calape	105	14	13.33	14	100.00	0	0.00	14
Talibon	105	46	43.81	47	85.45	8	14.55	55
Santo Tomas	140	19	13.57	22	95.65	1	4.35	23
TOTAL	785	187	23.82	209	91.67	19	8.33	228

Note: Data were from the survey of 785 households

During the KII and FGD, the low participation in mariculture of the local residents, particularly of the women was mentioned. Those local men and women identified to have participation in mariculture were in different stages of mariculture operation like input supply market, grow-out, harvest, and marketing. Men were more identified in the fry or feeds market and in the grow out stage. Records and reports also show that men and women were involved as

operators or owners of fish cages or pen in operation. Table 3 shows that the number of men as cage or pens operators was four times the number of women. Most operators were from outside of the municipality such in Balingasag, Calape and Sual. In Lopez Jaena and Bolinao, most of the operators were local residents.

Table 3. Men and Women as Mariculture Operators

Study Site	Number of Operators	
	Men	Women
Balingasag[1]	30	10
Lopez Jaena[2]	34	18
Calape[3]	4	0
Talibon[4]	2	0
Sual[5]	21	0
Bolinao[6]	43 (cage); 17 (pen)	9 (cage); 7 (pen)
Santo Tomas[7]	2 (inside MP zone)	0 (inside MP zone)
	63 (outside MP zone)	8 (outside MP zone)
TOTAL	216	52

Operators are owners of mariculture operation

[1]From 2014 active list of Balingasag Mariculture Park file provided by Balingasag Mariculture Park Fishery Designate during data gathering in January 2015.

[2]13 operators are not included because they are associations/barangays. Counts reflect the operators of grow-out cages. Conditioning cages are not included because owners also have grow-out cages. Data is based from Mariculture Park of Lopez Jaena List of Investors and Caretakers for 2014 that was provided by the Lopez Jaena Municipal Agriculture Office.

[3]One is owned by corporation and is not included in the count. This is the data as of 2015 and was taken from Calape Mariculture Park Locators Record prepared by the BFAR Aquaculture Technician.

[4]As of March 2015. Based on site visit in the area in Raois, Ubagan, Santo Tomas, La Union.

[5]As of May 2015. Data is based from fish cage area layout provided by the Sual Municipal Agriculture Office.

[6] Data from Bolinao Mariculture Survey/Monitoring/Inventory gathered last November 2014 by the Water Quality Management Team. List was provided by Bolinao Coastal Resource Management Office last July 2015

[7]As of May 2015. Data for "Inside Mariculture Zone" was taken from the records of the Aquaculture Technician of Santo Tomas Regional Mariculture Training and Development Center. Data for "Outside Mariculture Zone" was taken from records of the office of Barangay Narvacan, Santo Tomas.

Roles Performed by Men and Women in Mariculture Operation

The household members in the 7 sites who were identified to have ever participated in mariculture operation performed single or multiple roles in the production phase of mariculture operation. The major roles include as operators, caretakers, watcher, harvester, net cleaner, net mender, and feeder. No woman was identified to have performed the role of a watcher and a net mender, while all roles mentioned were performed by the men (Table 4).

Table 4. Roles Performed by Men and Women in Mariculture Operation*

	With participation	Operator	Caretaker	Watcher	Harvester	Net cleaner	Net mender	Feeder	Others
Balingasag	57	2	17	7	11	9	7	0	4
Men	55	2	17	7	10	8	7	0	4
Women	2	0	0	0	1	1	0	0	0
Lopez Jaena	5	1	2	0	2	0	0	0	0
Men	4	0	2	0	2	0	0	0	0
Women	1	1	0	0	0	0	0	0	0
Sual	41	0	8	3	4	2	0	17	7
Men	34	0	6	3	4	2	0	13	6
Women	7	0	2	0	0	0	0	4	1
Bolinao	33	0	9	1	5	2	1	5	10
Men	33	0	9	1	5	2	1	5	10
Women	0	0	0	0	0	0	0	0	0
Calape	14	1	5	1	3	1	0	1	2
Men	14	1	5	1	3	1	0	1	2
Women	0	0	0	0	0	0	0	0	0
Talibon	55	34	6	1	5	1	1	3	4
Men	47	28	6	1	5	1	1	3	2
Women	8	6	0	0	0	0	0	0	2
Santo Tomas	23	9	4	2	1	1	1	3	2
Men	22	8	4	2	1	1	1	3	2
Women	1	1	0	0	0	0	0	0	0
Total	228	47	51	15	31	16	10	29	29
Men	209	39	49	15	30	15	10	25	26
%	91.67	82.98	96.08	100.00	96.77	93.75	111.11	86.21	89.66
Women	19	8	2	0	1	1	0	4	3
%	9.09	20.51	4.08	0.00	3.33	6.67	0.00	16.00	11.54

*These are individuals from 187 households with participation in mariculture operation from the survey of 785 households in seven mariculture sites.

Roles performed varied by mariculture site. For example, the feeding was a specialized work only in Sual but part of the work of the caretakers in other areas. Moreover, net mending was part of the work of a caretaker in Sual but not in other areas. Roles also varied by scale of operation. For instance, in Sual where the scale of mariculture operation by a single operator (e.g., a corporation) was relatively bigger, there were more roles that require specialization (e.g., feeder, checker, manager, boatman, and helper). In Santo Tomas, the grouper culture operator using cages or pens outside of the designated mariculture zone also performed the roles of a caretaker, watcher, feeder and maintenance worker (for repair of cage/pen and nets).

Table 5. Roles Performed by Men and Women in Mariculture Operation*

Input	Grow-out	Marketing
Men		
Balingasag and Lopez Jeana		
• Cage/net fabricators • Feeds distributors/sales representatives • Seed supply operation/delivery of seed stocks to mariculture area	• Operator • Caretakers responsible for feeding and guarding the fish • Maintenance workers (change net/net mending) • Watcher	• Fish vendors
Sual and Bolinao		
• Cage/Pen/Net fabricators • Seed stock operators	• Feeders • Change net workers • Boat drivers/helpers • Harvesters	• Owners of consignment area
Calape, Talibon, Santo Tomas		
• Cage/pen fabrication • Seed stock supplier • Feeds distributors/sales representatives	• Caretaker • Maintenance (change net/net mending)	
Women		
Balingasag and Lopez Jeana		
	• Operator • Wives participate in the sorting of fish during harvest, • Wives help the husband in feeding the fish, and during stocking	• Members of the fish processing association are also members of the women's association
Sual and Bolinao		
• Feed brand sales representatives	• Feeders • Net menders • Sorters during harvest	• Owners of consignment area
Calape, Talibon, Santo Tomas		
• Feeds distributor/sales lady		• Fish traders/vendors

*Results from FGD and KII

The FGDs and KIIs indicated the involvement of local men and women in the grow-out stage, ancillary industries and marketing stage of mariculture operation (Table 5). Each role requires specific tasks and responsibilities. Skills and knowledge are important in the performance of these tasks. For the development of the manpower pool in mariculture parks, BFAR provides the caretakers training courses, fish cage management seminars, aquaculture

technologies trainings, product development, coastal resource management seminars, and environmental monitoring.

The operators were the owners, financiers, managers and decision-makers of mariculture operation. In big operations like in Sual, a number of operators were corporations and they had managers for the operation. In Santo Tomas, the operators of the grouper farming outside of the mariculture zone performed most of the work needed and hired few workers during harvest or for large repairs of the cage or pen.

The caretaker or watcher of the fish cages were locally hired men. The tasks they performed included guarding the cages during the day, feeding the fish, being in charge of the stocking and cleaning nets. In almost all areas, the wives actually went with their husbands to help in the feeding or in the stocking activities. Sometimes, the wife was left with feeding activity while the husband was fishing nearby or did some other work. While the husband's work was paid, the work of the wife was not. In Sual, there were 7 women who were paid feeders and net menders.

Given that net change/cleaning and net mending are heavy tasks, the men were mostly involved. Harvesting is laborious and risky and usually involved the men. However, the wives or the women helped as sorters of fish.

Men were also cage/net fabricators. This was the result of training on cage fabrication that targets the men as trainees. They were also feeds distributors/sales representatives (also women), or involved in fry supply operation as operators of fingerling nursery in the community.

Attitude towards Mariculture Operation

Knowing the attitudes of the people is important because attitudes can have a powerful influence over behavior. Attitudes are formed directly as a result of experience (direct personal experience or observation), social factors (social roles and norms), and learning (Bernstein et al. 1994). Attitude refers to the emotional or affective component of attitude which is the feeling or evaluation of like or dislike of the object of attitude.

6 in every 10 survey participants indicated that they like having mariculture operation in their municipality (Table 6). Near the majority of the survey participants in Sual (48 %) and Bolinao (43 %) expressed liking in having mariculture operation in their municipality; in other study sites, it ranged between 55 % (Balingasag) and 80 % (Calape and Talibon).

Table 6. Men and Women Who Like Having Mariculture Operation in their Municipality

Sites	Men			Women			Total
	Fishing	Non-Fishing	Total	Fishing	Non-Fishing	Total	
Balingasag	*n*=33	*n*=20	n_m=53	*n*=33	*n*=19	n_w=52	*N*=105
	66.67	50.00	60.38	54.54	42.10	50.00	55.23
Lopez Jaena	*n*=36	*n*=17	n_m=53	*n*=29	*n*=23	n_w =52	*N*=105
	75.00	76.47	75.47	58.62	69.56	63.46	69.52
Sual	*n*=39	*n*=22	n_m=61	*n*=31	*n*=28	n_w =59	*N*=120
	41.02	59.09	47.54	45.16	53.57	49.15	48.33
Bolinao	*n*=40	*n*=16	n_m=56	*n*=25	*n*=24	n_w =49	*N*=105
	42.50	50.00	44.64	28.00	54.17	40.82	42.86
Calape	*n*=53	*n*=20	n_m=73	*n*=12	*n*=20	n_w=32	*N*=105
	79.24	80.00	79.45	83.33	80.00	81.25	80.00
Talibon	*n*=43	*n*=21	n_m=64	*n*=22	*n*=19	n_w=41	*N*=105
	86.05	76.19	82.81	63.64	89.47	75.61	0.00
Santo Tomas	*n*=74	*n*=33	n_m=107	*n*=19	*n*=14	n_w=33	*N*=140
	72.97	84.85	76.64	84.21	78.57	81.82	77.86
TOTAL	*N*=318	*N*=149	*N*=467	*N*=171	*N*=147	*N*=318	*N*=785
	67.61	69.80	68.31	56.14	65.75	60.38	65.09

Note: Values up to hundredths place are % values; the rest are frequencies.

The proportion of men who expressed liking for mariculture operation in their area was higher than the women (68 % vs. 60 %). The difference was significant (χ^2=5.2372, *p*-value=0.022109, p<0.5), which means that the positive attitude towards mariculture operation was significantly associated with gender. By site, no significant difference was found among men and women.

The proportion who likes mariculture operation in their area was lower (but not statistically significant) among men who were from fishing than in the non-fishing households (68 % vs. 70 %). By mariculture site, the proportion who like mariculture operation was higher among men from fishing households in Balingasag (68 % vs. 50 %) and Talibon (86 % vs. 76 %); it was the opposite

in Lopez Jaena (75 % vs. 76 %), Sual (41 % vs. 59 %), Bolinao (42 % vs. 50 %), Calape (79 % vs. 80 %), and Santo Tomas (73 % vs. 85 %).

In general, the proportion who likes mariculture operation was lower (but not statistically significant) among women who were from fishing than in the non-fishing households (68 % vs. 70 %). By mariculture site, the proportion of women who like mariculture operation was higher in fishing households in Balingasag (54 % vs. 42 %), Calape (83 % vs. 80 %), and Santo Tomas (84 % vs. 79 %); it was the opposite in Lopez Jaena (59 % vs. 70 %), Sual (45 % vs. 54 %), Bolinao (28 % vs. 54 %), and Talibon (63 % vs. 89 %).

Willingness to be involved in Mariculture Operation among Men and Women

The information on the willingness-to-be involved in mariculture operation among the local residents is important in designing strategies to increase their participation, in targeting for the kind of role they are willing to be involved in, and in designing training programs to prepare them for the performance of the tasks and responsibilities required in each role.

Table 7. Men and Women Who Were Willing to Be Involved in Mariculture Operation

Sites	Men			Women			Total
	Fishing	Non-Fishing	Total	Fishing	Non-Fishing	Total	
Balingasag	*n*=33	*n*=20	n_m=53	*n*=33	*n*=19	n_w=52	*N*=105
	69.70	50.00	62.26	78.79	42.11	65.38	63.81
Lopez Jaena	*n*=36	*n*=17	n_m 53	*n*=29	*n*=23	n_w =52	*N*=105
	69.44	70.59	69.81	55.17	43.48	50.00	60.00
Sual	*n*=39	*n*=22	n_m 61	*n*=31	*n*=28	n_w =59	*N*=120
	64.10	45.45	57.38	51.61	50.00	50.85	54.17
Bolinao	*n*=40	*n*=16	n_m 56	*n*=25	*n*=24	n_w =49	*N*=105
	65.00	37.50	57.14	52.00	41.67	46.94	52.38
Calape	*n*=53	*n*=20	n_m 73	*n*=12	*n*=20	n_w=32	*N*=105
	75.47	45.00	67.12	50.00	50.00	50.00	61.90
Talibon	*n*=43	*n*=21	n_m 64	*n*=22	*n*=19	n_w=41	*N*=105
	81.40	76.19	79.69	81.82	78.95	80.49	80.00
Santo Tomas	*n*=74	*n*=33	n_m 107	*n*=19	*n*=14	n_w=33	*N*=140
	78.38	60.61	72.90	94.74	64.29	81.81	75.00
TOTAL	*N*=318	*N*=149	*N*=467	*N*=171	*N*=147	*N*=318	*N*=785
	72.96	55.70	67.45	66.47	61.29	59.31	64.20

Note: Values up to hundredths place are % values; the rest are frequencies

Survey results show that 6 in every 10 survey participants indicated willingness to be involved in mariculture operation (Table 7). By mariculture site, data shows that majority of the survey participants were willing-to-be-

involved, with the lowest proportion in Bolinao (52 %) and the highest in Talibon (80 %).

The proportion of men willing-to-be involved in mariculture operation was higher compared to the women (67 % vs 59 %) in all mariculture sites. This difference is significant (χ^2=5.2917, *p*-value=0.021428, *p*<0.5), which means that the willingness to be involved in mariculture operation among the survey participants was significantly associated with gender.

By mariculture sites, those who were willing to be involved in mariculture ranged between 57 % and 80 % among men, and 47 % to 81 % among women. The proportion of women was higher than the men in Balingasag (64 % vs 62 %), Talibon (80 % vs 79.6 %), and Santo Tomas (82 % vs. 73 %). It was the opposite in Lopez Jaena (70 % vs 50 %; significant, χ^2=4.2925, *p*-value=0.038282, *p*<0.5%), Sual (57 % vs. 51 %), Bolinao (57 % vs. 47 %), and Calape (67 % vs. 50 %).

The proportion willing-to-be involved in mariculture operation was higher among men from fishing than in non-fishing households (73 % vs. 56 %). This difference was significant (χ^2=13.7537, *p*-value=0.000208, *p*<0.5). By mariculture site, the proportion of men willing to be involved in mariculture operation was higher in fishing households than in non-fishing households in Balingasag (70 % vs. 50 %), Sual (64 % vs. 45 %), Bolinao (65 % vs. 38 %), Calape (75 % vs. 45 %; significant, χ^2=6.1096, *p*-value=0.013445, *p*<0.5), Talibon (81 % vs. 76 %), and Santo Tomas (78 % vs. 61 %; significant, χ^2=15.534, *p*-value=0.000081, *p*<0.5 %). The opposite was found only in Lopez Jaena (71 % vs. 69 %).

Meanwhile, the proportion willing-to-be involved in mariculture operation was higher among women from fishing than in the non-fishing households (66 % vs 52 %). This was also true by mariculture site, except in Calape where the proportion was found to be equal. Significant differences among women from fishing and non-fishing households were found in Balingasag (χ^2=7.1687, *p*-value=0.007419, *p*<0.5) and Santo Tomas (χ^2=5.0244, *p*-value=0.024992, *p*<0.5).

Roles Willing to be performed by the Men and Women

When classified by type of role they were willing to perform, 38 % of all study participants would like to operate their own mariculture farms (Table 8).

Table 8. Men and women by the role they are willing-to-be-involved in mariculture operation

	Willing to be involved	Operator	Caretaker	Watcher	Harvester	Net mender	Feeder	Others
Balingasag	67	31.34	34.33	13.43	11.94	28.36	0.0	0.0
Men	33	48.48	45.45	18.18	12.12	15.15	0.0	0.0
Women	34	14.71	23.53	8.82	11.76	41.18	0.0	0.0
Lopez Jaena	63	44.44	36.51	4.76	4.76	7.94	0.0	1.59
Men	37	45.95	35.14	8.11	8.11	0.0	0.0	2.70
Women	26	42.31	38.46	0.0	0.0	19.23	0.0	0.00
Sual	65	4.62	30.77	1.54	0.00	6.15	63.08	3.08
Men	35	8.57	45.71	2.86	0.00	2.86	48.57	2.86
Women	30	0.00	13.33	0.00	0.00	10.00	80.00	3.33
Bolinao	55	29.09	36.36	7.27	7.27	7.27	10.91	12.73
Men	32	21.88	31.25	9.38	9.38	12.50	12.5	18.75
Women	23	39.13	43.48	4.35	4.35	0.00	8.70	4.34
Calape	65	35.38	41.54	27.69	26.15	7.69	4.62	9.23
Men	49	26.53	44.90	30.61	32.65	10.20	6.12	10.20
Women	16	62.50	31.25	18.75	6.25	0.00	0.00	6.25
Talibon	84	55.95	11.90	4.76	14.29	2.41	2.41	7.14
Men	51	50.98	11.76	3.92	15.69	3.92	3.92	2.16
Women	33	63.64	12.12	6.06	12.12	0.00	0.00	15.15
Santo Tomas	105	50.48	25.71	16.19	11.43	8.57	0.00	1.09
Men	78	43.59	25.64	20.51	14.10	11.54	0.00	2.56
Women	27	70.37	26.92	3.85	3.85	0.00	0.00	0.00
All	504	37.70	27.78	11.11	11.11	9.52	10.32	6.55
Men	315	36.83	29.21	14.60	14.29	8.25	8.25	8.25
Women	189	39.15	25.40	5.29	5.82	11.64	13.76	3.70

Note: Values up to hundredths place are % values, the rest are frequencies

The proportion of those willing to become an operator differed by mariculture site. For instance, the highest proportion was found in Talibon (56 %), followed by Santo Tomas (51 %), and Lopez Jaena (44 %). The lowest

was in Sual where only 4 % would like to be a mariculture operator. When classified by gender, a higher proportion among women (39 %) than the men (37 %) would like to be an operator. A higher proportion of women than men would like to be an operator in Bolinao (39 % vs. 22 %), Calape (63 % vs. 27 %), Talibon (64 % vs. 51 %), and Santo Tomas (70 % vs. 44 %).

Moreover, one-fourth of the women who would like to be involved in mariculture operation would like to work as a caretaker, while 10 % would like to work as net mender or feeder. Similarly, the men would like to be a caretaker (31 %), net mender (13 %), feeder (13 %) and harvester or watcher (near 10 %).

One-fourth of the survey participants also would like to be a caretaker and the proportion was not significantly different between men (29 %) and women (25 %). For the rest of the roles, about 10 % would like to be a watcher (particularly the men), harvester (particularly the men), net mender (particularly the women), and feeder (particularly the women). The proportion also differed by mariculture site.

Discussion

The mariculture program was launched by the government in early 2000s to contribute to rural development through livelihood enhancement of residents in the coastal barangays where mariculture operations are situated. On the average, only 24 % of the households covered by the survey reported they had household members employed in mariculture at some point in their lives. This low participation of the local residents as fish operators or workers can be attributed to a number of factors. First, the financial requirements are beyond the capacity of the targeted fisherfolks and their families. Even one small bamboo cage (5×5×5 m in size) can cost about PHP 120,000. Even when the cages are free, the high cost of feeds prevents many locals from venturing into mariculture. Second, in small operations, the operator can perform several roles such as that of a caretaker, watcher, and maintenance worker (clean the cage, mend the nets); and only needs hired help during harvest or when changing nets. Third, there is low uptake in mariculture. In 2010, there were only 62 mariculture parks with 2,199 locators/investors, including the first mariculture park in the country established in Samal Island in 2001 (Salayo et al. 2012). In the mariculture areas covered in the study (i.e., Calape, Balingasag and Santo

Tomas), a number of operations have already stopped because of the high cost of operation; some were not able to return to operation after being damaged by a typhoon.

Particularly, among those engaged in mariculture, it is observed that men dominated in all phases of mariculture operation. The dominance of men as mariculture operators may have stemmed from a number of reasons. Fish culture in mariculture parks was perceived as a male activity. Among other things, it was conceptualized, introduced, and promoted as an alternative livelihood for the small-scale fishers, who were mostly men. The local and BFAR technical people were mostly men and thus have more direct contact with men in the community as well. The capacity building (e.g., training fisherfolk involved in mariculture so that they are better skilled in managing mariculture facilities) activities were oriented mainly toward men. In many of the presentations on mariculture, the fish farmer operator is depicted to be a male.

In addition, as mariculture operator, one has to spend time to visit the fish cages or pens, which require special boat trips. These fish cages are into the sea or at a distance from all other major activities of the household. Thus, the time involved in visiting fish cages or pens is more costly for the women (who are heavily burdened by other activities) than for the men. This is particularly true given that many operators were from outside of the mariculture area.

Aside from these, the local men and women who were willing to be involved in mariculture as operator were constrained by the high cost of initial outlay and operations. Despite their low participation, the local men and women like to have mariculture in their area because of employment and income it generates, albeit low.

On the other hand, more men have performed other roles such as caretaker, watcher, feeder, net mender, and net cleaner. This can be gleaned from Table 2 where 181 of the 228 individuals in 785 households who were involved in mariculture have performed different roles aside from being an operator or the owner of the operation. Among the 181 individuals, 170 were men and only 11 were women. Few women were hired because of the prevailing attitude that women are not as strong as the men in carrying out the

heavy tasks in mariculture (e.g., moving the fry for stocking, carrying sacks of feeds from the storage house to the mariculture site, and regular changing and of cleaning nets). During the typhoon season, the seas are dangerous, and more physical strength is required when guarding the cages. During the FGDs and KIIs, it was mentioned that the training for caretakers, which is a requirement in starting mariculture operation, were attended mostly by men.

The women were also perceived to have higher time constraints than men, especially when they have substantial workload and responsibilities in their household such as when having small children. The fish cages are some distance from the house and visits to the cages require taking a boat, which is mostly associated with men. Mariculture activities also require long hours in the open sea. It may also mean being wet for long period of time, which possess more health issues for women than the men.

The women, however, have demonstrated that they can equally perform similar roles as men. There were few women who were operators, feeders, and, as pointed out in the FGD and the KIIs, wives usually help their husbands, hired as caretakers, in feeding activities and in watching over the cages. These contributions of the wives helping their husbands in guarding the cages or feeding the fish, unfortunately, were under acknowledged or unrecognized. Earlier studies show that, in aquaculture in general, and in cage culture in particular, women are heavily involved in fry collection, feed preparation, feeding of stocks, harvest and post-harvest; they also take managerial positions (as an operator or caretaker); and deal with traders on pricing and in credit liaising (DA-BFAR 2004; Sekhar and Ortiz 2007, Guste and del Rosario-Malonzo 2004).

Given the reasons above, it is expected that more men than women would like mariculture in their area and were willing-to-be involved in mariculture operation. When type of household is considered, however, less men and women from fishing households than from non-fishing households like having mariculture in their area. This is likely a reflection of their dissatisfaction in their actual participation in mariculture operation. This is reinforced by the finding that more of men and women from fishing households would like to be involved in mariculture. The fishers were willing to be involved in mariculture operation, yet their actual participation is low. The

mariculture program was promoted in the early 2000s as a way to reduce poverty in coastal communities, particularly targeting the marginal fisherfolks. However, its take up has been slow and local people have not been involved to the degree that was hoped when the program was first launched.

Conclusions

The men were commonly identified with mariculture. The main reason for this is the perception that mariculture is a male activity with tasks requiring physical strength, it being time consuming, and exposure to danger associated with work in open sea. However, the women have demonstrated that they can equally perform similar roles as men.

Among the goals of mariculture are to reduce employment problems in communities where they are situated and to produce a pool of manpower for mariculture operation in the area. In the case of the 7 mariculture sites in the study, the goals were poorly attained given the low participation of local residents in mariculture operation.

The favorable attitude of the women on mariculture operation and their willingness to be involved in mariculture operation as operators are good inputs for program design to respond to the low impact of mariculture on local employment. Engaging women to become mariculture operators and also be hired for other work in the operation can be one of the opportunities to explore to increase the participation of the local residents toward achieving the goals set for mariculture, i.e., of higher employment and poverty reduction. The women or local residents, particularly from fishing households, who are interested in mariculture must be given support to start up small-scale mariculture operations and to market farmed fish. To increase womens' participation in mariculture, they have to overcome stereo-typing. Also, local legislations that will require a certain percentage of all mariculture harvests to be sold directly to local retailers and small processors, mostly dominated by women, are needed. If more mariculture operators are local residents, then it is likely that more residents will be hired to work on their operations. Non-local mariculture operators should be encouraged to prioritize local hiring. Moves should therefore be made to make this connection.

Acknowledgements

This study received generous funding from the Economy and Environment Program for Southeast Asia (EEPSEA). The authors gratefully acknowledge the support provided by the officials of the Department of Agriculture (DA) and the Bureau of Fisheries and Aquatic Resources (BFAR), headed by DA Usec. Asis Perez and BFAR Regional Directors Visa Tan Demerin (Region 10), Andres Bojos (Region 7) and Nestor D. Domenden (Region 1); The BFAR technical staff; the local officials and technical staff in the mariculture areas headed by Mayors Alexis Quiña (Balingasag), Michael Gutierrez (Lopez Jaena), Sulpicio Yu (Calape), Restituto Auxterio (Talibon), Roberto Arcinue (Sual) and Marietta Carbonell (Santo Tomas); all the efficient data collectors and special thanks to all the key informants, focus group discussion participants, and household survey participants for their time and for the information shared.

References

Adora, G.A. 2011. Charting the new direction of mariculture development. A presentation during the 14th Weekly Forum Meeting of the Management Association of the Philippines, 12 April 2011, Makati City (unpublished). http://www.map-abcdf.com.ph/documents/presentations/Agribusiness/Fisheries/P20110412.pdf. Accessed 17 January 2015.

Bernstein, D.A., A. Clarke-Stewart, L.A. Penner and E.J. Roy. 2012. Psychology. Wadsworth Cengage Learning Belmont, California. 944 pp.

BFAR (Bureau of Fisheries and Aquatic Resources). 2009. Mariculture. http://mariculture.bfar.da.gov.ph/. Accessed August 4 2014.

BFAR (Bureau of Fisheries and Aquatic Resources). 2014. Mariculture park. http://www.bfar.da.gov.ph/services?id=2. Accessed August 4 2014.

DA-BFAR (Department of Agriculture-Bureau of Fisheries and Aquatic Resources). 2004. In turbulent seas: The status of Philippine marine fisheries. Coastal Resource Management Project of the Department of Environment and Natural Resources, Cebu City, Philippines. 378 pp.

DA-BFAR (Department of Agriculture-Bureau of Fisheries and Aquatic Resources). 2015. Philippines fisheries profile 2014. DA-BFAR, Quezon City, Philippines. 68 pp.

Escobar, M.T.L., L.P.A Sotto, G.S. Jacinto, G.A. Benico, M.L. San Diego-McGLone and R.V. Azanza. 2013. Eutrophic conditions during the 2010 fish kill in Bolinao and Anda, Pangasinan, Philippines. Journal of Environmental Science and Management Special Issue 1-2013: 20–35.

Guste, M. J. and J. del Rosario-Malonzo. 2004. Women in Philippine Aquaculture. Asia Pacific Research Network Journal 11:12 pp.

Lopez, N.A. 2006. Sustainable development and trends in the Philippine Aquaculture. Paper presented at the International Workshop on innovative technologies for eco-friendly fish farm management and production of safe aquaculture foods, 4–8 December 2006, Denpasar, Bali, Indonesia. Food & Fertilizer Technology Center for the Asian and Pacific Region, TaipeI, Taiwan. 29 pp.

Rosario,W.R. 2008. The Philippines. In FAO/NACA Regional Workshop on the future of mariculture: A regional approach for responsible development in the Asia-Pacific. (eds. A. Lovatelli, M.J. Phillips, J.R. Arthur and K. Yamamoto), pp. 225-240. Guangzhou, China, FAO Fisheries Proceedings. No. 11. FAO. Rome.

Salayo, N.D., M.L. Perez, L.R. Garces and M. D. Pido. 2012. Mariculture development and livelihood diversification in the Philippines. Marine Policy 36:867–881.

San Diego-McGlone M.L., R.V. Azanza, C.L. Villanoy and G.S. Jacinto. 2008. Eutrophic waters, algal bloom, and fish kill in fish farming areas in Bolinao, Pangasinan, Philippines. Marine Pollution Bulletin 57: 295–301.

Sekhar, N.U. and Ortiz, I. 2007. Review and assessment of socio-economic issues of aquaculture in the Philippines. Project Nr. 26359. Oslo: Norwegian Institute for Water Research (NIVA). http://rapp.niva.no/symfoni/RappArkiv7.nsf/URL/581374385D2163DDC125737C0047519E / $FILE/ 5488_72dpi.pdf. Accessed 4 August 2014.

Sumalde, Z.M., K.L. Francisco and M. Peñales. 2002. Pollution-induced fish kills in Bolinao: Effects of excessive aquaculture structures and overstocking. EEPSEA Technical Report. Economy and Environment Program for Southeast Asia, Singapore. 48 pp.

Troell, M. 2009. Integrated marine and brackishwater aquaculture in tropical regions: Research, mariculturepark implementation and prospects. In: Integrated mariculture: A global review (ed. D. Soto), pp 47 -131. FAO Fisheries and Aquaculture Technical Paper. No. 529. FAO, Rome, Italy.

Williams, M. J. 2008. Why look at fisheries through a gender lens? Development 51:180-185.

Yap, W. G. 1999. Rural aquaculture in the Philippines. Food and Agriculture Organization of the United Nations Regional Office for Asia and The Pacific. Bangkok, Thailand. 82 pp.

Gender in Aquaculture and Fisheries: Engendering Security in Fisheries and Aquaculture
Asian Fisheries Science Special Issue 30S (2017): 103-128

ISSN 0116-6514
https://doi.org/10.33997/j.afs.2017.30.S1.005
Research Paper

Politics and Gender: Case Study of the Saemangeum Reclamation Project, South Korea

SUN-AE II*

Faculty of Humanities, Miyazaki Municipal University, 1-1-2 Funatsuka, Miyzaki, Japan, 880-8520

Abstract

The Saemangeum Seawall Project, South Korea, is a major land reclamation scheme for which the outer seawall was constructed between 1991 and 2006 and other reclamation work is still ongoing. The primary goal of reclamation was to create agricultural land and to strengthen the Gunsan area's position as an international centre of trade and industry. The project was implemented for the public good and on publicly owned surface water. The project, however, experienced many problems: women and men fishers lost their means of living, water became polluted, and ecosystems were destroyed. These problems, however, tended to be hidden behind debates about economic values and the logic that attached the greatest priority to economic development. By the development of this large-scale national project, the livelihood foundations of the women and men fishers were removed and yet the national government and administration did not guarantee their livelihoods. Once they had been compensated for their fishing rights, the fishers did not have a place to appeal for their basic livelihood rights. With a focus on the change in the women and men fishers' lives, the present study aims to elucidate the impacts and changes of the tideland reclamation on the fishers' communities and their cultural cohesion, the gender roles and the differences people of different ages experienced from the time of closure of the tide embankment.

Introduction

In Mangyeong, North Jeolla Province, Korea, "Saemangeum" means new fertile soil beyond the Gimje Plain (Kim 2009). The name was given for a new land reclamation project meant to augment the agricultural capacity of the Gimje Plain, a major rice-growing area. "Reclamation" is defined as the

* Corresponding author. Email address: iisune@miyazaki-mu.ac.jp

conversion of natural wetland into land and artificial wetland through mechanical means (Moores et al 2016). President No Tae-Woo announced the Saemangeum Seawall Project in 1987 as a campaign pledge, and the outer seawall stage was implemented from 1991 to 2006. Other work is ongoing and the inner seawalls are yet to be constructed. The project developed on an area of 40,100 ha by constructing 33 km of tide embankment from Gunsan, Gimje, to Buan in North Jeolla Province. The major aims were to enlarge national land including agricultural land, secure water resources, remove flood threats, and stimulate the local economy by improving transportation. Although aiming to increase agricultural land, over time the reclaimed land became used more for other industries, such as manufacturing. Leisure developments are also planned.

In South Korea, reclamation projects have been traced back to the beginning of the 12th century. In the first half of the 20th century, farmland was expanded in the colonized Korean Peninsula in order to solve Japan's food problem and to facilitate the immigration of Japanese people. Until 1945, 30 % of the total area of licensed reclamation (approximately 185,336 ha) was in North Jeolla Province (Oh 2004b). In the latter half of the 20th century, from the end of the Korean War in 1953 through to the 1980s, reclamation works continued with the expressed aim of increasing farmland and increasing food production. From the 1990s, reclamation works were expanded into comprehensive multipurpose development projects, including securing housing estates (Koh 2004). By 2008, more than 60 % of the total area of tideland had been reclaimed and the area reclaimed had more than tripled compared with that of the first half of the century (Ministry of Oceans and Fisheries 2014).

In the 1990s and early 2000s, the Saegmangeum reclamation project was the world's largest coastal reclamation project (Moores 2016). For more than two decades, it generated many conflicts among the government, local people, environmental conservation organizations, researchers and experts, and religious leaders. The conflicts concerned local economic growth, wildlife endangered by the destruction of the tideland ecosystem, and the economic value of marine products. However, no attention was paid to the rights of the women and men fishers to a living, even though the fishers lost their means of livelihood and their way of life (Ii 2014; Ii 2015). The fishers lost their fishing grounds and had to change jobs. They now engage in daily paid work. Recently, elected politicians from the constituency have called upon the national

government to take measures to secure the living of several thousand fishermen and their communities.

Land reclaimed by drainage was called “the third new world.” Even in recent years, despite the fact that fishermen and fisherwomen were losing their livelihood grounds, no fierce resistance confronted large-scale reclamation projects of tideland. This was because the projects had been advanced by the absolute power of the national government with a rosy belief that development would assure bright future progress. More recently, however, the functions and values of tideland have been appreciated anew, and efforts started to return reclaimed land back to tideland. This has been called “reverse reclamation,” and restoration of nature.

From the viewpoint of environmental protection theory, Kumamoto and others recommended that local inhabitants should participate directly in addressing local development problems (Kumamoto 2004, Japan Wetlands Action Network 2001). However, developments such as this tideland reclamation were experienced differently by different types of local inhabitants, e.g., in this case the fishers received a direct blow by losing their place of livelihood.

With a focus on the change in the women and men fishers’ lives, this study aimed to elucidate the impacts and changes of the tideland reclamation on the fishers’ communities and the gender roles within them from 2006, the time of closure of the tide embankment, to 2014.

Materials and Methods

The present study addressed changes that fishermen and fisherwomen experienced in coastal villages affected by the building of the tidal embankment outer seawall. In addition, key literature was reviewed in order to understand the history of land reclamation in South Korea.

The field survey was conducted in five villages of Gusan, Haje, Gimje, Gyehwa, and Buan in North Jeolla Province in the Semangeum areas. One village, J Village, adjacent to Simpo Harbour in Gimje City was the main study site because the changes due to nature, society, culture, and gender roles were

more evident in this village even than in the other villages. J Village is located on the estuarine coast of the Mangyeong River that flows into the Yellow Sea (Fig. 1).

Fig.1 Location of the Saemangeum Tideland

The research materials for this paper were drawn from data using key informant interviews and observation methods, administrative statistics, and materials obtained during three surveys in which the authors stayed for one month each time between September 2006 and March 2014.

The number of residents in J Village in 2013 was 113, living in 57 households. Since 2006, the population and number of households in J Village decreased by about 24 % (Table 1).

Table 1. The Number of residents and households in J Village in 2006 and 2013

Year	Men	Women	Total	Number of households
2006 (A)*	88	97	185	93
2013 (B)	54	59	113	57
A-B (%)	34 (24 %)	38 (24 %)	72 (24 %)	36 (24 %)

*(Kim 2008)

Results

Saemangeum Tideland as the golden fishing grounds and Simpo harbor as a new world for emigrants

Saemangeum tideland extends over a vast area at the estuaries of the Rivers Mangyeong and Dongjin, (Fig.1). Within the Saemangeum tideland, in 1925, a plain of about 32 km^2 of land was reclaimed by Japan. This extended adjacent to Simpo harbor. On this land, rice, wheat and potatoes were grown, as well as strawberries in green houses. In the harbor, fishermen used to sell their catches, including fishes and shellfishes in certain locations. Restaurants began to open in the latter half of the 1970s. In the 1980s, the area became a center of eating places and shops providing sashimi. Until the latter half of the 1990s, the harbor had been prosperous, with a great number of buyers and visitors. Women from the fishing villages also opened stands to sell common orient clam (*Meretrix lusoria* (Röding 1798)) to tourists. The harbor was so crowded with visitors that the nearby roads were congested every day. However, after the start of the construction of the tide embankment, the numbers of visitors to the harbor decreased and, around the wharf, reclamation works were carried out to construct a marine yacht harbor (Fig. 2). In addition, a 4 km road to Gogunsan Islands and expressways are planned to connect the area with surrounding cities.

Until construction works on the tide embankment started, a variety of organisms lived on the tideland. The tideland served as the biggest stopover site in South Korea for migratory birds (Moores et al. 2016) and provided the livelihoods for many local people. The area was selected for reclamation as it was considered to be easier to reclaim because of headlands and islands that could be used during construction.

Pre-reclamation, fish and shellfish caught in the tideland provided cash income for the women and men fishers. The average annual fisheries production was approximately 70,000 t. Prior to the reclamation project in 1991, fishers of Gimje fishing communities of the Saemangeum tideland delivered around 8 t of shellfish to Seoul and Incheon every day. The fishers regarded shellfish as something that would not decrease in abundance, even if a great number of people caught them in quantity every day. Shellfish served as “golden fields”

that provided them with their sole source of cash income.

The reclamation works, however, affected fisheries production and, by 1996, the production had declined by 35 % compared to that of a decade earlier (Jang 2004). Although the prices of a kg of shellfish were lower before the tide embankment works, a fisher's daily production then exceeded 100 kg.

Up until the last major reclamation, when seawater mixed with freshwater and the tideland was exposed for longer daily periods, the areas around Simpo harbor were nutrient rich and provided ideal places for organisms to live and lay eggs. Fishermen who stood on the top of the ecosystem in such an environment could raise their children by working only with a small boat and *goere* (Fig. 3). After retirement, the environment also provided natural welfare facilities for fishers to spend leisure time and earn pocket money.

The tide embankment has two sluice gates, 240 m and 300 m wide respectively. The flow of seawater into the embankment is only 10 % of that before the construction. Around the sluice gates, the salinity is sustained at seawater levels, but the water at other points is less saline due to freshwater influences. As the Mangyeong River was completely desalinated after the completion of the embankment, roach, carp and eel were caught there in quantities. Buyers were interested in the roaches, but no regular markets were found for carp.

Fig. 2. Simpo fishing port (2007) under construction for a yacht harbor (2014)

As the salinity of water in the tideland was reduced, grand jackknife clam (*Solen grandis* (Dunker 1862)), surf clam (*Mactra chinensis* (Philippi, 1846)) and bladder moon shell (*Glossaurax* spp.*)* became scarce, and fishing

then concentrated on common orient clams.

According to statistics from the Ministry of Oceans and Fisheries (2013), the production of yellow croaker (*Pseudosciaena polyactis* (Bleeker 1877) and swimming crab (*Portunus trituberculatus* (Miers 1876)) had recovered since 2007, while the production of shellfish, including common orient clam, Chinese dosinia (*Scapharca* spp.), and grand jackknife clam, had decreased, except for Japanese short necked clam (*Ruditapes philippinarum* (Adams & Reeve 1850)) and half-crenated ark (*Scapharcasub crenata* (Lischke 1869)).

Underlying these trends were complex patterns of change in fishing and production practices. The main bivalve fisheries for common orient clam and jackknife clam are now described, with reference to changing fishing patterns and gear due to the tideland reclamation impacts and other environment changes driven by infrastructure development.

Common orient clam

Common orient clam is an important species in Saemangeum. North Jeolla Province has the highest production of varieties of common orient clam in South Korea. Culture of the clam started around Saemangeum in 1961. Until 2008, the production of this clam in North Jeolla Province accounted for approximately 70 % of the national average annual production, but as of 2012, production had dropped to only about 10 % of the national total. Unlike commons practices such as raising common orient clam by spreading larvae in jointly-owned sea areas and collecting clam jointly with other fishers, the women and men fishers in Saemangeum individually owned fixed areas of sea as their personal fishing grounds for clam for a certain period of time, authorized by a government agency. From their own areas, the fishers could freely collect and sell these naturally occurring clams.

After abalone, common orient clam was the second most valuable shellfish species. From ancient times, varieties were presented to royalty. Their shells were naturally in shades of yellow, but cultured clam tended to have black shells as they buried in black mud. Buyers and the women and men fishers engaged currently in their cultivation, and who do not know the clam's

natural colors, recognize clam with black shells as high in commercial value.

Cultivation is simple. An area of the sea is encircled with fishing nets, and then left alone; the shellfish breeds and grows naturally. On harvest, they are sold for different prices according to size and maturity (Ii 2015).

During the present study period, common orient clam was fished in the tideland by the women and men using either a rake or a special tool called a *geore* (Ii 2015). Before the tide embankment, spawning seasons were designated as closed seasons, but, after, the clam was caught throughout the year. As the number of tourists and buyers declined, however, the prices also declined. In J Village, many more people used rakes and *goere* than people who fished with boats (Ii 2015).

Fig. 3. Common orient clam soup (left), Rake (middle), and *geore* (right)

Before the tide embankment was built, in J Village fishers engaged in the cultivation of common orient clam achieved an average annual production per person of 5 T. Two years after the reclamation works, their catches decreased sharply. The Shellfish Fisheries Association, representing dozens of fishermen who farmed common orient clams, determined catch quotas and the sizes of shellfish of the day and sold them when the prices were high. Duck clam (*Mactra veneriformis* (Reeve 1854)) and common orient clam were stockpiled at the harbor; the duck clam was sent to Incheon, and the common orient clam to Seoul and then marketed nationwide. According to a villager of J Village who belonged to the Association and recorded the production quantities, in those days the village as a whole earned about USD 100,000 every day.

In Saemangeum, catching of clam by dredge net was introduced by the

fishermen who emigrated from Busan in the 1960s after they lost their fishing grounds when the estuary weir was constructed at the Nakdong River. Local Saemangeum people began to practice this catching method in the 1970s.

After construction began on the tide embankment in 1991, dredge netting developed into catching by pump dredgers. In a day, a pump dredger could catch as much as could 30 fishermen and fisherwomen using rakes or *goere* (Kim 2008). On a pump dredger, high pressure water was pumped through a square frame with 200 holes to flush shellfish out of the mud so they can be caught. Though this method produced large numbers, the water pressure could harm them and push mud into the shells, after which they lost their freshness or died, and thus lost value. Another gear innovation was to deploy pump dredgers with outboard motors. In 2002, fishing boats in Gyeohwa and Simpo began catching shrimps and common orient clam using this method.

Since 1990 around Haje, screw boats (modified trawlers) of 6-7 t with inboard engines have been used for catching bladder moon shell, common orient clam and all types of shellfish and fish (Ii 2007).

Grand jackknife clam

Both men and women caught common orient clam and only men caught duck clam and grand jackknife clam. Around Simpo harbor, common orient clam and grand jackknife clam were essential for wedding ceremonies, funerals, and religious services honoring ancestors (Ii 2015). After the tide embankment removed their habitat, grand jackknife clams have been imported from China and North Korea. Ceremonial offerings are now made from common orient clam, pork and seasonings (Ii 2015).

Fig. 4. Grand jackknife clam (left), boiled dishes (middle), and *seoge* (right)

The catching season for grand jackknife clam is from winter to spring (March). When the tide goes out farthest, the fishers walk while pushing a tool called a *seoge* (Ii 2015) (Fig. 4). The catch of jackknife clam plunged in 2006 and, by 2010, the price of one grand jackknife clam increased fivefold (Ii 2015).

Environment changes and fishing

As the cases for common orient clam and grand jackknife clam indicate, environmental changes have affected the behavior of key fishery species, and hence their fisheries. Common orient clam may move 2 km a day. During the seventh tides after full/new moon, it moves into deeper water; during spring tides, it moves to shallow water. In Saemangeum in the 1970s, such tidal behaviors and the changing natural environment caused some fishermen to start clam cultivation, whereas others experimented with catching tools and methods.

From October 2007, shellfish in deeper waters started to die, and the fishers were restricted to working only 3-4 days.mth^{-1}. Coastal seas became more shoal as sediment accumulated, and consequently fishermen changed their large fishing boats for seaweed gathering boats called *nobaegi*, which had flat shallow bottoms and could be operated in water of 1 m. Investing approximately USD 1,000 each, fishermen used outboard motorboats and pump dredgers and developed fishing tools called *taltali* for use in chest deep waters. *Taltali* consisted of a pump of 5-10 hp fixed on an expandable poylstyrene board of 180 cm (length) by 20 cm (width), and 90 cm (height), and a fire hose. This fishing involved delivering water pressure to the river bottom by hose to catch shellfish. Two fishermen worked as a team. One dragged the board on which the pump was fixed, and the other put a net full of shellfish on the board before they removed the shellfish from the net.

In 2010, however, this type of catching was stopped when the quality of water deteriorated. Because of deteriorating water quality and indiscriminate catching, clam as young as 1 year was taken. Common orient clam and duck clam stocks decreased, but more edible cockles and Japanese littleneck clam (*Venerupis philippinarum* (Adams & Reeve 1850)) were caught.

The fishing grounds adjacent to the coast of J Village were reclaimed during Japanese colonialism (1910-1945) causing those who had harvested with

goere to move their harvesting to the tideland near Haje (Fig. 1), 20 minutes away by 1.5-2.5 tons boats. Those who harvested with rakes travelled to the fishing grounds by tractor. In their new grounds, fishers caught duck clam, common orient clam, crenated ribbed ark, and others.

In 2006, J Village had five 3-9 t pump dredgers and nineteen 1-2 t small-sized boats, whereas, in February 2014, it had one 9 t fishing boat and eight 1-3 t fishing boats working both inside and outside the embankment. Until the completion of the tide embankment, when the tide ebbed, 7-8 fisherwomen rode on a boat, each paying boat fares of USD 10. With their family members or friends, they caught about 20-30 $kg.d^{-1}.capita^{-1}$. After the completion of the tide embankment, however, the public recognised that the closure of the sluices may have fouled and polluted the water. The number of tourists dropped sharply and the market for, consumption and prices of shellfish declined.

At spring tides during the study period, the fishers left the harbor around 09:00 hrs and returned around 15:00 hrs. At the neap, they went fishing around noon and come home around 18:00 hrs. Since they had to wait for the ebb, they were able to work each day for 4-5 hours. Until the construction of the tide embankment, clam catching was carried out as a full-time job, but, after the works, it became a side job. During daytime, catches tended to be smaller; large-scale boats, making larger catches, operated during the night. The poorest fishers did not own boats but paid to go to the fishing grounds by tractor. Their catches per person were only about 15 kg. Further, the closure of the water gates prevented the tide from ebbing, so they could not catch shellfish. When the days for which the water gates were open and the tides were out sufficiently for shellfish harvesting were limited to three, fishers were forced to harvest the clam also at night. Fishers who left for work early in the morning went home when they felt too hungry to continue. For example, one woman (53 years old) in J Village worked 15 days average total each month from September 2006 to June 2007, and earned USD 1,640 mth^{-1}, except after December when she could work only 6 days per month and her income dropped to USD 390.

In winter, shellfish burrowed deep into the mud and this led to lower catchability and a decrease in fishers' incomes. The best harvest seasons began in spring. Until 2007, two women, aged 74 and 68 reported that their biggest catches used to be approximately 60 kg $clams.d^{-1}$. The harvests were sold to

buyers at the harbor; payments were made 1-2 days later or on the spot. They each earned about USD 50 d^{-1}, while married couples who were skillful earned USD 300 d^{-1}.

Other fisheries of J Village

In addition to shellfish, people of J Village reported fishing for fleshy prawn (*Penaeus chinensis* (Osbeck 1765)) and white bait in spring, swimming crab in summer, krill for salted and fermented dishes in autumn and Japanese mullet in winter. To catch swimming crab at neap tides, they used drift gill nets (triple nets) operated for 4-5 hrs.d^{-1} from small boats. Striped mullet were lower in commercial value than anchovies and had not been used for food until the 1970s, when the villagers began to catch them to sell to merchants from Gyeongsang Province. The villagers also caught Jeoneo gizzard shads (*Clupanodon punctatus* (Temminck & Schlegel 1846)) to make salted and fermented dishes for their own families. Using 1-2.5 t boats, they caught swimming crabs, Japanese mullet, and white croakers. From 3-3.5 t wooden vessels, villagers used a pump and dredge net to catch common orient clam, duck clam, and purple Washington clam (*Saxidomus purpurata* (Sowerby II 1852)).

Demographics of J Village

In 2006, J Village in Gimje City comprised 37 native households and 56 households of new settlers, which meant that households of new settlers accounted for 60 % of the total 93 households, in which 88 males and 97 females lived. In the 1970s, most of the settlers came to the village after their businesses failed and they were invited by their relatives or friends around the harbor or on hearing that people around Simpo harbor were earning well. At first, the newcomers had to ride on others' boats to fish, but soon they were able to purchase their own boats. Village J does not have a large area of farmland, and, in the 1960s when marine products were of low value, it was the poorest village in Gimje City.

After 1970, household income grew as the number of nurseries of common orient clam increased and the export of clam went into full swing. Villagers engaged in agriculture also gave priority to catching shellfish. From

among 12 fishermen's unions in Gimje City, J Village was the largest in scale of its fishing industry and activity. Seventy-five out of 114 fishermen's union members affiliated with Simpo were fishermen of J Village. In 1970, 114 villagers of J caught shellfish and registered for the Fisheries Cooperative; 53 % of them (76 persons) still lived in the village during the period of the present study. As of September 2013, 111 persons (52 males and 59 females) of 57 households resided in J Village. The number of households and the population had gone down by approximately 40 % compared with the population of the year the tide embankment was completed. None were children under 9 years. Only 3 % of the population were teenagers. Residents in their forties and fifties had also decreased by 8-10 % but the number of people in their 60s and 70s had grown by 10-20 % and accounted for approximately 60 % of the total population, mainly living in households of a couple or 2 people.

Villagers (women and men) in their 50s were occupied as fishers, self-employed, or farmer daily laborers (Fig. 5). Most of the villagers in their 60s were fishers, people without occupation, or people employed by farmers. The villagers in their 70s and 80s were mostly engaged in agriculture, had no occupation or were welfare recipients. The majority of the villagers in J who used to catch shellfishes remained in the village. Some of them were engaged in agriculture, and others were without occupation or were welfare recipients. Farm daily labor and employment in restaurants were solely women's occupations. Most of the men were engaged in agriculture and fishing, whereas many women were jobless, self-employed, or on welfare (Fig. 6).

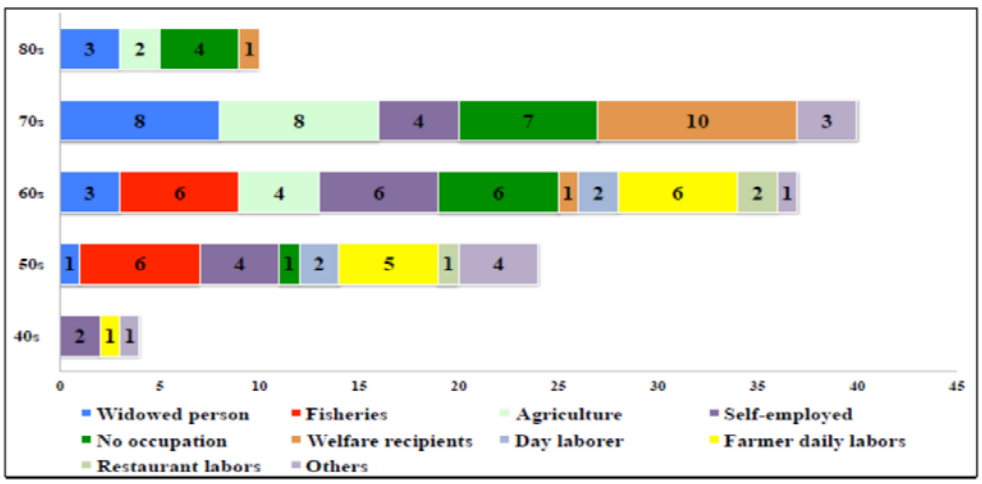


Fig. 5. Age-specific occupations

Although young fishermen abandoned fishing after they received money in compensation for fishing rights, and fishing was illegal after compensation was given, they could not find new jobs. Some purchased 2-4 t pump dredgers from South Jeolla Province at the cost of USD 20-40,000 each and restarted fishing. Six people (married couples and individual women and men) owned nine boats among them (Ii 2015).

Since villagers of J lost the sea that brought them cash income, they were not able now to lead a comfortable life, both financially and mentally. In 2014, villagers cancelled the lunar village festival in February, as no villagers were available to carry the responsibility.

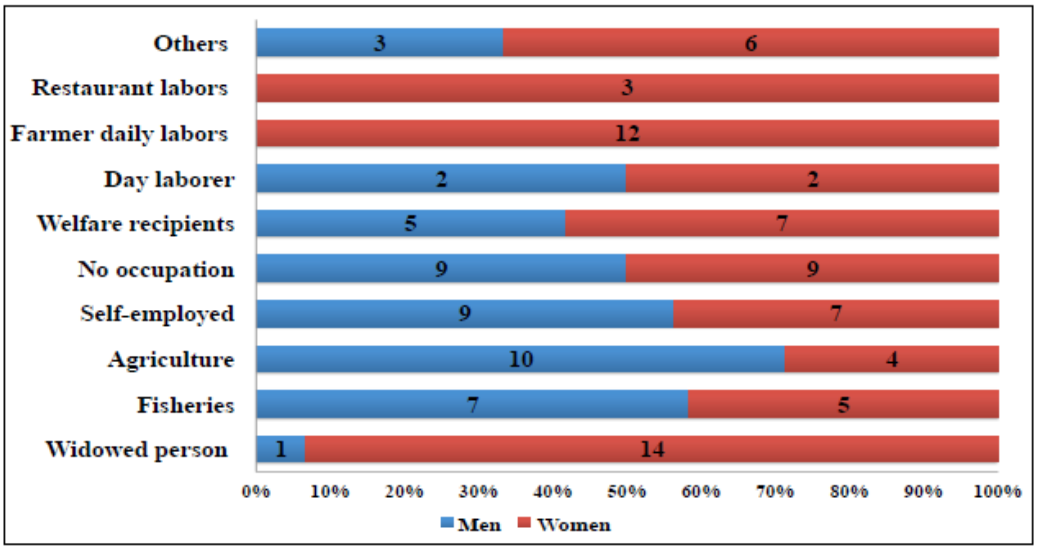


Fig. 6. Gendered occupations after the tidal embankment was constructed (N=113).

Case studies of men and women and local culture

The changes experienced by the people of Village J as a result of the tidal embankment were revealed through interviews.

Mr. S., fisherman with a small-sized boat (68 years, b. 1946)

At the age of four, Mr S. came to K Village with his parents, fleeing the Korean War. Graduating from middle school, he helped his father on a sailboat and learned how to fish. During those years, swimming crabs were so abundant that the fishers chose only bigger ones to take home from out of the

full catch of the boat. Except for a period of military service and job-hunting, during which he lived in Ulsan, Geoje Island, and Seoul, he had fished in K Village. In 1975 after marriage, he moved to J Village and worked on other fishermen's boats. In 1983 he bought a 2 t boat and began fishing with his wife. Over a year, they caught grand jackknife clam with *soege*, common orient clam with *goere*, duck clam with rakes, and swimming crabs, prawns and fishes with gill nets and drift nets, earning USD 80,000 a year after deducting expenses. With techniques learned from his elder brother, Mr. S. became a master in catching grand jackknife clam. He once caught 1,000 grand jackknife clam in 30 minutes where they were abundant. He shared his knowhow with villagers. In October and November, his catch was worth USD 200 a day, whereas in January the daily catch decreased to USD 60-70; in a month he could earn USD 1,000. In winter, cold winds froze the mud in the tideland, so he went to the seashore to catch grand jackknife clam.

In 1991, as a small boat owner, Mr S. received USD 2,500 in compensation for the loss of the fishing ground use right. However, the women and men fishers fished from 2001, when an environmental group filed a suit to object to the reopening of the Saemangeum construction, until to 2006, when the final judgment was given. In 2007, Mr S.'s boat was bought out by the national government. He then helped his brothers in the neighboring village in catching Japanese littleneck clam. When these clams were caught in quantities in 2010, women and men were hired for USD 80 and USD 150 per day respectively. In the Mangyeong River, which was completely desalinated, carp, eel and cubicula clams have been caught since 2012. Abandoning fishing, young people left the village to look for jobs, resulting in the reduction of the population by half and an increase in empty houses.

From 2012, Mr. S. has been taking care of the graves of the ancestors of the residents in Seoul and their farms. Depending on his wife's income and his pension worth USD 300 a month after he lost his job, he grew vegetables in the field near his home for in-house consumption. On 2-3 days in spring, when the tide ebbed, he drove a car to the seashore to collect grand jackknife clam, taking one and a half hours each way to get there. His wife worked by day in the fields cultivating potato, cabbage and onions near the village. At the request of the Rural Water Corporation, he attended weeding activities in the village, which were be carried out by a person from a household for a daily allowance

of USD 55. Joining a team of three members of the Rural Water Corporation, he worked on a three-month shift on the site where three major companies were implementing reclamation works. He watched the speed of cars and earned a daily allowance of USD 55.

Mr. S. said: "*I can fully understand the Policies of Junbuk Provincial Government concerning the reclamation of Saemangeum. Though I think it is highly unlikely that they hear the fishermen's voice, I want to ask them once what they intend to do about the living of the fishermen who lost their fishing grounds. Until construction works on the tide embankment, if you went to the sea, there were abundant fishes and shellfishes. So we didn't fish striped mullets, echinoids, and so on. We did fish Jeoneo gizzard shads, but just for salted and fermented dishes. After the construction, there was nothing to fish, so we lived on fishing striped mullets. As long as there was the sea, I intended to keep on fishing, but now that we cannot continue fishing, I feel uneasy about my life. Without fishing grounds, more and more elderly people are killing time at the senior citizens' community hall. They have almost no cash income, so they are oversensitive to the loss and gain, and quarrel over trifles right away. They tend to have a nasty temper.*"

Mrs. L. fisherwoman catching shellfishes (60 years, b. 1954)

When she married the second son of a family with six sons and daughters in 1974, Mrs. L. and her husband were given a boat for catching surf clam as well as 10 kg of rice and 10 kg of wheat for them to start their new independent life. They rented a house in J Village, and her husband caught grand jackknife clam while employing 7-8 men on his boat. When their youngest child was five years old, she and her husband fished swimming crabs and fleshy prawn. Then they also employed women on their boat and caught common orient and duck clams. Their two daughters and a son were married and living in Gimje City. Until the construction of the tide embankment, they had operated a 2 t boat with 10 people aboard to catch 100-120 kg.day^{-1} of duck clam, and sold them to consignors' counters at the harbor. In 1997, their catch of shellfish was worth USD 30,000, contributing to the expenses for their elder daughter's wedding. Since 2002, they had fished Japanese mullet, fleshy prawn and female swimming crabs in spring, striped mullet in summer, male

swimming crabs, fleshy prawn and gizzard shads in autumn, and grand jackknife clam, common orient clam and duck clam in winter.

As they could not fish after the completion of the embankment, her husband became jobless, and Mrs. L. worked in agriculture as a day laborer with co-workers who were in their fifties and sixties. Sea fishing for 4-5 hours brought about USD 200 day on average, but working in the fields only earned about a half this, even though physically harder. When working at sea, they would take days off for rain and storms, whereas working in the fields was not so affected by weather. If others worked, they could not rest even if they wished. Sometimes, villages would take time off fishing to go on a group tour. Now, they could no longer afford this. In autumn after the rice was harvested, Mrs L. worked planting potatoes in the greenhouses from 04:00-14:00 hrs. If six people worked as a team for 8 hours, the team earned USD 300; four people working together earned USD 200. The wages were divided equally among team members. The more fields they worked in, the more they could earn. So they gathered together to maintain each member's daily allowance of USD 60. With regard to other field work, they worked 250 days annually harvesting cabbage, Chinese cabbage and onions, and earned USD 13-15,000. Women in their seventies made USD 100-200 a day when they caught shellfishes, but working in the fields even for as long as 10 hrs brought them USD 55. Yet, the women had places to work, whereas the men had none. Elderly people who had no income could obtain special allowances of USD 700-800 a month, but those who stopped fishing often suffered cognitive impairment and moved into nursing homes or their children's houses. As a result, the number of empty houses was increasing, and accounted for more than 10 % of all houses.

When Mrs. L. started her work at 03:00 hrs, she comes back home at 13:00 hrs, and then grew vegetables, such as red pepper, sweet potato, potato, bean, Chinese cabbage, radish, and eggplant in her own fields for her own household. Harvested in August and dried by machine, red peppers were sold to villagers. The price of rice was USD 150 for 80 kg, while the prices of black soybean and soybeans were USD 800 and USD 600 for 70 kg, respectively. Thus vegetable fields yielded more than paddy fields, so more and more villagers changed paddies into vegetable fields. However, the income from fishing was 20 times more than that from farming. With a 2 t boat, fishers earned about USD 60,000 a year. Each received only USD 5,400 (almost 10 %

of the annual income) as compensation for the reclamation of Saemanguem. The largest compensation paid was USD 8,400. When engaged in fishing, fishers went to markets every week but at present, however, all the necessary cooking ingredients are raised in their own fields, so they no longer shop. As they were not involved in farming before, they were learning from elderly fellow villagers about the varieties of seasonal vegetables as well as how to plant and look after them. To hold expenditure low, when she had nothing to do, Mrs. L. played Japanese gambling card games with village women in the community hall or took care of her grandchild for her daughter.

Cancellation of the festival of women

Decreasing villagers' incomes were negatively impacting the local economy of the Gimje area. Those who lost their sources of income had become very sensitive to their expenditures. As an example, in 2014 elderly women unilaterally canceled the festival to pray for their families, maritime safety and good catch, which was traditionally held by women in the village over three days in February, according to the lunar calendar. The origin of the festival was uncertain, but previously it had been held every three years (National Folk Museum 2008). Since 2003 when a marine boat accident occurred, however, women as central players had held the festival every year. The reasons the festival was suspended were that women began to regard it as a superstition, most of the younger women who should have been hosting the festival had jobs, and the remaining elderly women alone could not prepare the festival. However, women in their fifties and sixties intended to continue the festival at least in their generation. From preparation to the party after it, all the village women participated in the festival that promoted a sense of unity and solidarity. Although they were rivals in fishing, they helped each other in the perilous sea, and they also assisted each other on occasions such as weddings and funerals. When they did not go fishing, they gathered in the community hall to prepare and have lunch together, or they went on group tours. However, women at the age of 70 and above who were living alone began to receive livelihood assistance from the government, and it became impossible for younger working women to have lunch with them. Such a gap between generations seemed to have caused the discontinuity of the festival. With little cash income, elderly women appeared to be strict about their spending money. A group of village women who were in their fifties and sixties requested an influential politician

representing the constituency to make a room for them to gather in the community hall. These age cohort differences suggest widening gaps between women of different ages.

Fishers livelihoods, development policies and environmental issues

At first, many women and men fishers opposed the reclamation works, but people who had nothing to do with fishing were rallied to demonstrate in favor of the reclamation and the fishers' voice was ignored. The Federation for the Environment Movement also opposed the reclamation but its top priority was to conserve the wildlife.

The J Village fishers' views were expressed through the J Village Emergency Preparedness Committee, and the fishing village cooperative. Neither body was effective nor well informed in representing the fishers, and the two did not hold common views. The former Committee dealt with such matters as liaison with the Rural Water Corporation that was in charge of water quality and opening and closing the water gates.

In addition, the fishers' interests were represented by those who did not support their opposition to the reclamation. Of the chiefs of 12 fishing village cooperatives in Simpo harbor area, only 3 were engaged in fishing. The remaining 9 chiefs were not concerned with fishing and did not sympathize with the fishers whose livelihoods would be badly affected by the reclamation. Each fishing village cooperative was a subordinate organization of the Fisheries Cooperative Association, with a budget that was 90 % subsidized by the national government. The chiefs of the fishing village cooperatives were quasi-public servants who could not act openly for the interests of the women and men fishers they were representing.

Even after the completion of the tide embankment, differences of opinion remained between the chief of the fishing village cooperative of J Village and the Emergency Preparedness Committee. Although compensation for fishing rights had already been made, the Committee planned a demonstration in the expectation of further compensation from the national government. At first the Committee was for the reclamation of Saemangeum, but later it participated in the movement against the reclamation, together with

the Federation for the Environment Movement, and urged the governor of North Jeolla Province to clearly show the grounds for determining the amounts of compensation money. Government authorities assumed that since the Council of the chiefs of the 12 fishing village cooperatives and official organizations constituted the Emergency Preparedness Committee, then the fishers' voice was expressed. However, the chiefs, who had no knowledge of fishing, disapproved of the idea of further protest and the organizations became antagonistic.

The chief of the fishing village cooperative of J Village who had been against the reclamation from the very beginning argued that if the Committee held a demonstration they should demand some measures to secure the livelihoods of fishers. The J Village fishers who did not own boats were not aware of information on compensation and let themselves be led by the Emergency Preparedness Committee's views. They urged the Committee to consult with villagers and develop a consensus, rather than pursue its own opinion. When they realized, however, that the position of the Committee was different from theirs and that they had been used for the Committee's own ends, the fishers of J Village began to act independently.

To hide several problems, including dust caused by the reclamation and dried tidelands damaged by salt, the Rural Water Corporation employed local residents to sow seeds of sea-blite (*Suaeda japonica)* by tractor. Such support employed women and men fishers on construction sites and assisted the Corporation to stifle the fishers' dissatisfaction. However, failing to find new jobs, many of the several thousand women and men who lost their fishing grounds kept fishing, though they were aware that they were considered temporary illegal fishermen. For fear that fishermen would feel resentful toward strict controls, the government tacitly permitted such illegal fishing. Fishermen of J Village said that the reclamation project could not be reversed because it was the national policy which 5 consecutive presidents pushed forward and that what they wanted was to have the government reclaim just an area for present needs and hand the remaining tideland down to the future generations.

Compensation complications

Compensation arrangements were contentious. Since government agencies neither explained to nor discussed with the women and men fishers the

rationale for the amounts and their distribution, J Village's Council of Fishers with Boats did not accept a unilateral proposal. The women and men fishers catching shellfish, however, accepted it only because they could receive as much as USD 10,000. The government insisted that if the fishers did not accept money, the funds would be returned to the national treasury. In the end, the amounts of compensation that the fishers of J Village received varied from USD 1,500 to 8,400 per person, whereas some who had never fished received USD 10,000.

More importantly for the long term, despite the compensation, the women and men fishers were not provided any support in their future livelihoods and authorities did not keep a promise that depreciation would not be deducted from the compensation. In 1991, the fishermen with boats in Saemangeum protested by camping in front of the national assembly building and also talked with congressmen representing the constituency, but the problem was not solved. The fishermen then took their case to court but, after 4 years, lost it.

The amounts to be paid to the women and men fishers who cultivated common orient clam were determined according to the areas of the grounds and annual incomes. As a result, they were larger than the amounts paid to those who had been fishing in public areas of common fishing grounds, including both the fishers who had been catching shellfish and fishermen who had been fishing on boats. The standards used for determining the amounts for the latter fishermen were yearly incomes, the scale of boats (for fishermen on boats), and ages and days working (for fishermen catching shellfish). However, the standards for determining the amounts of compensation for fishermen catching shellfish were not very clear, and all the residents who had applied were considered eligible recipients.

The number of fishermen in Gimje City who were to receive money in compensation should have been about 3,500 but about 7,000 actually received compensation. Using only resident registration, even those who did not live in Gimje City or who had not been engaged in the fishery were included as eligible recipients. The total sum of compensation was fixed and so when more people were eligible, each person's share was less.

To rectify such unclear standards, Gimje City issued licenses for catching shellfish to those who paid USD 3 as a usage fee for the fishing grounds for 1994 and only the people who had licenses for catching shellfish were targeted for compensation. Thus the city limited compensation to only licensees and excluded non-residents.

The fishers became powerless parties with respect to compensation for fishing rights. Firstly, they had no information-gathering ability and legal knowledge and lacked appropriate advisers. In Gimje City, the Ministry of Agriculture and Fishery approved that the Gimje Fisheries Cooperative's use of 2,600 ha of fishing ground, and that the fishing rights belonged to the members of the J fishing village cooperatives, who were also the members of the Gimje Fisheries Cooperative. However, the women and men fishers in the surrounding areas of Haje and Simpo did not have adjacent fishing grounds, so they were not granted such rights. If exclusive access to adjacent fishing grounds were admitted, the fishers from other areas could not fish there. Yet, local women and men fishers in Gimje, Haje and Gyeohwa have used Saemangeum as common fishing grounds since the 1960s. To prevent conflicts among the fishers, the Provincial government of North Jeolla Province determined that adjacent seashores in the North Jeolla Province were common fishing grounds that anyone residing in North Jeolla Province could have accessed. As a result, not only the women and men fishers working in adjacent fishing grounds but also people who had just entered in the register of residents beforehand were able to receive money in compensation. Thus, the fishers who were affected the most by the loss of fishing grounds received smaller amounts of money than their annual incomes.

Even though they were aware that people who were neither the women and men fishers nor residents had received money in compensation, no one could stop this because some were their relatives and some were their neighbors. Fishermen said that it was a problem for the government to coordinate, whereas the government said that it was a problem for the local people to settle. Although they paid attention to themes such as environmental deterioration of tidelands, economic values and conservation, in their concerns over the reclamation the Federation of the Environment Movement and researchers neglected the rights of dispossessed humans (the women and men fishers) to a decent standard of living.

Reclamation politics

The tideland reclamation project was perceived by many as a political issue. Capitalists and conglomerates had the rosy dream that reclamation would secure a vast area of land and the following developments would vitalize a sluggish local economy. For local women and men fishers, it was surely an illusion as they were deprived of their fishing grounds. The fishers who were immediately concerned with using the tideland did not benefit from the development of the reclaimed land. Instead, as the affected parties, they continually felt helpless. The J fishing village cooperative chief said that the fishers did not have sufficient power to oppose national policies and, rather than object, it was wiser to demand the government implement measures to provide them living support.

The fishers of J Village say that the reclamation in Saemangeum was a development project intended to pull in votes from the residents in the Jeonbuk Provincial Government area who had a tendency to support opposition parties. The reclamation project has been underway for more than 20 years, and has survived five presidential elections. Its plans have changed with each change in national government. The project was not initiated with any specific objectives. The project went ahead despite researchers and experts insisting that Saemangeum had more economic value as fishing grounds than as farmland.

On the advice of the chief of H fishing village cooperatives in Gyeonggi-do, where measures to guarantee the women and men fishers' livelihood after the reclamation were taken, the chief of the fishing village cooperatives urged the fishers around Simpo harbor to demand such measures of the government. Without a persuasive leader who could harmonize various opinions, however, J Village ended up with a clash of opinions. Villagers brought their problem to researchers and experts, congressmen, NGOs, and environmental conservation organizations. The top priority of these interest groups, however, was to stop reclamation works and restore the environment to its original condition. The problem of securing the women and men fishers' livelihoods after the reclamation was deferred.

Conclusions

Since it was desalinated through major land reclamation projects starting in 1991, Saemangeum had changed from a lucrative marine fish and shellfish area to a location for freshwater fish. Markets for the freshwater products have still to be developed. Although the original plan for the land reclamation was to open up more agricultural land, industry had tended to take over and tourism is planned. Looking for jobs, young women and men fishers who had worked on the sea left the villages, accelerating the hollowing out and aging of the village populations.

For those who were born in Saemangeum and has spent decades there dependent on the sea before they lost their fishing grounds in the national reclamation project, changing jobs and learning new techniques was hard. The women and men fishers without agricultural land have been absorbed into unskilled, low paid work as day laborers. Those who remained in the villages were forced to be self-sufficient.

Their sense of solidarity and belonging to the same community promoted by mutual aid as well as relationships established beyond generations has been shattered. Thus, just as the tideland is disappearing to become part of the land, so the women and men fishers are becoming exhausted and impoverished.

Development that should have vitalized the local economy affected it adversely. Women and men fishers who constituted the minority and the weak were made acutely aware of how helpless and hopeless they were. Meanwhile, the development project is making progress toward completion, by 2020, of a vast area of land and expressways. In the face of this development, the fishers were social, political, and cultural underdogs. By the development of large-scale national projects, their livelihood foundations were removed but nobody, including the nation and administration, guaranteed the life of the women and men fishers who did not have a place to appeal for their basic life rights.

Acknowledgements

This work was supported by Monbu-Kagaku-Sho (Ministry of Education, Culture and Science, South Korea), and the Miyazaki Arts and Sciences Promotion Foundation, Japan funds from 2011 to 2014. And in this research, thank you for the cooperation of many people including Kim Chairman of the senior citizens association of Ana Village.

References

Ii, S. 2007. South Korea Saemangeem Tideland Reclamation and fishermen's strategies. Bulletin of Miyazaki Municipal University Faculty of Humanities.15: 15-27

Ii, S. 2014. The development is for whom: The case study of Saemangeum, South Korea. Nature and Culture of Tidal Flats in the Western Pacific. Tokai University Press, Tokyo. 28pp. (In Japanese)

Ii, S. 2015. Clamming down. Samudra 70: 20-23.

Jang, C. 2004. Aquatic Products. In: South Korea's Tidal flats: Environment, Creatures and Humans (ed. Koh, C.), pp. 195-224. Seoul National University Press, Seoul. (In Korean)

Japan Wetlands Action Network. 2001. The people who sold the sea. Nampoushinsya.305 pp.

Kim, G. 2008. The Change of the Life Location and Corresponding of the Residents by Saemangeum Reclamation: Mainly Simpo harbor. Mokpo National University Graduate School of Archaeology Department of Mankind. Master's thesis. 96 pp. (In Korean)

Kim, S. 2009. Gimje local culture Encyclopedia: Gimje Gwanghwal Reclaimed Land and Dongjin Irrigation Association. http://gimje.grandculture.net/Contents/Index?contents_id=GC02600016&local=gimje. Accessed 10 June 2014. (In Korean)

Koh, C. 2004. Reclamation after the Japanese colonial period. In: South Korea's Tidal flats: Environment, Creatures and Humans, pp. 691-700. Seoul National University Press, Seoul. (In Korean)

Kumamoto I. 2004. Whose thing is the Sea. In: A human being and environment: Whose thing is nature, pp.138-161. Showadou, Kyoto. (In Japanese)

Ministry of Oceans and Fisheries. 2013. Current Conditions of Costal Wetland Areas. https://www.mof.go.kr/statPortal/cate/statView.do. Accessed 30 March 2014.

Moores, N. 2016. Saemangeum Estuarine System (Republic of Korea): Before and after reclamation. In: The Wetland Book: Distribution, Description and Conservation, (eds. C. M. Finlayson, N. Davidson, G. R. Milton, C. Prentice), 8 pp. Springer: Dordrecht, The Netherlands. https://link.springer.com/referenceworkentry/10.1007/978-94-007-6173-5_36-2. Accessed 16 November 2017.

Moores, N., D.I. Rogers, K. Rogers and P,M, Hansbro. 2016. Reclamation of tidal flats and shorebird declines in Saemangeum and elsewhere in the Republic of Korea. Emu 116:136-146.

National Folk Museum. 2008. Why they live in the reclaimed land of tidal flats: Simpo fishing village: North Jeolla Province folk working papers. National Folk Museum Jeollabuk-do, Jeolla Province. 357 pp. (In Korean)

Oh, S. 2004a. Reclamation of the Choseon Dynasty. In: South Korea's Tidal flats: Environment, Creatures and Humans, (ed. Koh, C.), pp. 645-668. Seoul National University Press, Seoul. (In Korean)

Oh, S. 2004a. Reclamation in the Japanese colonial period. In: South Korea's Tidal flats: Environment, Creatures and Humans, (ed. Koh, C.),pp. 669-690. Seoul National University Press, Seoul. (In Korean)

TECHNICAL PAPERS

Gender in Aquaculture and Fisheries: Engendering Security in Fisheries and Aquaculture
*Asian Fisheries Science Special Issue **30S** (2017): 131-143*

ISSN 0116-6514
https://doi.org/10.33997/j.afs.2017.30.S1.006
Technical Paper

Towards Assessing Gender Authorship in Aquaculture Publications

MORGAN CHOW[1], HILLARY EGNA[2*] and JEVIN WEST[3]

[1]The Nature Conservancy, Seattle, Washington, and AquaFish Innovation Lab
[2]AquaFish Innovation Lab, Oregon State University, Corvallis, Oregon
[3]University of Washington, Seattle, Washington

Abstract

While gender disparities are decreasing in some areas of academia, studies have shown that gender inequities in scholarly literature still persist. A review of more than eight million papers across disciplines found that men predominate in the first and last author positions and women are underrepresented in single-authored papers.

The present study applies the vetted methodology of assigning authorship gender in peer-reviewed literature, according to the U.S. Social Security Database of names, to the broad discipline of aquaculture in peer-reviewed journals in the complete JSTOR database archive, and compares these results to authorship by gender in the International Aquaculture Curated Database (IACD). The International Aquaculture Curated Database (IACD) is a compilation of over 500 peer-reviewed publications supported by four international aquaculture programs developed by Oregon State University researchers. Preliminary findings reveal that the percentage of women authors was similar to that for the JSTOR aquaculture journals subsample (13.8 %) and the journals in the IACD (15.7 %). Women, therefore, are not well represented in either database. The next steps for this work include comparing and contrasting the proportion of women authors in aquaculture journals to women working in the aquaculture discipline and to women graduates in the discipline. Learning how gender authorship has changed in the aquaculture discipline is a critical component for promoting gender equity in the academic discipline and broader field of aquaculture.

[*]Corresponding author. Email address: Hillary.Egna@oregonstate.edu

Introduction

Studies have revealed that gender inequities still persist in scholarly literature (West et al. 2013; Breuning and Sanders 2007; Jagsi et al. 2006; Dubey et al. 2016; Arismendi and Penaluna 2016). From examining authorship of more than 8 million papers across disciplines in natural sciences, social sciences, and humanities, West et al. (2013) found that men dominate in the first and last authorship positions and that women are underrepresented as single authors. These numbers are important because most university systems judge a researcher's proficiency according to the number and quality of peer-reviewed papers, and on authorship position. This criterion is then used in determining promotions, assessments for tenure-track positions, attainment of research funding, and so on. Therefore, authorship can also be a measure of the status of gender and diversity in academia.

Generally, studies have found that women are underrepresented in science, publish less (Martin 2012; Conti and Visentin 2015), and receive less grant funding than their male counterparts (Vernos 2013). Other studies have assessed women's authorship in disciplines including political science and medicine, and found that not only does a gender gap in published literature still remain, but women's authorship has been levelling off in recent years (Breuning and Sanders 2007; Jagsi et al. 2006; and Dubey et al. 2016). This trend makes a closer evaluation of the status of gender authorship in peer-reviewed literature within aquaculture, one of the world's fastest growing food production sectors, highly relevant.

The academic discipline of aquaculture is relatively new and interdisciplinary, and many aquaculture degrees are granted from fisheries departments. Our analysis of the discipline, therefore, is embedded within the broader domain of fisheries. In more than 50 academic institutions, a study by Arismendi and Penaluna (2016) found that women and minorities are still a small portion of tenure-track faculty in the discipline of fisheries. Over the past three decades, they found only a slight increase in the inclusion of women among the academic community of fisheries science. This suggests a perpetuation of the "leaky pipeline" in fisheries science as, in recent years, women have received more than half of the doctoral degrees in the biological sciences (Miller and Wai 2015; Egna et al. 2012; Blickenstaff 2005). These

trends and a study by Perna (2005) reveal that women are less likely to be promoted than men in academia, and the unlikelihood of a promotion can be linked to the status of gender authorship in peer-reviewed literature. Ignoring these inequities or allowing them to persist limits the development of the scholarly field of aquaculture.

To evaluate gender authorship within a discipline, it is first important to understand that the process of assigning authorship position varies across academic institutions, disciplines, and sub-cultures within research groups. Furthermore, most disciplines do not have a standardized protocol for determining authorship order, or determining each author's contribution to a paper. This is partly because it can be difficult to ascertain how much work each contributor has put into a paper (Laurance 2006; Tscharntke et al. 2007). Traditionally, the first author has contributed the most to the paper and receives the most credit, and the positions of the subsequent authors are determined according to contribution, alphabetical order, or reverse seniority (Tscharntke et al. 2007). The last author often gets as much credit as the first author as he or she is assumed to be the intellectual and financial driving force (Tscharntke et al. 2007). Subtle biases and other factors can influence how authorship is assigned. Increasingly, "gift authorships" are given, i.e., an author is added for courtesy reasons because of their academic status, particularly in biomedical journals. This trend further confuses the actual contribution of each author listed on a publication. Because of the unclear process by which the set of authors for a paper is determined, identifying the amount of work each author contributed is challenging.

The culture of peer-reviewed publications is also changing and this also affects how changes in gender authorship over time are assessed. In particular, over the last several decades, the amount of collaborative and cross-disciplinary research has grown, as has the pressure to publish. Both of these factors have led to growth in the number of authors listed per paper (Wren et al. 2007). The growing number of authors per paper makes it even more difficult to adequately and fairly assert authorship order.

Because of the complex nature of assigning authorship position and the importance associated with publishing as a first author, examining gender authorship can help understand the advancement of the discipline because it is

inevitably a critical component of an individual's success in academia. For this reason, our study begins to evaluate the status of gender authorship in aquaculture by comparing authorships across the JSTOR Corpus database archive to, first, a subsample of JSTOR with aquaculture journals, and, second, a smaller, curated database, compiled by the AquaFish Innovation lab, of aquaculture peer-reviewed publications. The second database, the International Aquaculture Curated Database (IACD), was created in order to have a very rich data source of aquaculture publications from around the world that have been published throughout the entirety of the existence of the modern era of aquaculture for scholarly analysis. The richness of an international curated database lends itself to factoring in additional variables such as funding and faculty rank, along with other social metrics when assessing authorship.

The present paper shares preliminary findings that the percentage of women authors across the aquaculture discipline is significantly lower than women's apparent presence in the discipline. Since women have received more than half of the doctoral degrees in the biological sciences, it is plausible that women represent more than 16 % of researchers working in the discipline, while this is the rate at which women are authoring papers. This number is corroborated across two completely disparate, yet valuable sources within the aquaculture discipline. Although the results are not yet final and work is continuing to contextualize these authorships across the changing discipline, our findings represent the first time gender authorship in aquaculture has been calculated.

Materials and Methods

Datasets

Building on the work of West et al. (2013) and other studies conducted on gender authorship in the peer-reviewed literature within and across research disciplines, we compared multiple data sets from journals with publications in the aquaculture discipline. The International Aquaculture Curated Database (IACD), created by the AquaFish Innovation Lab, consists of 542 articles, written by 1706 authors in 121 journals, all of which were published between 1983-2016. The IACD draws from peer-reviewed papers whose research was supported by 4 separate international aquaculture programs, which were

developed by Hillary Egna including: (1) Pond Dynamics/Aquaculture Collaborative Research Special Program (CRSP) (1982-1996); (2) Aquaculture CRSP (1996-2008); (3) AquaFish CRSP (2006-2013); and (4) AquaFish Innovation Lab (2013-Present). The IACD was compiled by AquaFish Innovation Lab staff who reviewed both electronic and hard copies of journal articles. Every publication since 1983 was recorded with publication information, including full names, gender of authors, and author position, with the percentage of unknowns being less than 1 %. Gender of authors was recorded by Egna from having a personal connection to the author or by the lead authors themselves.

The IACD was analyzed for comparison to two separate JSTOR collections: (1) Recalibrated JSTOR dataset; and (2) JSTOR aquaculture subsample. The JSTOR is an expansive database of publications organized according to broad topics, and contains publications dating back to1665. Similar online databases include but are not limited to: Academic Search Premier, Web of Science (WoS), Scopus and Microsoft Academic Graph (MAG). Each of these, however, has their proprietary strengths and weaknesses. For example, JSTOR has far more time depth than any of the other databases and it has full text for all their articles whereas most of the others have only bibliographic data. Some are freely available like MAG; others have decades of data (WoS). Hundreds of databases have been created, but many of them are specific to certain disciplines or types of publications, whereas those listed above are more comprehensive across the literature.

Recalibration was done in order to revisit the gender findings from West et al. (2013) and compare the findings to authorship data in the present study. The JSTOR aquaculture subsample separated the aquaculture journals from others within the broad database. It begins in 1913 as that was the year one of the first aquaculture-related journals began. Both the IACD and JSTOR comprise journals in the biotechnical domain of aquaculture more so than in the social or management domains of the discipline. JSTOR journal areas include: cultural studies, arts, business and economics, history, humanities, law, medicine and health, science and mathematics, and the social sciences. Aquaculture journals are located within the science and mathematics category. The Recalibrated JSTOR Corpus covers all major realms of scientific publications; the aquaculture subsample of the JSTOR Corpus includes a large

number of articles from a select few aquaculture journals; and the IACD is a substantiated aquaculture-specific database containing fewer journal articles. Together, the 3 data sources allow for a stronger understanding of gender representation in journal authorship.

Results

Women's authorships in the three databases

In the entire JSTOR Corpus, recalibrated for this study and comprising nearly 2 million papers, women represent 21.9 % of total authorships for papers published between 1665-2011 (West et al. 2013). This timeframe represents the existence of JSTOR publications.

For fisheries-related fields such as Ichthyology and Aquatic Ecology, women represent 21.0 % and 9.0 % of total authors, respectively. In the JSTOR, authorships are defined as an author-paper relationship, and does not count unique authors. This requires author disambiguation for the full corpus, which is an ongoing challenge in the field of bibliometrics and scientometrics. Also, in this prelimary stage of the current research, authorship by gender was not explicitly calculated for the interdisciplinary field of aquaculture. Because of the large number of authorships in JSTOR, gender was inferred by looking up the frequency of first names in the U.S. Social Security Database. For example, if "James" appears 99 % of the time as a boy, we assume that an author with the name "James" is male. For androgynous names such as "Andrea" and first names written as initials, we could not infer gender so we do not include these authors in the analysis. Therefore, the gender labels are self-identified and determined by only looking at the names and the frequency of gender for a given name. Unidentifiable names account for about one in every five authors in the Recalibrated JSTOR dataset (Table 1).

In the JSTOR aquaculture subsample, 23,381 articles and 43,146 authorships within 8 aquaculture journals (since 1913) were extracted and assessed for authorship gender in multiple positions to compare to the Recalibrated JSTOR dataset. The JSTOR recalibration adjusted for the period in which the first aquaculture journal in our subsample was initiated. The process for extracting authorship gender for the subsample was the same as for the

recalibrated entire JSTOR. The following eight journals were selected because they are highly ranked in the aquaculture discipline: Ambio, Copeia, Estuaries and Coasts, Journal of Coastal Conservation, Journal of the North American Benthological Society, Limnology and Oceanography, and Water and Environment Research. We recognize that these journals do not comprise a representative sample of all aquaculture journals, and are skewed towards biotechnical domains of aquaculture. However, these journals are consistent with the journals available in JSTOR. Future work will include a greater variety of aquaculture journals in the JSTOR subsample.

Table 1. Comparison of journal databases used for this study.

Dataset	Number of Journals	Number of Articles	Authors/ authorships	Timeframe	% Genders Unknown
IACD	121	543	1,706	1983-2016	<1 %
Recalibrated JSTOR	2227	1.8 million	2.8 million	1665-2011	26.7 %
JSTOR Subsample	8	23,381	43,146	1913-2016	23.7 %

Aquaculture Discipline

As well as recent changes in the publication process for peer-reviewed literature, the history of aquaculture was considered for this analysis. To understand the evolution of gender in the aquaculture discipline, it is important to first recognize that the discipline of aquaculture has changed substantially over the past 30 years (FAO 2016). Global aquaculture production started increasing in the early 1980s, rapidly expanding in the 1990s to the present to accommodate a growing global population with its changing diets and preferences. Development was especially expansive in the 1980s, with pond culture predominating total aquaculture production. The fisheries discipline has also grown in both scope and geographic range. There has been a global scale expansion of marine fisheries from the North Atlantic and West Pacific to the Southern Hemisphere. The southward expansion of intense industrial fisheries exploitation occurred at a rate of almost one degree latitude per year with the greatest expansion occurring in the mid-1980s and early 1990s (Swartz et al. 2010).

Growth of the aquaculture discipline and industry have, not surprisingly, mirrored each other. Preliminary data from over 300 aquaculture-related publications shows the rapid inception of new journals from the late 1980s to the 2000s. Overall, the number of journals and publications has grown in all disciplines. In the recalibrated JSTOR set, we find that roughly half of all peer-reviewed publications were published after 1990. We think that this is consistent across other large scholarly article corpora. Scientific publishing, like many other industries, has faced many changes with the onset of the internet. Journal articles today are accessed online with increasing frequency, and retrieved in digital formats rather than through printed sources (Laakso et al. 2011). The way that journal articles are accessed online has also changed in recent years, particularly with the growth of Open Access publishing between 1993-2009. Since 2000, the annual growth rate for Open Access journals has been 18 %, and 30 % for the total number of published articles (Laakso et al. 2011). The evolving mechanisms for publishing peer-reviewed literature have consequences for researchers in the field, and their authorship track records.

Preliminary results reveal that women occur in low percentages as authors in any position in aquaculture journals, reinforcing results found by West et al. (2013) more generally in science. Women represent 16.1 % of authorship in all positions in the Recalibrated JSTOR Corpus, after correcting for unknowns. The percentage of women authors was comparable for the JSTOR aquaculture subsample (13.8 %) and the journals in the IACD (15.7 %). Women's authorship in aquaculture closely reflects the Recalibrated JSTOR Corpus covering many fields (Fig. 1).

For single-authored papers, the JSTOR Corpus shows an overall decline over time. However, there has been an increase in sole authorship by women. In the JSTOR aquaculture subsample, women represent 11.0 % of single-authored papers since 1913. In the IACD, women represent 11.1 % of all single authored papers since 1990.

Percentages of women in first and last authorship positions were comparable for the publications in the JSTOR Aquaculture subsample and IACD at 15.8 % and 14.4 %, respectively for first authors and 16.5 % and 14.0 % respectively for last authors. First and last author results from the overall

JSTOR Corpus for all fields were slightly higher than for the field of aquaculture at 19.2 % and 19.6 %, respectively.

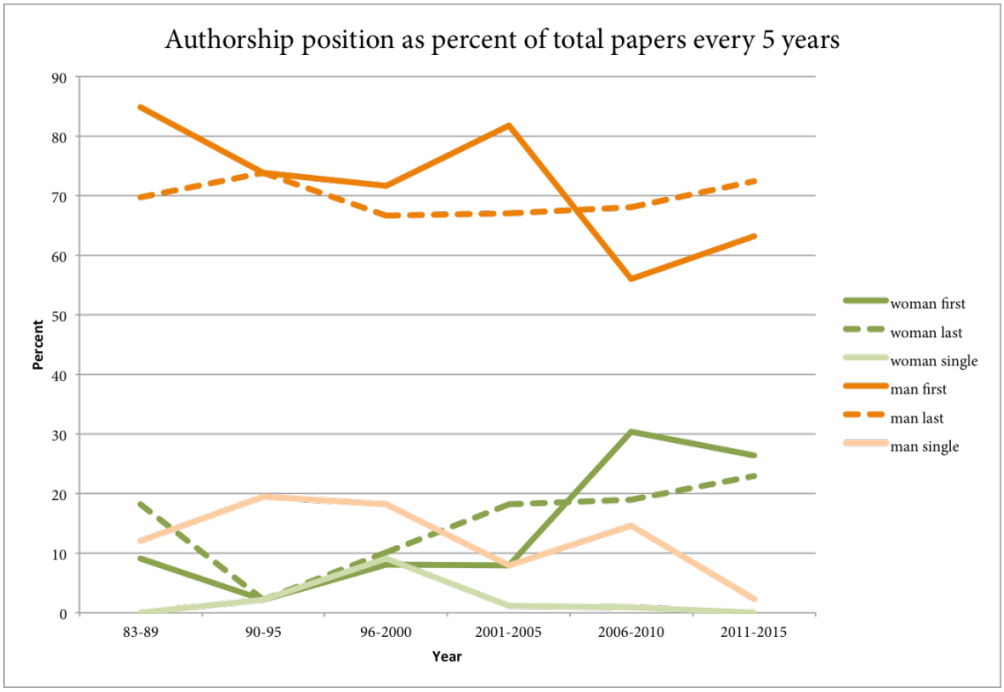


Fig. 1. Results from analysis of the IACD for the gender authorship by first, last, and single-author position as a percentage of the total papers published every five years. Note that only authorships for which gender could be assigned were included, and that gender was only assigned as a binary variable.

Discussion

Comparing the percentage of women authors across all 3 databases reveals a low percentage of women authors with between 13.8-16.1 % of all authorships. The 3 datasets, while skewed towards biological and technical domains of aquaculture, represent a wide range of aquaculture journals that are well regarded within the discipline. These preliminary results for aquaculture echo the findings of West et al. (2013) for women in many fields of science, as well as (Arismendi and Penaluna 2016) on the status of women publishing in the broader discipline of fisheries.

While there are many factors that may explain why women hold a low percentage of authorships across all fields of peer-reviewed literature and in aquaculture, in particular, these results do not reveal the cause. The data reflect

an end-result that is influenced by a number of factors that are not easily studied and have not yet been addressed in the project. One of the main factors is the proportion of women trained and actively working in the aquaculture discipline. Also, recognizing that gender is a social construction, our preliminary work was simplified by binary designations (man-woman; male-female); additional deeper analyses may reveal nuances for other underrepresented groups.

Although the data show a low share of women authors in all 3 datasets, in subsequent work we plan to contextualize these results within the datasets that reveal the population of women professionals in aquaculture worldwide across the time period of focus. Thus far it is known that women have been reported by the World Bank (2008) to comprise 47 % of the total workforce in fisheries yet this is a rough estimate confounded by a paucity of gender-disaggregated data in aquaculture and fisheries overall. Few data are available on the percentage of women in the fisheries discipline. One exception is the study by Arismendi and Penaluna (2016) for the United States of America. In that study, 26 % of federal fisheries scientists and managers, and 31 % of research faculty were women. Until adequate numbers for women in aquaculture and in the aquaculture discipline are obtained, it is useful to apply information from the greater field of fisheries to frame the research.

Next steps involve re-analyzing data from the IACD and JSTOR with the population of women graduates with aquaculture degrees over time, and of a curated population of international professional and student participants in the IACD. The timelines for the 3 data sources will be aligned to represent the time frame of the discipline. Further, the JSTOR subsample dataset will be expanded to include a larger set of aquaculture journals, as well as sub-areas within related disciplines. Additional analysis including comparison of the gender of authorship positions over time in the JSTOR Corpus and JSTOR aquaculture subsample with those in the IACD will also be conducted. These analyses will make the overall findings of the study more contextualized so that more significant conclusions can be made regarding the current status of women in aquaculture and how that status may have changed over time.

Conclusions

These results suggest that gender inequities in aquaculture, specifically in authorship of peer-reviewed literature, exist. While these are very preliminary conclusions, 15 % is a relatively low number for women authorships in aquaculture considering that the proportion of women authorships in the entire JSTOR corpus is 22 %. To understand some of the drivers propelling low authorship participation, we will add further context by examining data on the representation of women in the aquaculture discipline over time, and by geographic region. The IACD may prove a useful tool for social network analyses including assessments of unique very highly networked authors, and of subsequent generations of authorships. The richness of an international curated database lends itself to factoring in variables such as funding and faculty rank, along with other social metrics. The IACD will be further verified against the larger data sets from JSTOR, and the JSTOR conversely will be further examined as a proxy for the IACD. The information in these data sets can be used by other studies to assess the major influences on gender equity in the field of aquaculture. Increasing awareness of the equitable treatment of scientists in aquaculture remains essential for the sustainable growth of the discipline.

Acknowledgements

All listed authors contributed a significant amount to the paper. Dr. Hillary Egna had the original intellectual contribution to the work and a strong vision for the paper. She also contributed to data collection, analysis, writing and editing. Morgan Chow collected the IACD information, analyzed results with the JSTOR databases, and wrote the backbone of the paper. Dr. Jevin West conducted data analysis for the recalibrated and subsample of JSTOR, while providing substantial information for the methods. AquaFish Innovation Lab intern, Katie Nye Hogen assisted with IACD data collection and compilation. This research is a component of the AquaFish Innovation Lab, which is supported in part by the US Agency for International Development (USAID CA/LWA No. EPP-A-00-06-0012-00), and in part by participating institutions. The AquaFish accession number is 1464. The opinions expressed herein are those of the authors and do not necessarily reflect the views of the AquaFish Innovation Lab or USAID.

References

Arismendi, I. and B.E. Penaluna. 2016. Examining diversity inequities in fisheries science: A call to action. BioScience 66: 584-591.

Blickenstaff, J.C. 2005. Women and science careers: Leaky pipeline or gender filter? Gender and Education 17: 369-386.

Breuning, M. and K. Sanders. 2007. Gender and journal authorship in eight prestigious political science journals. Political Science and Politics 2: 357-351.

Conti, A and F. Visentin. 2015. Science and Engineering Ph.D. students' career outcomes by Gender PLoS ONE 10: e0133177. doi:10.1371/ journal.pone.0133177

Dubey, D., A. Sawhney, A. Atluru, A. Amritphale, A. Dubey and J. Trivedi. 2016. Trends in authorship based on gender and nationality in published neuroscience literature. Neurology India 64: 97-100.

Egna, E., L. Reifke and N. Gitonga. 2012. Improving gender equity in aquaculture education and training: 30 years of experiences in the pond dynamics/aquaculture, aquaculture and aquafish collaborative research support program. Asian Fisheries Science 25S: 119-128

FAO (Food and Agriculture Organization of the United Nations). 2016. Global aquaculture production. Fishery statistical collections. http://www.fao.org/fishery/statistics/global-aquaculture-production/en. Accessed 22 August 2016

Jagsi, R., D. Phil, E.A. Guancial, C.C. Worobey, L.E. Henault, Y. Chang, R. Starr, N.J. Tarbell and E.M. Hylek. 2006. The gender gap in authorship of academic medical literature - A 35-year perspective. The New England Journal of Medicine 355: 281-287.

Laakso, M., P. Welling, H. Bukvova, L. Nyman, B. Bjork and T. Hedlund. 2011. The development of open access journal publishing from 1993-2009. PLoS ONE 6: e20961. https://doi.org/10.1371/journal.pone.0020961

Laurance, W. 2006. Second thoughts on who goes where in author lists. Nature 442: 26.

Martin, L.J. 2012. Where are the women in ecology? Frontiers in Ecology and the Environment 10: 177–178.

Perna, L.W. 2005. Sex differences in faculty tenure and promotion: The contribution of family ties. Research in Higher Education 46: 277–307

Swartz, W.E. Sala, S. Tracey, R. Watson and D. Pauly. 2010. The spatial expansion and ecological footprint of fisheries (1950 to Present) PLoS ONE 5: e15143. https://doi.org/10.1371/journal.pone.0015143

Tscharntke, T., M.E. Hochberg, T.A. Rand, V.H. Resh and J. Krauss. 2007. Author sequence and credit for contributions in multiauthored publications. PLoS Biol 5: e18. DOI:10.1371/journal.pbio.0050018.

Vernos, I. 2013. Quotas are questionable. Nature 495: 39.

West, J.D., J. Jacquet, M.M. King, S.J. Cornell and C.T. Bergstrom. 2013. The role of gender in scholarly authorship. PLoS ONE 8: e66212. https://doi.org/10.1371/journal.pone.0066212

World Bank. 2008. Small-scale capture fisheries: A global overview with emphasis on developing countries. PROFISH Series, Washington, D.C. 64 pp.

Wren, J.D., K.Z. Kozak, K.R. Johnson, S.J. Deakyne, L.M. Schilling and R.P. Dellavalle. 2007. The write position. EMBO Reports 8: 988-991.

Gender in Aquaculture and Fisheries: Engendering Security in Fisheries and Aquaculture
*Asian Fisheries Science Special Issue **30S** (2017): 145-162*

ISSN 0116-6514
https://doi.org/10.33997/j.afs.2017.30.S1.007
Technical Paper

A Model for Gender-Based Post-harvest Fisheries Technology Transfer Initiatives in the Philippines

ENCARNACION EMILIA S. YAP[1*], ERNESTINA M. PERALTA[1], RUBY P. NAPATA[2], LIBERTY N. ESPECTATO[2] and GENNA N. SEROFIA[2]

[1]Institute of Fish Processing Technology, College of Fisheries and Ocean Sciences, University of the Philippines Visayas, Miagao, Iloilo, Philippines
[2]Institute of Fisheries Policy and Development Studies, College of Fisheries and Ocean Sciences, University of the Philippines Visayas, Miagao, Iloilo, Philippines

Abstract

A study on a gender-based post-harvest fisheries technology transfer scheme was conducted to come up with an alternative intervention model that can provide more effective and responsible livelihood activities to capacitate women in coastal communities in the Philippines. The study included a rapid resource and needs assessment of the coastal community and the design of appropriate skills training modules for the women of Carles, a coastal town in northern Iloilo, Philippines. Results reveal the recent status of the coastal resources in the area, the roles that men and women play in a coastal community, the opportunities and constraints in introducing alternative livelihood activities in a coastal community, and the viability of a model for gender-based post-harvest fisheries technology transfer project that aims to uplift the economic conditions of women in these communities. This model that focuses on women may be replicated in other coastal communities in the country.

Introduction

The social and economic developments of the coastal fishing communities are highly dependent on the status of the coastal resources in these

*Corresponding author. Email address: esyap@up.edu.ph

communities. In the Philippines and elsewhere, the implementation of new and innovative management strategies and interventions is a response to the increasing problems that impede these developments in the coastal areas. These management interventions ranged from establishment of protected areas, stock enhancement, implementation of closed and open seasons, ecotourism, regulations of fishing gears and methods, provision of alternative livelihood, and others.

In providing alternative livelihood activities, in particular, finding the most appropriate sustainable activity has always been a challenge especially when a fishing community refuses to completely detach from the marine environment as a source of livelihood. In addition, women in most communities tend to assume the supporting role as their husbands' helpers in livelihood activities. As a result, intervention strategies become limited to basic skills training of women. However, most of this trainings, if not all, is not translated into viable alternative livelihood activities for these are mainly based either on the available fish processing methodologies being widely used elsewhere or based on the requests of the beneficiaries or their local leaders, or simply, they just serve as one time skills training activities with no intention to allow women to gain control in livelihood activities. There is a need to change this approach so as to make the fisheries technology transfer activities more effective, sustainable and appropriate to the status and needs of the communities, most especially to the needs of the women in these communities.

Hence, this study was designed to use an intervention model for a gender-based post-harvest fisheries technology transfer in the Philippines. Specifically, the study aimed to test a model for technology transfer that uses a more holistic approach – from a rapid resource and needs assessment to training on alternative livelihood projects. Using the gender analysis framework (March et al. 2005), in particular, this study aimed to assess the roles of women, and to determine the factors that may mainstream these roles in the coastal community.

The information from this study can serve as a template on how to do post-harvest fisheries technology transfer activities in coastal communities in the Philippines and elsewhere, with focus on the mainstreaming of the roles of women in more effective, sustainable, and responsible economic activities.

Methodology

The project focused on the women in some fishing "barangays" or communities in Carles, a coastal municipality in Northern Iloilo, Philippines (Fig. 1) that is known for its rich fishing ground.

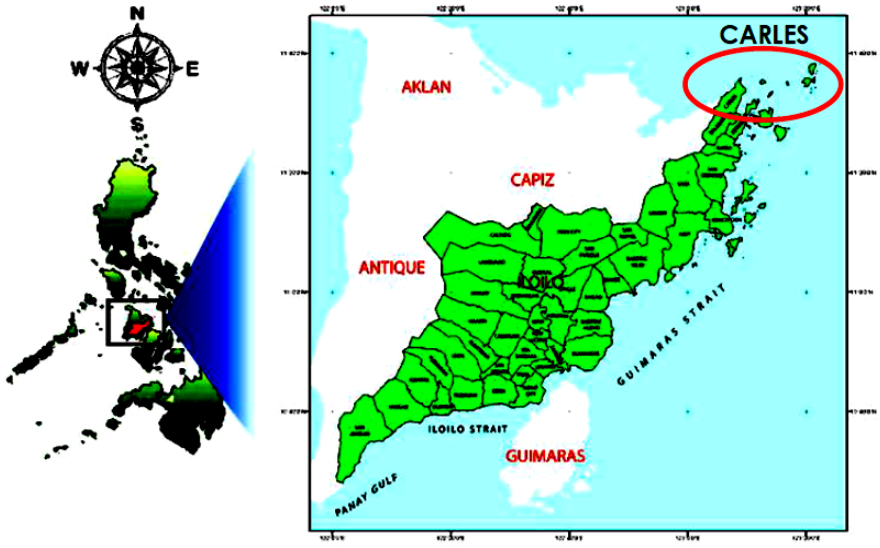


Fig. 1. The geographical location of the municipality of Carles, Iloilo in the Philippines

A gender-based model for fisheries technology transfer inititiatives in coastal communities was tested in the study. This model was patterned after the concept of social mobilization as noted by McKee (1992) in which activities in the model constitute the "process of bridging together all feasible and practical intersectoral social allies to raise people's awareness of and demands for a particular development program, to assist in the delivery of resources and services and to strengthen community participation for sustainabilty and self reliance". Hence, the study included the following activities.

Rapid Assessment of the Community

This was intended to rapidly evaluate the coastal resource availability and utilization, the production activities and the capacity of fishing communities, and their problems and needs. Focus group discussions (FGD) and key informant interviews of a total of 149 participants were conducted in 5 "barangays".

Alternative Livelihood Activities for the Coastal Communities

Using the results of the assessment of the communities, the following activities were conducted: development and implementation of training modules, product commercialization, and monitoring and evaluation. Development and implementation of training modules included 3 modules, namely Module 1 - fisheries processing, value addition, fish packaging, and labeling; Module 2 - food safety, hygiene and sanitation; Module 3 - enterprise planning and development, and record keeping. Using these modules, a total of 40 men and women beneficiaries were selected from the different coastal "barangays" of Carles. Product commercialization included the final activity of the project such as the exposure of the products in an agri-fishery fair. At the fair, the products were officially introduced in the market and were displayed and showcased for one week. Monitoring and evaluation including the conduct of the training were assessed by the participants a week after the product launch. The post training monitoring and evaluation were also conducted 8 months after the training.

Data Analyses

Both quantitative and qualitative methods were used to examine the data and to determine the viability of the intervention model.

Results and Discussion

Rapid assessment of the status of the coastal communities

The "Carles Municipal Fisheries Code of 2008" is an ordinance that recognizes the municipality's need for sustained fisheries production. The ordinance specifically includes provisions that limit the access of outsiders to the fisheries and aquatic resources of the municipality. The strict implementation and enforcement of laws and regulations related to fishing is also part of the provincial government's persistent campaign against illegal fishing activities. In recent years, a number of commercial fishing boats, e.g., Danish seines, were apprehended in Carles for violation of the ordinance (Nepomuceno 2016; 2015). The municipality has also institutionalized the establishment of 50,000 hectares of marine protected areas (MPA) through the

creation of the Municipal MPA System Management Council. Considering the observed decline in the volumes of catch in the area (Ferrer 2009), these strategies of protection in the municipality of Carles were expected to provide the enabling conditions for the revitalization of the coastal fisheries resources in the area.

In the present study, most of the 149 participants from 5 coastal "barangays" of Carles who were included in the survey believed that the resources in the area were still abundant. However, despite the efforts of the local government of Carles in maintaining the abundance of its aquatic resources, the participants noted that a number of fishing-related problems still existed. These included encroachment by commercial fishers into the municipal waters, overfishing especially of siganids or "danggit", cyanide fishing, and the use of the following destructive fishing methods and gears: zipper, a fishing gear that destroys the environment, and dynamite fishing, e.g., in Brgy. Barosbos; a dragging method, locally known as "taksay" to catch shrimp, that works like a trawl but is manually operated; fine meshed nets; and trawls, with most trawlers coming from nearby areas in northern Panay Island, Philippines, including Roxas City in the province of Capiz, and from the provinces of Negros, Cebu, and Masbate.

Most of the problems listed contributed to over-exploitation of the resources. For example, there seems to be an observed contrast between the perceived riches of the aquatic resources of Carles and the economic status of the fisherfolk, especially the women in Carles. Results of this study indicate that of the 149 participants in the survey, 108 of whom were males (72 %) and 41 (28 %) females (Table 1), most of them (66 %) have annual household incomes that range from PhP 2,000 to less than PhP 5,000 or roughly US$ 100.00 (Table 2), with men having higher incomes than women.

Table 1. Number of particpants in the KIIs and FGDs

Name of Barangay	Total	Male	female
Brgy Buaya	39	22	17
Brgy Alipata	30	17	13
Brgy San Fernando	27	25	2
Brgy Bancal	27	18	9
Brgy Barosbos	26	26	0
Total	**149**	**108**	**41**
% from total		**72.48**	**27.52**

Table 2. Annual household incomes of the 149 participants in the KIIs and FGDs

Annual Household Income (PhP)	Male	Female	Total	%
700-1999	0	7	7	4.70
2000-4999	65	33	98	65.77
5000-9999	30	1	31	20.81
10000-19999	11	0	11	7.38
20000-30000	2	0	2	1.34

This observed low income can be partly attributed to the respondents' educational attainment (Table 3). Most of the respondents were either elementary graduates (50 %) or high school graduates (40 %), with only a few college or vocational graduates (9 % and 1 %, respectively), with men generally having higher educational attainment than women. Most of those who had not gone beyond high school earned significantly less compared to those who had college or vocational degrees.

Table 3. Highest educational attainment of the 149 participants in the KIIs and FGDs

Educational Attainment	Male	Female	Total	%
College graduates	13	0	13	8.72
Vocational graduates	1	0	1	0.67
High School graduates	41	19	60	40.27
Elementary graduates	53	22	75	50.34

The study further revealed that, of the 149 participants, all of the men interviewed were engaged in fishing activities and were not involved at all in the marketing or processing of their catch (Table 4). These activities were mostly done by the women in their families. Although 16 women identified fishing as their main occupation, these women were primarily involved in gleaning of seashells, net/gear making, monitoring of fish pots, preparation of baits, and other fishing-related activities. The majority of the women who were interviewed were involved in either marketing/trading of fish, fish drying, and net mending, with a good number of them serving as housekeepers.

Table 4. Major occupations of the Key Informant Interview participants from 5 barangays in Carles, Iloilo (n=149)

Main Occupation	Male	Female	Total	%
Fishing	108	16	124	83.22
Fish / Food Vending	-	3	3	2.01
Net Mending	-	1	1	0.67
Fish Buying	-	1	1	0.67
Fish Drying	-	1	1	0.67
Other Activities				
Buy and Sell	-	4	4	2.68
Laundry women	-	1	1	0.67
Housekeeping	-	14	14	9.40

Clearly, in terms of production activities, the results of the study reveal that the role of women in the coastal communities of Carles, Iloilo was similar to that which had been reported in previous works (Siason 2000; Tietze et al. 2007; Macalagdag et al. 2014). Men were still the fishers, while women remained as the home makers and those involved in "light" fishing activities, fish processing, and other related activities (Table 3). Indeed, the roles of men and women were still sharply defined in most coastal communities. Such differentiation of gender roles had been in existence for a long time (World Bank 2012) where men are usually the catchers while women were delegated to repairing fishing nets and processing and marketing the catch. This scenario was still prevalent in most of the coastal areas in Carles.

Opportunities and constraints in introducing livelihood activities for the women in Carles

A significant number of development assistance projects, and to some extent local initiatives, traditionally involve provision of fishing boats and gears to help alleviate the economic conditions of fisherfolk. These efforts offer opportunities mostly for men and often place additional pressures on the aquatic resources of the coastal communities. An alternative strategy to this is the provision of opportunities for improving and diversifying livelihood activities, not only of men but of women too in the community *via* capacity building for better income and increased entrepreneurial activities in the coastal communities.

One opportunity that can be considered prior to the introduction of a livelihood activity in the community is the perception on the roles of men and women in fish processing activities. In the case of Carles, in terms of attitude, the majority of the respondents (68 %) believed that men should also be involved in fish processing; while 29 % of them believed that only women should be involved in these activities (Table 5). Only 5 out of 149 respondents (3 %) said that both men and women should be processing fish.

Table 5. Perception of the participants on who should engage in fish processing activities (n=149)

	Male	**Female**	**Total**	**%**
Men in fish processing	71	30	101	67.79
Women in fish processing	37	6	43	28.86
Both	-	5	5	3.36

This connotes changing views on the roles that men and women play in a community. The usual attitudes of most men in the Philippines about the division of labor in their households (Siason 2000; PSPD 2007; Lentisco and Lee 2014) appear to be slowly changing. Although men are still considered the heads of the households and should provide for the families by mainly engaging themselves in fishing activities, there could be changes in this attitude in future.

On the other hand, such changes in attitude on gender roles as noted in this study must be treated with caution. While it may appear that men would also like to engage in activities that were traditionally designated to women, this could also signal an attitude that men would like to assume the responsibility of earning more for their families via activities other than fishing. This is something to look into, for the access and control of resources in the coastal communities, as well as being the main earner in the family, may still be perceived to favor men, with women further getting relegated to primarily performing household tasks.

The case is different when access to resources, and therefore the ability to provide for the family, was also given to women. The attitude where women were not involved in jobs “designated” for men but instead continue to be the ones giving “light” to households, must be changed. For example, recent demographic data revealed that in the world’s two major fish producing countries, namely, China and India, women represent 21 % and 24 %,

respectively of all fishers and fish farmers in those countries (FAO 2012). In the Philippines, studies have shown women's significant involvement in "male-dominated" fishing activities (de la Cruz 2005; Santiago 2008 and Ferrer et al. 2014). These are concrete examples on how demographic changes are influenced by a shift in the attitude towards gender roles of both men and women in the community. In other words, communities need to get exposed to activities that are intended to mainstream the women in the economic activities in those communities.

In terms of specific activities that provide opportunities for alternative livelihood activities in Carles, the participants identified the following as potential livelihood activities for the municipality: fishing; fish drying; sweetened-dried fish "tapa" making; production of fish paste "ginamos/tabal"; net fabrication; and crab pot/fish pot fishing. They also noted the presence of post-harvest facilities and market support for any gender-based enterprise in the area. Accordingly, there is presently a centralized landing in "Barangay Bangkal" in Carles where every day trading of "compradors" or buyers from the municipalities of Estancia, Balasan, Barotac Nuevo, Pavia, and Concepcion (in the province of Iloilo), Roxas City (in the province of Capiz), and the municipality of Kalibo (in the province of Aklan) are being done.

The participants, however, noted seasonality of some fish species as the most limiting factor in choosing appropriate livelihood activities for them. In addition, they enumerated other factors, as listed in Table 6 that may influence their choice of any fish processing activity for the community.

Table 6. Factors that influence the choice of fish processing activities for the community (n=149)

Factors	#	%
Products are easy to sell	21	34.23
Can be a good livelihood activity	16	26.23
Sources are readily available	7	11.48
Good price	5	8.20
Products are more expensive than dried fish	4	6.56
Easy processing	3	4.92
Seasonality of species	2	3.28
No extra expenses, can get financing	2	3.28
Profitability	1	1.64

In addition to these, the study also showed other constraints in the community that are related to processing and marketing of fish and fishery products, such as strong involvement of the private sector in marketing and distribution of fish from Carles. Different private companies operate in the community and these include those from nearby municipalities, cities and elsewhere. There is also an absence of other important basic post-harvest facilities such as ice plants, cold storage facilities and solar dryers, absence of reliable freshwater sources for ice making, absence of a show room for the fishery products of the municipality, bad conditions of some access roads and problems related to transport and distribution of some of the products from the Island "barangays" directly to Manila.

These findings indicate that looking for the most appropriate sustainable livelihoods for women in a coastal community will always be a challenge. This becomes more apparent especially in areas where men in fishing communities refuse to completely detach from the marine environment as a source of livelihood for the family. Many programs and projects in the Philippines and elsewhere have attempted to complement conservation and protection strategies as well as regulations with alternative livelihood approaches which are mainly land-based (Tietze et al. 2007; Macalagdag et al. 2014). But purely land-based livelihood programs do not seem to be sustainable as many fishers and families would often fail to continue them. It is therefore opportune to examine sustainable supplemental livelihood options that are fisheries-based (Yap et al. 2013) and gender-sensitive. Decisions on the most appropriate gender-based fisheries technologies for any coastal community, however, depend on several influencing factors that tend to shape gender relations and provide different opportunities for both men and women in the communities.

The women of Carles even identified several problems and constraints that prevent them from engaging in fish prosessing and other livelihood activities. Although the need for training delivered in the municipality is acknowledged, access of women to these training oppotunities has been minimal in the past due to the following: limited funding for livelihood training in the local government's budget; lack of time to attend training because of household duties; difficulty in conducting training in the island "barangays; limited information on the benefits of training; and in most cases, after particular training, limited follow-up as to the usefulness and utilization of the training in the communities. This mindset is what needs to change. By making

women aware of their valuable contribution in shaping an economic activity, they can be capacitated to assume a greater role in the families and their communities.

In short, the information on the status of the resources and the activities in Carles suggests that a more appropriate community-based coastal resource management approach to decrease poverty-driven over-exploitation of the coastal resources is needed. Such an approach must not only consider the bio-physical aspects of resource management but also the socio-economic aspects. Sustainable development can be achieved through appropriate education and organization of the coastal communities to improve their livelihoods while protecting their coastal resources. The results of the assessment of the status of the resources in the area as well as the roles that both men and women play in the communities, together with the results of our comprehensive review of all potential community-based fisheries technologies that could be used in Carles, are all necessary elements for developing an appropriate intervention that will help women realize their invaluable contribution to their community.

Alternative Livelihood Activities for the Coastal Communities

Using the results of the assessment of the communities, training modules were developed. Training workshops were then successfully conducted with a total of 40 beneficiaries of the men and women who were selected from the different coastal "barangays" of Carles. Nearly 78 % of the trainees were women and 23 % were men. Table 7. shows that the participants were mostly between 31 and 60 years old. With regard to their highest educational attainment (Table 7), the participants are mostly college graduates (50 %) and high school graduates (38 %).

To effect immediate utilization of the acquired skills generated from the project's on-site trainings, including that of entrepreneurship, and to establish linkages between the fishing communities and the private sector, the participants were initially organized into a women's cooperative, the "CARLES ISLES Multi-Purpose Cooperative (CIMPC)". Specific sessions were conducted for the formation of the cooperative. These activities were geared to exposure of the products in an agri-fishery fair in the municipality (Fig. 2). This event showed various products and by-products of Carles. Among the featured exhibits were the products of CIMPC, whose members were determined to

promote value-added products from local marine and aquatic resources. The official launch of the fishery products was held during the first day of the event. The products were displayed for 1 week.

Table 7. Profile of the training workshop participants (n = 40)

	Female	Male	Total	%
Age distribution				
21-30	5	1	6	15.0
31-40	7	2	9	22.5
41-50	10	2	12	30.0
51-60	7	3	10	25.0
61 up	2	1	3	7.5
Educational attainment				
Elementary	2	1	3	7.5
High School	11	4	15	37.5
Vocational School	2	0	2	5.0
College	16	4	20	50.0

The conduct of training was assessed by the participants a week after the product launch. The post training monitoring and evaluation were also conducted 8 months after the training. The results of the post training evaluation of the effectiveness of the training workshops revealed that the participants generally appreciated the training designed for them, as shown in Table 8.

Fig. 2. The activities for the preparation of fishery products and the exhibition and sales of these products during the Carles Agri-Fishery Fair

Table 8. Average score of the self-assessment of the participants on the levels of their knowledge and skills before and after the training (5=high; 3=medium; 1=low)

Topics	Before the training	After the training
Fish processing technologies	2.11	4.28
Product quality and safety	2.61	4.28
Good manufacturing practices	2.33	4.11
Smoking	1.72	4.11
Deboning	1.76	4.18
Bottling	1.65	3.78
Value addition	2.22	4.06
Product packaging and labeling	2.17	3.83
Enterprise development	2.55	3.94

Previous studies revealed that a few entrepreneurial projects have been successful in some Philippine coastal communities and these include seaweed farming, bird watching tours, and other forms of ecotourism and handicraft projects (DENR et al. 2001). In the present study, the participation in the training of women (77.5 % or 31 women out of a total 40 training participants) from the fishing communities indicated their willingness to have their own businesses that could help increase their household incomes. This training, coupled with an opportunity for them to get organized (via a cooperative), gave them a much needed boost to introduce their finished products in the market (Fig. 2). It likewise increased the awareness of these women of the potential for commercialization of their finished products. In fact, post-evaluation data revealed that a good number of the training participants regularly impart the skills they acquired to other women in the community, with a couple of them having ventured into their own businesses. Clearly, these activities made them aware of their ability to use not only the fisheries resources from the area but also the intangible resources, such as the community structures and networks (in the form of a cooperative), their time, and the knowledge from the training given to them, as noted in the results of the training evaluation (Table 8). These activities appear to have introduced to them the opportunities for positive changes for women and, perhaps, may have changed their attitude on gender roles in the process.

Indeed, this observation, coupled with information on women from other fishing communities elsewhere who manage to enter the modern and growing seafood export processing industry, suggest that women can no longer stay at home to assume the supporting role as their husbands' helper in livelihood

activities (PCPD 2007). These women can now manage to move outside their homes also to become wage earners.

However, caution must be exercised so as to prevent a situation where women, as in the case of those in export oriented companies, experience relatively poor working conditions and lower income as compared to their male counterparts (Tietze et al. 2007). Such appalling scenarios can be prevented if these women are capacitated to come up with their own business ventures rather than become just labor in the ventures of other larger operators. In having their own business, no matter how small, women can have their own income and their livelihoods can result in increased economic and social capital while providing more options for their families to meet their basic household needs, education for children, and others (Macalagdag et al. 2014). In more ways than one, these undertakings can help women attain self-actualization or self-worth as they are able to share their knowledge and skills to alleviate their family's economic status.

Use of a gender-based model for fisheries technology transfer in coastal communities

In the past, there have been a number of skills training courses on processing aquatic species in certain fishing communities. Most of these courses were designed based on either the perceived abundance of certain species of fish in a community, the exposure of the beneficiaries to certain commercially available fisheries products, the available fish processing methodologies being widely used, or the requests of the beneficiaries or their leaders for the conduct of specific training. Conduct of such skills training might not be particularly useful, especially when basic information on the actual coastal resource availability and the training and livelihood needs of the beneficiaries are lacking. There is a need to change the approach so as to make the skills training more effective and more appropriate to the needs of the communities (Yap et al. 2013). As shown in the present study, such a needs-based approach must likewise consider the bio-physical and the socio-economic aspects of the coastal communities to succeed and be responsive to the needs, most especially of the women in the community.

The use of a gender-based model for fisheries technology transfer initiatives in coastal communities, as presented in this study, agrees with the concept of social mobilization. McKee (1992) described this as "the process of

bridging together all feasible and practical inter-sectoral social allies to raise people's awareness of and demand for a particular development program, to assist in the delivery of resources and services and to strengthen community participation for sustainability and self-reliance."

The gender-based model for fisheries technology transfer initiatives in coastal communities, as tested in the present study, had a holistic approach in which all activities started with a rapid appraisal of the status of the aquatic resources in the community and the socio-economic activities of the fisherfolk, among others. The information from this appraisal, together with reported data from different sources was considered in the development of the training modules that were appropriate for the coastal community. The training modules included not only those on post-harvest fisheries technologies, but also others on fish marketing, budgeting, record-keeping, basic accounting, and entrepreneurship. These should be basic components of the modules. The present study proved that this approach was very well received by the stakeholders, especially the women in the coastal communities of Carles (Table 8). Membership in organizations, cooperatives or associations must also be encouraged for this can become an outlet for solidarity with other women in the community (Macalagdag et al. 2014). Clearly, these activities demonstrate the importance of the interconnectivity of the components of an effective community-based coastal resource management, as graphically shown in Fig. 3 (IIRR 1998; Rivera and Newkirk 1997).

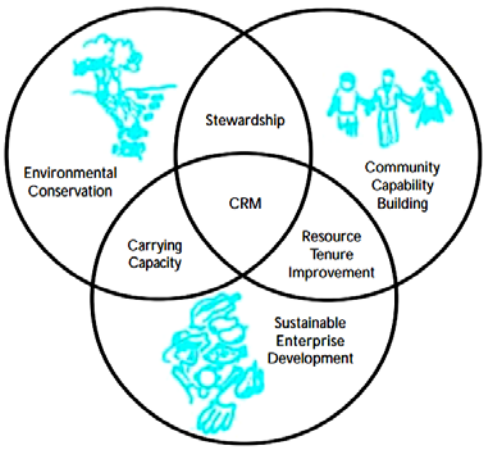


Fig. 3. Components of a community-based coastal resource management (IIRR 1998)

Conclusions

This study presents a plausible model for a gender-based approach in fisheries technology transfer programs for use in the Philippines, and possibly in other countries. Although more intensive efforts still need to be taken to achieve the top of the 5 levels of women empowerment (i.e., welfare, access, conscientisation, mobilisation and control), as described by Choo and Williams (2014) and March et al. (2005), the approach used in this study helped the women surpass the welfare and access levels. The use of the gender-based model and activities for fisheries technology transfer has proven an effective tool for the women in the coastal communities. This approach aims to engage more women and to mainstream their roles in the community as significant means to capacitate them to come up with and take control of their own business ventures. In so doing, women have their own income and can improve their purchasing power. Finally, this approach may likewise provide venues for women to break away from the usual stereotyping in traditional Filipino families (PCPD 2007), with the hope that these would bring changes in the division of labor in the home and for such practices to be replicated by their children and the other generations to come.

References

Choo, P.S. and M.J. Williams. 2014. Avoiding pitfalls in development projects that aspire to empower women: A review of the Asian Fisheries Society Gender and Fisheries Symposium papers. Asian Fisheries Science 27S: 15-31.

de la Cruz, M.T. 2005. Women are fishers too. Profile of women fishers in Eastern Samar, Philippines In Proceedings of the third conference on gender and fisheries: assessing gain, negotiating challenges in gender and fisheries development September 29-30, 2005. Organised by The National Network on Women in Fisheries in the Philippines Inc. (NNWFPI).UP Visayas, Iloilo City.

DENR (Department of Environment and Natural Resources), Bureau of Fisheries and Aquatic Resources of the Department of Agriculture, and Department of Interior and Local Government. 2001. Philippine Coastal Management Guidebook No.4: Involving Communities in Coastal Management. Coastal Resource Management Project of the Department of Environment and Natural Resources. Cebu City, Philippines. 84 p. http://oneocean.org/download/db_files/crmguidebook4.pdf. Accessed 27 November 2016.

Ferrer, A.J. 2009. Evaluation of fisheries management options for the Visayan Sea, Philippines: The Case of Northern Iloilo. Research Report No. 2009-RR5, Economy and Environment Program for Southeast Asia (EEPSEA), Singapore. 68 pp.

Ferrer, A.J., M.L. Perez, A.T. Roxas and E.M. Avila. 2014. Expanding roles of men and women in aquatic agricultural systems in the Philippines. Asian Fisheries Science 27S:185-194.

FAO (Food and Agriculture Organization). 2012. The state of world fisheries and aquaculture (SOFIA). FAO, Rome. http://www.fao.org/docrep/i2727e/i2727e.pdf. Accessed 27 December 2016.

IIRR (International Institute of Rural Reconstruction). 1998. Participatory methods in community-based coastal resource management (Module 3). International Institute of Rural Reconstruction, Silang, Cavite, Philippines. 103 pp.

Lentisco, A. and R. Lee. 2014. Beyond fish processors and care givers: Women as primary, secondary and tertiary fish users. Asian Fisheries Science 27S:33-42.

Macalandag, R., S. Virtudazo and G. Labrado. 2014. Case study: Maximizing women's participation in a fisheries livelihoods project: The Philippine experience. Regional Fisheries Livelihoods Programme for South and Southeast Asia. Food and Agriculture Organization and Minesterio de Asuntos Exteriores y de Cooperacion, Kingdom of Spain. 20 pp. http://www.fao.org/3/a-ar509e.pdf. Accessed 27 December 2016.

March, C., I. Smyth and M. Mukhopadhhyay. 2005. A guide to gender-analysis frameworks. Oxfam Publishing, Oxford, U.K. 144 pp.

McKee, N. 1992. Social mobilization and social marketing in developing communities: Lessons for communicators. Southbound, Penang, Malasia. 220 pp.

Nepomoceno, J. 2016. Fishermen nabbed for illegal fishing. The Daily Guardian, Iloilo City, Philippines. https://thedailyguardian.net/local-news/fishermen-nabbed-for-illegal-fishing/. Accessed 10 October 2017.

Nepomoceno, J. 2017. 18 illegal fishers nabbed in separate operations in Iloilo. SunStar Iloilo, Iloilo city, Phillpines. http://www.sunstar.com.ph/iloilo/local-news/2017/03/30/18-fishermen-face-illegal-fishing-charges-iloilo-533960. Accessed 10 October 2017.

PCPD (Philippine Council for Population and Development). 2007. The effect of livelihood activity on gender roles and fertility intention: Men and women in coastal areas in Mindanao. Project Code #06-055. http://www.pcpd.ph/index.php/project/the-effect-of-livelihood-activity-on-gender-roles-and-fertility-intention-men-and-women-in-coastal-areas-in-mindanao. Accessed 30 November 2016.

Rivera, R. and G. Newkirk. 1997. Power from the people: A documentation of non-governmental organizations' experience in community-based coastal resource management in the Philippines. Ocean and Coastal Management 36: 73-95.

Santiago, C. 2008. Philippines: Country gender profile. http://www.jica.go.jp /activities/issues/ gender/pdf/j03phi.pdf. Accessed 30 November 2016.

Siason, I. 2000. Women in fisheries in the Philippines (A Country Paper Presented Duringthe Fifth Asian Fisheries Forum in Chiang Mai, Thailand). Review of Women's Studies 10:112-125.

Tietze, U., S. Siar, S. M. Upare and M. A. Upare. 2007. Livelihood and micro-enterprise development opportunities for women in coastal fishing communities in India – Case studies of Orissa and Maharashtra. FAO Fisheries Circular. No. 1021. FAO, Rome. 69 pp.

World Bank. 2012. The Hidden Harvest: The Global Contribution of Capture Fisheries. Washington, DC © World Bank. https://openknowledge.worldbank.org/handle/10986/11873 License: CC BY 3.0 IGO. Accessed 28 December 2016.

Yap, E., M. Andalecio, E. Peralta, R. Napata, L. Espectato and G. Serofia. 2013. Community-based postharvest fisheries technology transfer program. Technical Report. University of the Philippines Visayas (UPV) - University of the Philippines Visayas Foundation, Incorporated (UPV-FI)-Department of Agriculture - Bureau of Agricultural Research (DA-BAR). 95 pp.

Gender in Aquaculture and Fisheries: Engendering Security in Fisheries and Aquaculture
*Asian Fisheries Science Special Issue **30S** (2017): 163-179*

ISSN 0116-6514
https://doi.org/10.33997/j.afs.2017.30.S1.008
Technical Paper

The Value of Marine Protected Areas: Through the Eyes of Community Members

LIBERTY N. ESPECTATO[1]*, RUBY P. NAPATA[1] and CARLOS C. BAYLON[2]

[1] Institute of Fisheries Policy and Development Studies, College of Fisheries and Ocean Science, University of the Philippines Visayas, Miagao, Iloilo, Philippines
[2] Institute of Aquaculture, College of Fisheries and Ocean Science, University of the Philippines Visayas, Miagao, Iloilo, Philippines

Abstract

Values and beliefs play a vital role in how people make choices, judgments, and undertake actions related to marine resource use. This information is vital for marine protected area (MPA) managers since values and beliefs influence behavior of the community members, which in turn affect the management operation of the MPA. Gender roles can influence the community's values and beliefs. MPAs affect women and men differently, and thus MPA implementation and management need to take this into account.

This study was conducted to examine the values and beliefs on MPAs of community members in San Joaquin, Central Philippines. Results show that women and men have different perspectives on their marine resources and differ on their knowledge and perceptions regarding MPAs. A greater percentage of women respondents than men had complete awareness of, and some formal knowledge about, MPAs. Similarly, a higher percentage of women respondents than men had a "sustainability mindset" that acknowledged the need to manage marine resources sustainably for future generations. Statistical analyses showed a significant difference between the responses of women and men respondents. This study supports the findings of other studies that strategies need to integrate gender perspectives in implementing resource management initiatives such as the establishment and management of MPAs.

Introduction

A marine protected area (MPA) is any marine geographical area that is afforded greater protection than the surrounding waters for biodiversity

* Corresponding author. Email address: lnespectato@gmail.com

conservation or fisheries management purposes (FAO 2011). A more detailed definition was given by the International Union for Conservation of Nature (IUCN) during its 17th Session in Costa Rica in 1988, referring to an MPA as "any area of tidal or subtidal terrain, together with its overlying waters and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment" (Kelleher 1999). An MPA often has a core zone and a buffer zone (White et al. 2006; Kelleher 1999). The core zone is a "no-take zone" where fishing may be prohibited and human activity limited, while the buffer zone is usually a multiple-use zone where activities are regulated. The establishment of an MPA is one option within the fisheries management toolbox to address the rebuilding of fish stocks and the conservation of biodiversity (Pauly et al. 1998; Kelleher 1999; Roberts et al. 2005; Pelletier et al. 2008).

Marine conservation is vital in the Philippines, as the country is considered the "center of the center" of marine biodiversity in the Indo–Malay–Philippines archipelago (Carpenter and Springer 2005). Various Philippine legislation supports the establishment of MPAs and marine conservation and protection in general. This includes the Local Government Code of 1991 (RA 7160) which devolved the authority for the management of coastal and marine resources from the central government to the local government, and the Philippine Fisheries Code of 1998 (RA 8550) which mandated local government units (LGUs) to set aside 15 % of the municipal waters (legally defined as 15 kms from the shoreline) for the establishment of fish sanctuaries. In addition, the country also has the National Integrated Protected Areas System (NIPAS) Act of 1992 (RA 7586) which defined the processes in establishing and managing protected areas.

According to Weeks et al. (2009), about 95 % of Philippine MPAs are community-based. In this type of management regime, the success or failure of the implementation of an MPA will largely depend on the level of participation of the community concerned (ole-MoiYoi 2003; Alcala 2001; Beaumont 1997; White et al. 1994; White et al. 2002; Rodriguez-Martinez 2007).

The choices and actions that people undertake for marine resource use are largely influenced by their values (social norms) and beliefs (shared understanding) (Pomeroy et al. 2004). These are further influenced by gender roles, thus, it is an important reason why gender concerns need to be considered in management initiatives especially in communities living in protected areas (Biermayr-Jenzano 2003). Charles and Wilson (2009) acknowledge that there

are human dimensions of MPAs and that this "people side" includes, among others, the gender dimension. However, as Clabot (2013) observed, the topic of gender is generally missing from MPA management analysis. Moreover, there is generally a lack of research on and recognition of the role and contributions of women in fisheries and coastal resource management initiatives (Williams et al. 2012; Di Ciomma and Schiavetti 2012).

Project interventions in fisheries should take into account also the changing gender roles (Lentisco and Alonso 2012). MPAs may affect women and men differently (WIOMSA). Mascia and Claus (2008) discussed the reallocation of MPA resource rights and benefits. This reallocation can induce broader positive and negative shifts in the community's economic well-being, and impacts may vary depending on different community variables including gender.

The present paper examined whether or not there are gender differentials on the values, beliefs, and levels of awareness of the community members regarding MPAs in San Joaquin, Central Philippines. The 3 indicators that were used were: local values and beliefs about the marine resources; distribution of formal knowledge to the community; and local understanding of MPA rules and regulations. The results were compared to related studies in the literature.

Materials and Methods

A study was conducted to evaluate the management effectiveness of 3 pilot MPA sites in the municipality of San Joaquin in Central Philippines (Fig. 1, Table 1), in order to determine the impacts on the fishery resources and the community as a whole. The study employed the evaluation methodology developed by the International Union for Conservation of Nature and Natural Resources (IUCN) (Pomeroy et al. 2004). This evaluation tool was utilised since it has a comprehensive list of indicators and a simple data gathering method.

For the purpose of this study, only the indicators on values and perceptions of the community members and their level of awareness of the MPAs are presented and analysed using the gender lens. These indicators are: local values and beliefs about the marine resources; distribution of formal knowledge to the community; and local understanding of MPA rules and

regulations. For the indicator "distribution of formal knowledge to the community", the following scale was used to be able to gauge the level of awareness of the respondents on information related to MPA: 1 – No awareness (NA); 2 – Limited awareness (LA); 3 – Moderate awareness (MA); 4 – Extensive awareness (EA); and 5 – Complete awareness (CA).

A total of 499 randomly chosen respondents (150 men and 349 women; one respondent per household), representing about 30 % of the total number of households, were interviewed using a pre-tested interview schedule which was translated into the local dialect (Hiligaynon). The study was done in Barangays Tiolas, Lawigan, and Igcadlum (barangay is the smallest administrative unit in the country). The survey was conducted in 2013, 4 years after the MPAs were established. Responses were gender-disaggregated to compare the differences of gender values, beliefs, and level of awareness. Focus group discussions (one FGD per barangay) were also conducted. During the FGD, preliminary data were presented and probing questions were asked to validate the results of the survey. Results were also subjected to statistical analysis.

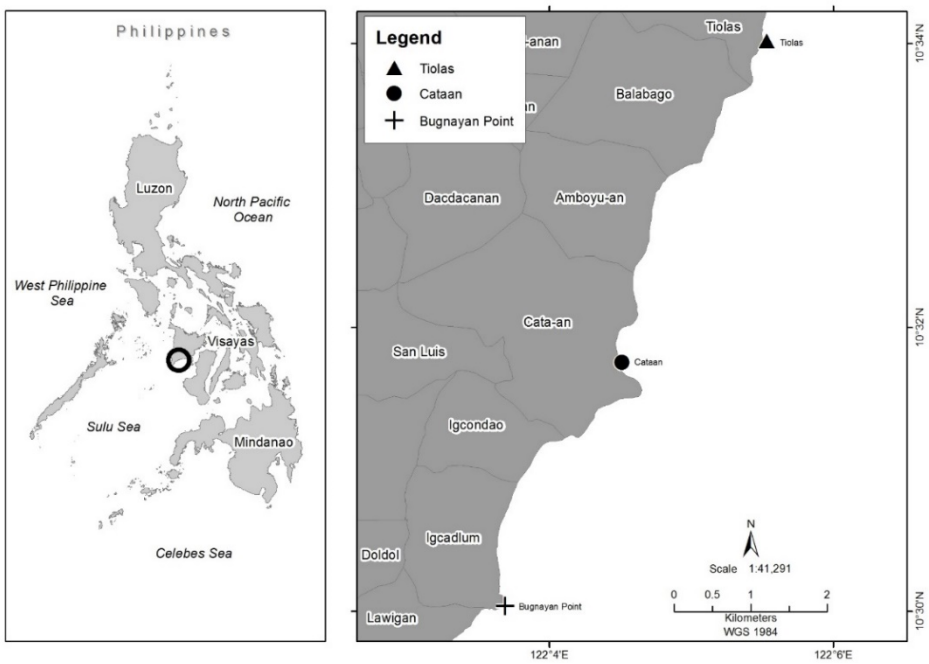


Fig. 1. Map showing the study site, the municipality of San Joaquin in Central Philippines

Table 1. Profiles of the MPA sites.

Name of MPA	Core Zone	Buffer Zone
Brgy. Lawigan-Igcadlum Marine Sanctuary (Bugnayan Point)	2 ha	2 ha
Brgy. Cataan Marine Sanctuary	2 ha	6 ha
Brgy. Tiolas Marine Sanctuary	2 ha	4 ha

Results

Profile of the MPAs

The municipality of San Joaquin is one of the coastal towns of the province of Iloilo in the central part of Philippines. It has a total land area of about 23,527 ha with 25 km stretch of coastline. It has 80 barangays of which 19 are located in coastal areas. The municipality has 1,065 municipal fishers based on the municipality's 2016 Fish Registration (FishR) data.

The local community of San Joaquin depends primarily on its coastal resource for its economic activities (e.g. fishing and gleaning) and recreation (e.g. swimming). To address its problem on declining fish catch and degradation of the critical coastal habitats, the local government unit established 3 pilot MPAs in October 15, 2009. This was enacted by virtue of Ordinance No. 7-2009 or the Marine Sanctuaries Ordinance of the Municipality of San Joaquin, Iloilo. It covers a total area of more than 16 hectares (Table 1).

Marine protected areas have 2 main parts: the core zone and the buffer zone. Each MPA has a 2 ha core zone or no-take zone. Fishing and other related activities are not permitted within the core zone; only hook and line fishing is allowed in the buffer zone. Operations of the MPAs are managed by the relevant barangay through its respective Marine Sanctuary Management Board (MSMB). The MSMB is composed of the barangay officials and fisherfolk leaders. The municipal LGU provided the initial funding of PhP 50,000 (about USD 1000), after which, it was expected that the MSMBs would generate their own funds from user fees to be able to sustain the operation (Espectato et.al. 2017).

Profile of the Respondents

A total of 499 respondents were surveyed covering the four barangays where the MPAs are located, 30 % of which are men and 70 % women. Table 2 shows that the majority of men-respondents belong to age group 41-60 years old. On the other hand, majority of the women-respondents belong to a younger age group, 21-40. Data also shows that a relatively higher percentage of men-respondents that have earned a degree and graduated from college level than women-respondents.

Table 2. Profile of the respondents

	Men	(n=150)	Women	(n=349)
	f	%	f	%
Age				
0-20	3	2.0	13	3.7
21-40	47	31.3	138	39.5
41-60	55	36.7	131	37.5
61-80	42	28.0	61	17.5
81-100	2	1.3	5	1.4
No answer	1	0.7	1	0.3
Education				
College graduate	33	22.0	67	19.2
College level	11	7.3	30	8.6
High school graduate	47	31.3	127	36.4
High school level	1	0.7	11	3.2
Elementary graduate	39	26.0	88	25.2
Elementary level	16	10.7	15	4.3
No education	1	0.7	0	0.0
No answer	2	1.3	11	3.2

Local values and beliefs about the marine resources

Respondents highly valued their marine resources (Fig. 2). Most of them (89 % for men, 94 % for women) considered the sea as a source of food and livelihood. This highlights how the community is highly dependent on the marine resource and fishing as their main source of household income. Most respondents also believe that coral reefs are important because they provide habitat and breeding ground for various marine life. There is a general

consensus that using destructive fishing methods is not good for the marine resource. As pointed out during FGDs, the main reason why fisherfolk resort to destructive fishing methods is to maximise fish catch and thereby increase income.

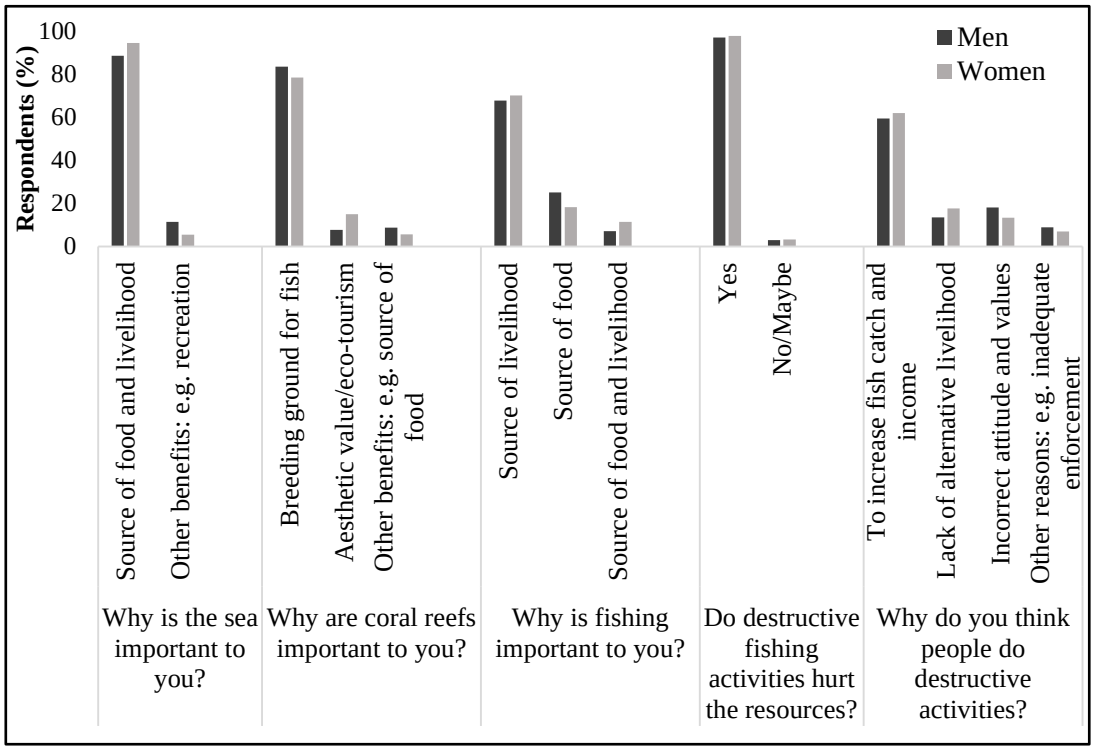


Fig. 2. Local values and beliefs of women and men respondents about the marine resources (%)

To further assess their values and beliefs, respondents of the survey were also asked to indicate the degree to which they agreed on some general statements about the marine resources, using the following scale: very strongly agree (VSA); strongly agree (SA); agree (A); neither agree nor disagree (NAND); disagree (D); strongly disagree (SA); and very strongly disagree (VSD).

Results show that there a greater percentage of women respondents than men very strongly agreed on the first and second statements ("We should manage the sea to ensure that there are fish for our children and their children" and "We have to take care of the land and the sea or they will not provide for us in the future," Fig. 3). When the Mann-Whitney test ($\alpha = 0.05$) was applied to the data, results indicated that responses on the first statement were significantly

different by gender (Table 3). This is also validated in the results of the series of FGDs conducted. Women participants frequently discussed issues on sustainability of the resources in the context of "*buasdamlag sang mga kabataan*" (their children's future).

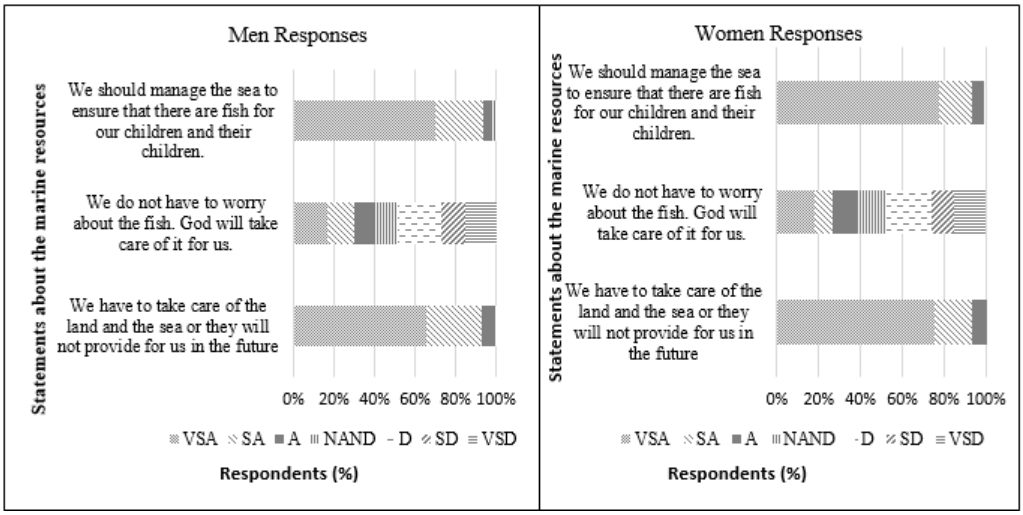


Fig. 3. Women and men's responses on some general statements about the marine resources

Table 3. Comparing the women and men's responses on some general statements about the marine resources using Mann-Whitney Test

Statements	*p-value*	Level of significance ($\alpha = 0.05$)
We should manage the sea to ensure that there are fish for our children and their children.	.035	significantly different
We do not have to worry about the fish. God will take care of it for us.	.949	not significant
We have to take care of the land and the sea or they will not provide for us in the future.	.064	not significant

Distribution of formal knowledge to the community

As described by Pomeroy et.al. (2004), the term "formal knowledge" refers to the information generated by the scientific community regarding MPA use and ecosystem impacts. Information from this indicator can be used as a basis for appropriate information campaigns and awareness building to avoid mis-perceptions about MPAs.

4 generally accepted items of scientific information on the local MPAs were presented to the respondents. The information was: each MPA has a core zone or "no take zone"; MPAs can help protect and conserve over-exploited fish species; fish inside the MPA will "spillover" to areas outside of it; and MPAs can generate income by also being an eco-tourism site. To be able to gauge the level of awareness on this information, the respondents were asked to assess their own level of awareness for each item, using the scale described in the Materials and Methods section.

More women respondents than men assessed themselves to have complete awareness (CA) of the generally accepted information presented to them (Fig. 4). A smaller number of women than men said they had limited (LA) to moderate (MA) levels of awareness on the items. This relatively higher level of awareness of women respondents can be attributed to the common practice in coastal communities in the Philippines which is that, in a household, the wife is the one who attends awareness-building activities (Webb et al. 2004; Eisma-Osorio et al. 2012). Most of the time, the husband is out fishing or is resting at home because he has just returned from fishing.

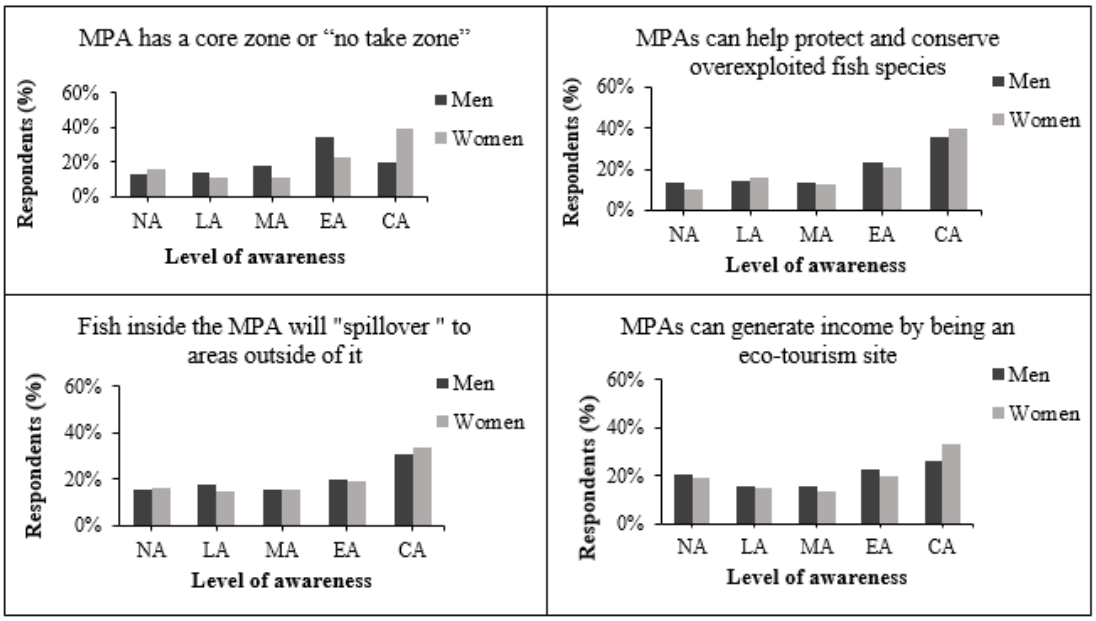


Fig. 4. Level of awareness of women and men respondents on information related to MPA

From a Mann-Whitney Test, the responses of the women and men responses on the information "MPA has a core zone or no take zone" is significantly different ($p<0.05$) as shown in Table 4. This demonstrates that level of awareness of the women respondents on the said statement is significantly higher than men respondents. Establishing zones in the MPA is a regulatory measure and having a clear and delineated zone is an attribute of a good MPA (DENR 2004), thus, community's knowledge on this policy is important to the attainment of the conservation goals.

Table 4. Level of awareness of women and men respondents using Mann-Whitney Test.

Information	*p-value*	Level of significance ($\alpha = 0.05$)
MPA has a core zone or "no take zone"	0.005	significantly different
MPAs can help protect and conserve overexploited fish species	0.405	not significant
Fish inside the MPA will "spillover" to areas outside of it	0.602	not significant
MPAs can generate income by being an eco-tourism site	0.246	not significant

Local understanding of MPA rules and regulations

This indicator measures whether the stakeholders are aware and have fully understood the MPA rules and regulations. This has great implication on the degree of compliance of the community. It is expected that there will be voluntary compliance if the community understood the basic reason behind the laws and regulations (DENR et al. 2001). Legitimacy of the regulatory system and high compliance is expected if community participation is encouraged (Islam 2017).

Proportionately slightly more men (90 %) than women (85 %) respondents claimed that they were aware of the existence of the rules and regulations for the management of the MPAs (Fig. 5). However, when probed to provide details of the prohibited activities, more women than men respondents were able to give details of the prohibited activities in the municipal ordinance (Table 5). This would imply that women respondents were more familiar with the rules and regulations. Again, this can be attributed to their more active

participation in awareness-building activities (Webb et al. 2004; Eisma-Osorio et al. 2012).

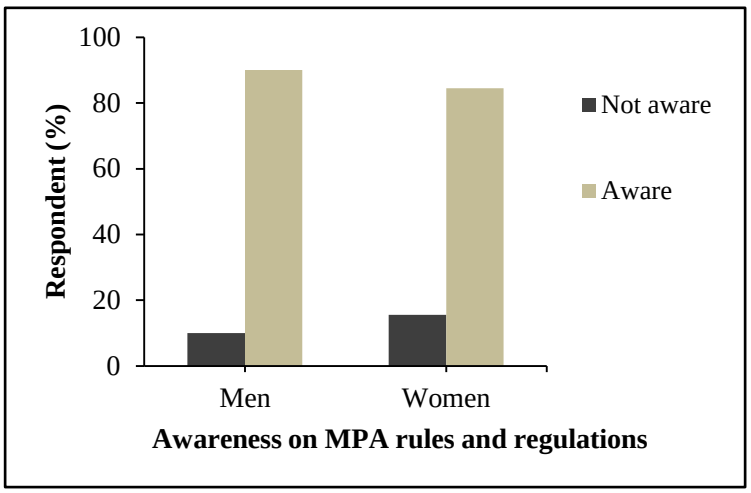


Fig. 5. Awareness on the existence of MPA rules and regulations

Table 5. Rules and regulations being enforced in the MPA as detailed by respondents (%)

Rules and Regulations	Female	Male
No fishing in the MPA core zone	63	37
No gathering of corals, stones and sand in the area	76	24
No swimming activities inside the MPA area	79	21
No throwing of garbage anywhere, observe proper waste disposal	85	15
No trespassing in the MPA area	62	38
No gleaning activity in the MPA area	84	16
No jetski and over speeding of boats when passing the MPA area	32	68
No diving in the MPA area	71	29
No illegal fishing (cyanide, dynamite, fine mesh nets, poachers)	62	38

In general, both women and men felt a sense of ownership of the rules and regulations and considered them socially acceptable and credible (Fig. 6). As one fisherfolk remarked: "*Ang ini nga mga laye para man sa amon kaaraydan*" (loosely translated as "these regulations are also for our own good and benefit"). Results of the FGD further revealed that there is high compliance rate with MPA rules. In fact, for the three MPAs, only 11 documented cases of violations occurred from 2009 to 2013. No case was ever filed in court and violators were only warned not to commit violations again.

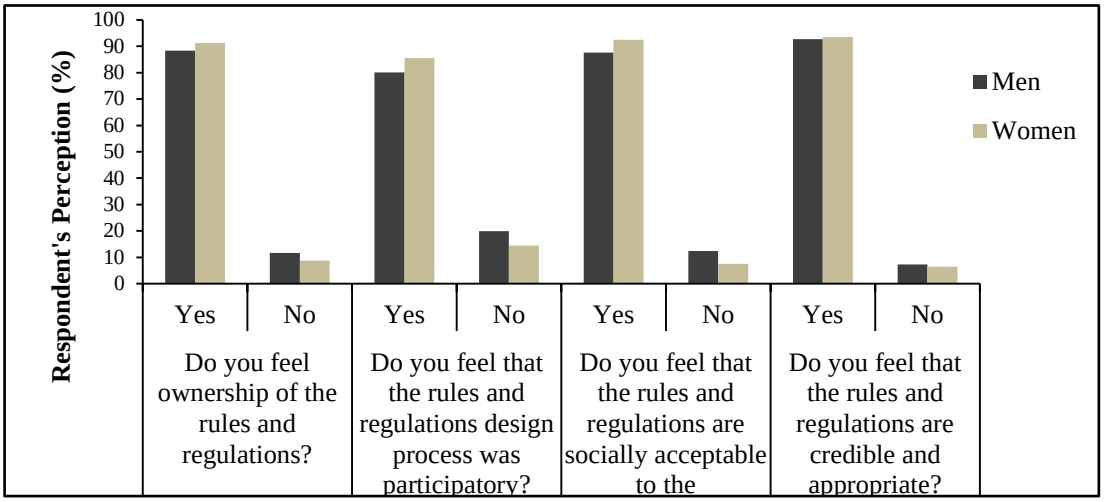


Fig. 6. Respondents' perceptions on the MPA rules and regulations

Generally, both women and men respondents had positive values and beliefs towards the establishment of the MPAs. They perceived that the establishment of MPAs in their community could address the problem of declining fish catch and degradation of critical coastal habitats. The perceived positive impact of the MPA was confirmed by a related biophysical study that showed fish biomass increased about 1-5 times (comparing pre-MPA vs post-MPA data) and that overall, average fish size grew by 2.3-3.3 times (Espectato et al. 2017).

Discussion

The results of the present study showed that, in general, some gender differentials exist on the values, beliefs, and level of awareness on MPAs. While both women and men respondents valued the marine resources as important source of food and livelihood, more women respondents then men very strongly agreed on the statements that there is a need to manage the sea and the marine resources sustainably for the future generations. In addition, there was a statistically significant difference in the responses of women and men to the statement that there is a need to "manage the sea to ensure that there are fish for our children and their children."

This "sustainability mindset" of the women respondents in San Joaquin conformed to observations and conclusions of other studies. Epps and Benbow

(2007) in their study in Madagascar observed that women often showed more concern for future generations and their children's future. This also supported the seminal concept of the "mother" and "father" effect of Blocker and Eckgberg (Stern 1993) in which mothers were more concerned about local environmental problems than fathers. The reasons for this may be due to differences in gender roles in society such that mothers prioritise welfare and health of the family, both factors closely associated with the local environmental quality, while fathers prioritize the economic well-being of the family. Wives of fisherfolk have greater interest in the welfare of their families (Oracion 2000) and their motives for participating in resource conservation is to conserve resources for their families and for the next generations (Clabots 2013; Guiriba 2010).

A relatively higher percentage of women respondents than men assessed themselves to have complete awareness of the formal knowledge about the MPAs. This general self-assessment was supported by the level of awareness of the women respondents on the different zones of the MPA, which was significantly higher than the awareness of the men. This could be attributed to the fact that attending meetings and other awareness-building activities was usually a task delegated to wives in Philippine coastal communities. The study of Webb et al. (2004) showed that women in the community of Sagay Marine Reserve were well informed on several aspects of the outcomes of the reserves, since they frequently attended meetings on behalf of their husbands who were out fishing. Similarly, Eisma-Osorio et al. (2012) observed that in coastal resource management in the Philippines, women often attended meetings in place of their husbands, even if they are not members of the association.

The relatively high level of awareness of women of MPA matters in San Joaquin demonstrated the potential of the wives/mothers to be an effective medium of social marketing related to marine resource management. As discussed by Gonzales and Martin (2007), women have great influence on their children, to whom they can pass on environmental messages. For the Pacific Islands, Ram-Bidesi (2015) also pointed out that women, as the primary caretakers of the children, could be instrumental in instilling desired social and moral values in children at a young age, and which could influence them to later follow fishing practices that are sustainable and which support the protection of the marine environment. Similarly, WWF (2012) acknowledges the pivotal role

of women on having the main responsibility for educating young children including passing on of their knowledge of resource use and traditional management.

Conclusions

This study found that women in San Joaquin played an important role in resource protection initiatives such as MPAs, even if their roles were not formally recognized. Their delegated task of attending meetings on behalf of their husbands was an additional role they played in the community on top of their productive and reproductive roles. Possessing a "sustainability mindset" and generally higher level of environmental awareness than men could make them a very good medium for social marketing programs related to resource management. However, caution must be observed in order not to overload them without relieving some of their existing multiple roles and burdens.

While there are already initiatives and progress on introducing gender into the policy agenda in fisheries and aquaculture, much still needs to be done. This paper supports the findings of other studies on the need for strategies to integrate gender perspectives in implementing resource management initiatives, such as the establishment and management of MPAs. The roles that women play in coastal resource management should be properly recognized by giving them equal participation and control in the management process.

Acknowledgements

This paper draws on the results of the study titled "Evaluation of the Marine Protected Areas (MPAs) in San Joaquin, Iloilo, Philippines" which was funded by the University of the Philippines Alumni Association of Greater Chicago (UPAAGC) through the initiative of Dr. Almira Astudillo Gilles.

References

Alcala, A. C. 2001. Marine Reserves in the Philippines: Historical development, effects and influence on marine conservation policy. Bookmark, Makati City, Philippines. 115 pp.

Biermayr-Jenzano, P. 2003. Maximizing conservation in protected areas. Guidelines for gender consideration. Policy Brief. IUCN, Population Reference Bureau. 6 pp.

Beaumont, J. 1997. Community participation in the establishment and management of marine protected areas: A review of selected international experience. South African Journal of Marine Science 18: 333-340.

Carpenter, K.E. and V. G. Springer. 2005. The center of the center of marine shore fish biodiversity: The Philippine Islands. Environmental Biology of Fishes 72: 467-480.

Charles, A. and L. Wilson. 2009. Human dimensions of Marine Protected Areas. – ICES Journal of Marine Science 66: 6–15.

Clabots, B.M. 2013. Gender dimensions of community-based management of marine protected areas in Siquijor, Philippines. Thesis submitted to the School of Marine and Environmental Affairs. University of Washington, Seattle, WA. 19 pp.

DENR. 2004. Marine protected area establishment and management training course. http://oneocean.org/download/db_files/MPA_Establishment_&_Management_Training_Manual.pdf. Accessed 10 March 2017.

DENR, DA-BFAR and DILG. 2001. Philippine coastal management guidebook no. 8: Coastal law enforcement. Coastal resource management project of the department of environment and natural resources. Cebu City, Philippines. 164 pp.

Di Ciomma, R.C. and A. Schiavetti. 2012. Women participation in the management of a Marine Protected Area in Brazil. Ocean and Coastal Management 62: 15-23.

Epps, M. and Benbow, S. 2007. Community attitudes and perceptions of marine and coastal resources and sustainable management in SW Madagascar. Blue Ventures Conservation Report. 41 pp.

Eisma-Osorio, R.L., M.V.Gamale, R.C.Amolo, R.D. Kirit, A.C. Patindol and A.T .White. 2012. A Sourcebook on mainstreaming gender into coastal resources management in the Philippines. Coastal Conservation and Education Foundation. Inc., Cebu City, Philippines. 52 pp.

Espectato, L., R. Napata and C. Baylon. 2017. Will small MPAs work?: The case of small-sized MPAs in Southern Iloilo, Philippines. Ocean and Coastal Management 139 : 24-32.

FAO. 2011. Fisheries Management. Marine protected areas and fisheries. FAO Technical Guidelines for Responsible Fisheries No. 4, Suppl. 4. Rome, FAO. 198 pp.

Guiriba, G. O. 2010. The role of women in environmental conservation in Sorsogon Province, Philippines. In: Proceedings of 4th Asian Rural Sociology Association International Conference. (eds. L.L. Tolentino, L.D.Landicho, S.Wun'Gaeo, K.Ikegami), pp. 106-112. September 7-10, Bicol University, Legazpi City, Philippines.

Islam, M.M., M.M. Shamsuzzaman, M.M.H. Mozumder, X. Xiangmin, Y. Ming, M.A.S Jewel. 2017. Exploitation and conservation of coastal and marine fisheries in Bangladesh: Do the fishery laws matter?. Marine Policy 76 :143–151.

Kelleher, G. 1999. Guidelines for marine protected areas. IUCN, Gland, Switzerland and Cambridge, UK. 107 pp.

Lentisco, A. and E. Alonso. 2012. On gender mainstreaming strategies and tools in fisheries development projects: RFLP gender strategy and lessons from the Asia-Pacific region. Asian Fisheries Science 25S:105-117.

Mascia, M.B. and C. A. Claus. 2008. A property rights approach to understanding human displacement from protected areas: The case of marine protected areas. Conservation Biology 23:16–23.

ole-MoiYoi, L.M. 2003. Community participation in the planning and management of marine protected areas: A study of Kenya and the Philippines. Thesis submitted to the Brown University. Providence, Rhode Island. 113 pp.

Oracion, E. 2000. Filipino women in coastal resource management: The need for social recognition. Silliman Journal 41: 9-23.

Pauly, D. V. Christensen, J. Dalsgaard, R. Froese and F. Torres Jr. 1998. Fishing down marine food webs. Science 279 :860-863.

Pelletier, D., J. Claudet, J. Ferraris, L. Benedetti-Cecchi and J. A. Garcìa-Charton. 2008. Models and indicators for assessing conservation and fisheries-related effects of marine protected areas. Canadian Journal of Fisheries and Aquatic Sciences 65: 765-779.

Pomeroy, R.S., J. E. Parks and L. M. Watson. 2004. How is your MPA doing? A guidebook of natural and social indicators for evaluating marine protected area management effectiveness. IUCN, Gland, Switzerland and Cambridge, UK. 216pp.

Ram-Bidesi, V. 2015. Recognizing the role of women in supporting marine stewardship in the Pacific Islands. Marine Policy 59:1–8.

Roberts, C.M., J.P. Hawkins and F.R. Gell. 2005. The role of marine reserves in achieving sustainable fisheries. Philosophical Transactions of the Royal Society B 360: 123–132.

Rodriguez-Martinez, R.E. 2007. Community involvement in marine protected areas: The case of Puerto Morelos reef, Mexico. Journal of Environmental Management 88: 1151-1160.

Stern, P. C., T. Dietz and L. Kalof. 1993. Value orientations, gender and environmental concern. Environment and Behavior 25: 322-348.

Webb, E.L., R.J. Maliao and S.V. Siar. 2004. Using local user perceptions to evaluate outcomes of protected area management in the Sagay Marine Reserve, Philippines. Environmental Conservation 31: 138–148.

Weeks, R., G.R. Russ, A.C. Alcala and A.T. White. 2009. Effectiveness of marine protected areas in the Philippines for biodiversity conservation. Conservation Biology 24: 531-540.

White, A.T., L.Z. Hale, Y. Renard and L. Cortesi. 1994. Collaborative and community-based management of coral reefs: Lessons from experience. Kumarian Press. West Hartford, Connecticut, USA. 130 pp.

White, A.T., Salamanca, A. and C.A. Courtney. 2002. Experience with marine protected area planning and management in the Philippines. Coastal Management 30:1-26.

White, A. T., P. A. Aliño and A. Meneses. 2006. Creating and managing marine protected areas in the Philippines. Fisheries improved for sustainable harvest project. Coastal Conservation and Education Foundation, Inc. and the University of the Philippines Marine Science Institute, Cebu City, Philippines. 83 pp.

Williams, M.J., M. Porter, P.S. Choo, K. Kusakabe, V. Vuki, N. Gopal and M. Bondad-Reantaso. 2012. Guest Editorial-Gender in Aquaculture and Fisheries: Moving the agenda forward. Asian Fisheries Science 25S:1-13.

WIOMSA. Managing marine protected areas: A toolkit for the Western Indian Ocean. Western Indian Ocean Marine Science Association. https://www.wiomsa.org/mpatoolkit/Themesheets/B3_Gender_and_MPAs.pdf. Accessed 28 February 2017.

WWF. 2012. Fisheries management and gender: Briefing note. World Wide Fund for Nature, United Kingdom.14 pp.

Gender in Aquaculture andFisheries: Engendering Security in Fisheries and Aquaculture
*Asian Fisheries Science Special Issue **30S** (2017): 181-198*

ISSN 0116-6514
https://doi.org/10.33997/j.afs.2017.30.S1.009
Technical Paper

Occupational Safety and Health (OSH) Risks for the Female Workers Engaged in the Shrimp Processing Industry in Bangladesh

MOHAMMAD NURUZZAMAN[1*] and MOHAMMED HELAL UDDIN[2]

[1]Research Fellow, Department of Development Studies, University of Dhaka, Bangladesh
[2]Associate Professor, Department of Economics, University of Dhaka, Bangladesh

Abstract

Occupational Safety and Health (OSH) risks are emergent issues for the female work force in the Bangladesh shrimp processing industry. The Bangladesh Government, along with the United Nations Industrial Development Organization (UNIDO), the International Labour Organization (ILO) and the local shrimp factory owners, has taken the OSH issues seriously across the shrimp processing sector following several accidents that occurred in the Bangladesh garments industry. That shrimps are processed on ground floors of two-storied building, has made shrimp processing less risky with respect to fire and building safety. But working in cold and moist conditions for long periods, without adequate personal protection equipment (PPE) can cause health problems for workers. Respiratory problems and musculoskeletal pains are the common health issues perceived to be prevalent in shrimp processing workers.

Other OSH risks include faults in electric lines and connections to run processing machines, high sound volumes in the work environment, vibration around machine rooms, and prolonged work hours without ear plugs that can cause impaired hearing. Compressor machines and ammonia gas cylinders carry high risks of explosions and leakage of toxic gas, which can cause breathing ailments or can kill in severe cases. Recent investigations of OSH in shrimp processing revealed that female workers suffered more than their male counterparts from several illnesses and occupational diseases. They were also victims of wage disparity and were deprived of admissible leave and privileges. Since the majority of the shrimp processing workers are female, these OSH risks require additional scrutiny. The present paper investigated and presents findings of a study conducted to assess OSH status of shrimp processing workers in Bangladesh.

[*]Corresponding author. Email address: nuruzzaman07@gmail.com

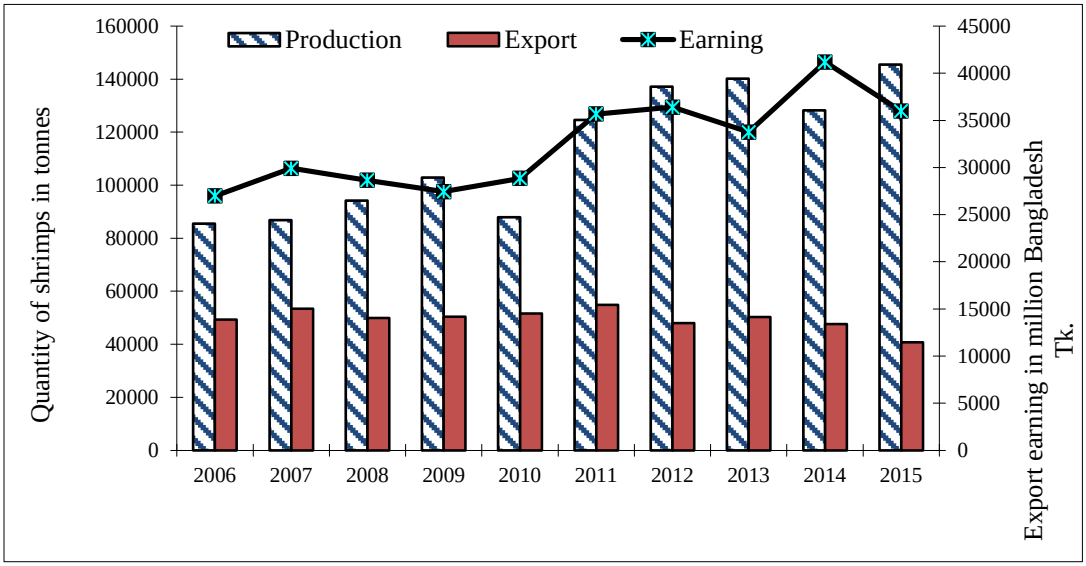
Introduction

For many years, Bangladesh has achieved and maintained significant economic growth and is expected to achieve even higher economic growth in the years to come. A very high export growth is believed to be one of the main contributing factors to this relatively strong growth of the Bangladesh economy in the 1990s (Mahmud 2008). Sustained export growth is reflected in the export earnings to GDP ratio that has quadrupled from 7 % in year 1995 to nearly 28 % in 2012, with the country's total exports bringing in USD 31.2 billion in fiscal year (FY) 2014-15 (MOF 2016). The shrimp industry is currently the fifth largest export earner, with frozen foods earning USD 638.19 million dollars, of which shrimp and prawn exports contributed about 80 % in FY 2013-14 (Export Promotion Bureau 2015). Bangladesh accounts for 2.5 % of the global shrimp trade (FAO 2016).

The shrimp farming industry in Bangladesh is conducted in a manner that is far from the modern aquaculture practiced in other contemporary shrimp producing countries. The majority of the farming areas are under natural irrigation systems that receive tidal brackish water seasonally and which farm rice and shrimp alternately.

The production regime is around 300 kg to 400 kg. ha^{-1}. yr^{-1} on average. This is low production per unit of land compared to that in other neighbouring countries. Shrimp are farmed on approximately 275,500 ha of land and the average shrimp-rice farm size is 1.4 ha. About 145,500 tonnes of shrimp were produced in 2015 (DoF, 2016).

The difference between total shrimp production and export has expanded gradually over the last 10 years as more shrimp are consumed locally today compared to that being exported. In 2015, Bangladesh exported 40,726 tonnes of shrimp, which is about 28 % of total raw shrimp production. The country's shrimp export has declined gradually since 2011, and has fallen from the second top to fifth position in the national export earnings. The current shrimp export volume is about 18 % less than that of the 10 year average, while the farmed shrimp production has increased from 2011, albeit with a drop in 2014 (Fig. 1).



Source: DOF Bangladesh

Fig. 1: Trend of Bangladesh Shrimp production, export and earning, 2006 - 2015

90 shrimp processing factories operate across the coastal region of Bangladesh, engaging between 50,000 and 60,000 workers, of whom about 70 % are women. Most of the shrimp processing plants are under utilised relative to their installed processing capacity and the businessmen are apparently unhappy in terms of the future of their "unfertile investment."

Workers' Occupational Safety and Health (OSH) issues in industries including the shrimp processing industry have been a grave concern. After several tragic incidents of the building collapses and fires that have killed and injured thousands of workers in the readymade garment (RMG) industry, international buyers and consumers are also looking carefully at OSH matters across the shrimp processing sector. In 2016, due to the lack of safety in workplaces, accidents and casualties caused the deaths of at least 1240 workers in several industries, including 89 female workers (OSHE 2016).

Most of the shrimp processing factories in Bangladesh are considered safer than factories in other industries, from the perspectives of fire and building safety (Nuruzzaman et al. 2014). Shrimp processing work is done in wet and chill conditions on ground floors of 2 storey buildings in which the office and administrative units are usually situated on the first floor. The Fisheries Department mandates the strict enforcement of food safety and HACCP

(Hazard Analysis and Critical Control Points) rules and needs to grant export certificates for each consignment of shrimp and seafood exported. This system has made the handling and processing of this valuable commodity safe from any health risk for its overseas consumers. But the safety and health of the workers behind the safe commodity is often neglected.

The issues of occupational safety, health risks, accidents in the workplace, and occupational diseases for the workers remain mostly undisclosed. In addition, health hazards related to work in cold, moist and slippery environments, especially on night shifts, have important implications for labor productivity. The issue of OSH for the shrimp processing workers has not been addressed until recently.

This paper investigates and explains the current state of OSH practices. The information was collected through a comprehensive action-oriented survey in the Bangladesh shrimp processing industry. The specific objectives are to give an overview of OSH status in relation to female workers across the shrimp processing industry; to give an account of OSH risk areas affecting female workers; and to recommend ways to improve the OSH situation across the shrimp processing sector in Bangladesh.

Methodology

The paper builds on the data set collected through a comprehensive survey conducted by the Economic Research Group and funded by the International Labour Organization (ILO) Shrimp Project in Bangladesh. As part of the study, 536 factory workers, 27 factory owners/general managers/managers (operation), 31 Labour compliance officers, and 35 Labor supervisors from 40 shrimp processing factories (30 from Khulna region and 10 from Chittagong region) were interviewed face-to-face using structured questionnaires. The interviews were carried out inside factory premises and also at the worker residences. Of the total 536 workers, 403 were drawn from Khulna and the remaining 133 from Chittagong (Table 1).

In addition to the interviews, Focus Group Discussions (FGDs) and Key Informant Interviews (KII) were conducted with staff of Fish Inspection and Quality Control (FIQC), Department of Fisheries (DoF), Department of

Inspection for Factories and Establishments (DIFE), Ministry of Labor and Employment (MoLE), Government of Bangladesh Joint Director of Labour in Chittagong and Khulna, the leaders of Bangladesh Frozen Food Exporter's Association (BFFEA), Khulna and Chittagong, 4 Labor Contractors, 3 Trade Union leaders, and several Participation Committee members from different processing factories.

Table 1. Shrimp processing workers interviewed for the OSH study undertaken from the processing factories across Khulna and Chittagong region, 2015

Interview location	Worker type	Khulna region	Chittagong region	Total
Inside Factory	Permanent to Factory	207	83	290
	Casual to Factory	2	0	2
	Contractor worker	6	0	6
	Sub-total	215	83	298
Outside Factory	Permanent to Factory	86	23	109
	Casual to Factory	22	4	26
	Contractor worker	80	23	103
	Sub-total	188	50	238
Total		403	133	536

Results and Discussion

Current state of OSH in the Bangladesh shrimp industry

Occupational safety and health issues are always a concern for workers engaged in industries in the poor and developing countries. The shrimp processing industry in Bangladesh is no exception to this. After the destructive incidences in the garment factories, the Bangladesh government, international buyers, and consumers have taken OSH issues in Bangladesh seriously. Even though no such destructive incidences have occurred in the shrimp processing industry thus far, renewed attention has been given to this sector.

Only a few papers have explored the OSH situation of the shrimp processing factories in Bangladesh, and even these do not give much detail and the studies were often only peripheral to other work. Common observations were that most of the workers have to work in low temperatures and work standing for long hours (Nuruzzaman et al. 2014; Islam 2008; Verite 2009; SAFE, 2012). Some mentioned inadequacies in terms of safety and health

protection. Further, workers, mostly females, often suffered from fungal infections, muscle and back pain, stomach related problems, cuts and so on. Factories rarely provided any compensation to injured workers, arbitrarily granting some meager lump sum payments. There had been many more studies looking into different aspects of the shrimp industry, including with a focus on the details of the shrimp supply chain (Tasnoova et al. 2010; Verite 2009; Nuruzzaman 2006; Hensler 2013; Islam 2008).

Some studies focused on the rights and benefits, working conditions and the nature of employment contracts in processing factories (Nuruzzaman et al. 2014; EJF 2014; Verite 2009; SAFE 2012; Islam 2008). These have addressed the issues of working condition in the processing factories, all being critical of the treatment of the workers in those factories. Few of them looked into the issues of freedom of expression and the collective bargaining power of the labor force employed in this segment of the industry.

Working in cold and moist condition for longer period can cause problems for workers. Symptoms like colds, coughing, sneezing, running nose, asthma, and accumulation of water in the lungs are the common ailments perceived affecting processing workers. Working long hours while standing causes backache and repetitive work in certain postures may cause musculoskeletal disorders. Rules and directives in the labour laws are meant to ensure occupational safety and health for the workers and maintain a healthy workforce.

Our objective was to gather information on prevailing working conditions; understand the gendered distribution of labour during shrimp processing; determining issues on OSH and the status of workers training on safety health and use of personal protective equipment (PPE).

The study revealed that shrimp deheading, peeling, deveining, panning and packing were female dominated activities, whereas receiving, sorting, grading and weighing were done mainly by the male workers. Heavy duty activities such as lifting ice blocks storage and operating machines also were done mainly by the male workers (Table 2).

Table 2. Division of labor across the shrimp processing factories in Bangladesh, 2015

Task number	Types of work	% of Females (n=388)	% of Males (n=148)
1.	Receiving	0.3	12.2
2.	Sorting	0.8	18.6
3.	Grading	0.3	7.1
4.	Deheading	27.6	1.9
5.	Washing	1.5	1.3
6.	Peeling	3.9	1.3
7.	Deveining	3.9	0.0
8.	Weighing	4.1	7.1
9.	Panning	16.5	5.1
10.	Packing	17.3	6.4
11.	IQF	15.2	16.7
12.	Ice lifting	0.3	1.9
13.	Work in machine room	0.5	16.0
14.	Cleaner	2.1	1.9
15.	Others	5.9	2.6

Demographic and socio-economic conditions

The workers engaged in the shrimp processing industry were young; 72 % of female and 76 % of male workers were under 35 years old. More girls under 18 were found, compared to their male counterparts (Table 3). Unmarried women, along with separated, widowed and divorced women, made up about 37 % of the female workforce. They have been considered less powerful players in the labour market.

Table 3. Age, education and marital status of sample shrimp processing workers interviewed in 2015

Age			Education			Marital status		
	% Female	% Male		% Female	% Male		% Female	% Male
18>	2.8	1.3	No schooling	36.4	9.6	Married	63.1	68.4
18 – 25	30.9	34.6	Up to 5 years	48.6	35.9	Unmarried	14.7	31.0
26 – 35	38.1	40.4	Up to Secondary School	14.0	47.4	Separated	9.8	0.6
36 – 45	22.7	17.3	Up to Higher Secondary School and above	1.0	7.1	Widow	9.5	0
46 and above	5.4	6.4				Divorced	2.8	0

Female workers' wages were 26 % less than those of male workers in Khulna region factories and 31.5 % less in Chittagong region factories (Table 4). The subordinated social position of girls and women with little or no schooling may have pushed them to the surplus labour market and to accept such wage disparities for their survival.

Table 4. Wage difference of sample shrimp processing workers interviewed in 2015

Region	BDT/month		Remarks
	Male	Female	
Khulna	5,826.00	4,299.00	26.2 % less than males
Chittagong	6,231.00	4,270.00	31.5 % less than males

Note: BDT = Bangladesh Taka

Health risks, illness and diseases

The respondents were asked if, during their work, they experienced extreme cold temperature, slippery floors, had to lift heavy objects, had to work near fast spinning machines with loud noise and vibrations, had to work standing for long hours, had to and inhale harmful ammonia gas, or faced other hazards. They were also asked whether they suffered from illnesses or diseases which they perceived were due to working in the shrimp factory.

Table 5. Occupational Safety and Health risks indicated by the shrimp processing workers in their workplaces, 2015

Response types (%)	Work in extreme cold		Work in slippery floor		Lift heavy object		Work in heavy noise		Work in vibration		Work standing long hour		Inhale NH_3 gas	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M
Never	44.6	47.7	69.6	72.3	79.3	62.6	65.5	61.9	84.3	82.6	13.9	26.5	67.8	74.2
Always	27.6	25.8	3.9	5.2	5.2	14.2	13.1	16.1	2.8	5.2	72.2	47.7	0.5	0.6
Frequently	4.6	4.5	0.5	0.6	2.1	1.9	3.1	3.9	1.0	0.6	3.4	5.8	1.6	0.6
Sometimes	17.3	14.2	17.5	11.6	8.3	15.5	9.5	9.0	2.8	3.9	10.3	18.1	2.6	2.6
Rarely	5.9	7.7	8.5	10.3	5.2	5.8	8.8	9.0	9.0	7.7	0.3	1.9	27.5	21.9

Note: F – Female, M - Male

The majority (about 55 % of females and 52 % of males) of the workers had to work in extreme cold conditions (Table 5). About one third of the respondents reported working on slippery floors, with only small variations between males and females. Just less than 40 % of male workers performed their jobs amidst loud noise and lifted heavy objects, whereas 65 % of female workers never worked in noisy areas, and about 80 % of them did not lift heavy objects.

Working while standing for long hours was a common problem for both female and male workers as 84 % of females and 73 % of males mentioned the inconvenience of standing long hours and reported illnesses such as musculoskeletal pain, lower back pain, back pain and swelling of hand/feet swelling that were related to long standing work (Table 6).

Table 6. Workers response on their sufferings from different illness across shrimp processing factories in Bangladesh, 2015

Types of illness	% Females (n=388)	% Males (n=148)
Cold/cough	59.6	50.3
Nausea/Dizziness	7.5	3.9
Lower back pain/back pain	4.6	3.9
Musculoskeletal pain (Pain on leg/hand/waist)	4.4	1.9
Fungal infection	3.9	0.6
Hand/feet swelling	2.1	0.6
Stomach pain/vomit	1.0	1.3
Fever	1.0	2.6
Fainting	0.5	0.0
Poor appetite	0.3	0.0
Impaired hearing	0.3	0.0
No illness	14.1	35.5

The survey revealed that the shrimp processing workers were suffering from 11 different illness and 5 occupational diseases (Table 6 & 7). Among the illnesses that were related to the unpleasant working conditions colds, coughs, dizziness, musculoskeletal pain, of hand/feet swelling and fungal infections appeared the most common for the female workers. Prolonged illnesses associated with shrimp processing jobs may lead to a number of diseases reported by 32 % of the female respondents. Among those diseases, skin diseases, spinal cord and bone related pains and chronic coughs, asthma and pneumonia are notable. Some workers also reported bearing multiple diseases. Less than 5 % of the male respondents admitted the sufferings from occupational diseases in shrimp processing jobs, compared to 33 % of females who reported diseases.

Working with wet raw materials in chilly conditions made shrimp processing factories less risky than other factories in terms of fire safety. But workers health problems, illnesses and diseases cannot be neglected. The present study noted that small amounts of medicines were provided by the

factories and about 72 % of the respondents said that they received painkillers, antibacterial ointments, oral rehydration salts, bandages, band-aids and other medicine from first-aid boxes in cases of emergency.

Table 7. Workers response on their sufferings from different diseases across shrimp processing factories in Bangladesh, 2015

Types of diseases	% Female (n=388)	% Male (n=148)
No disease	67.6	95.4
Skin diseases	22.3	2.6
Spinal cord, nerve or bone related problems	5.2	1.3
Chronic cough	3.1	0.7
Asthma	1.0	0.0
Pneumonia	0.8	0

Vaccination and health checkups

The respondents were asked about any disease prevention steps taken by the factories to avoid health risks. About 53 % of the respondents said that the employer arranged their blood test for blood grouping, as an important requirement of labour laws required the display of group on each workers' ID card. Further 14 % of respondents said that they were vaccinated against important communicable diseases, especially tuberculosis, malaria and hepatitis. In addition, 13 % of respondents said that their factory helped them to undergo skin and venereal disease tests; 11 % said they had done pathological tests and only 4 % said they had to undergo a general health checkup arranged by the factory.

Structural weaknesses were found in the adequacy of human resources to maintain workplace safety and health. About three-fourths of the respondents reported no appointed medical officer, and 77 % reported no trained nurses had been appointed in their factories. The labour laws specify a full time medical officer equipped in performing surgery if required be appointed for factories having 300 or more workers; and a trained nurse with an almirah (cupboard) for necessary instruments along with first aid boxes and emergency medicine was required for factories having 150 workers or more (BLA 2006). More than 80 % of workers however, said that their workplaces had first aid boxes.

Fire, electrical, mechanical and chemical safety and risks

As shrimp processing involves handling wet raw materials in cold conditions, these activities generally are safe from fire risk, even though the general stores of packaging materials contain dry paper-board, polythene sheets, packets and other wrapping materials that are fully combustible. These areas and others in the factories have high fire risks, for example, from electrical short-circuits, fuel and lubricant stores, laundries and kitchens.

Electricity can ease production work but poor or unskilled use of electricity may be hazardous and risky. Faults occur in electric lines and connections in processing machinery. In 2015, accidents from electrical shocks were reported (Deputy Director, Fire Brigade & Civil Defense, Khulna, personal communication), possibly due to the use of poor quality cables, exposed surface lines and/or low quality electrical fittings.

The machines used in shrimp processing factories are important for continuous production, but if they are not operated with due care, workers may be endangered. Apart from shrimp processing equipment inside the processing buildings, vehicles, refrigerated vans, generators, boilers and other machines are found outdoors in the factories. The present study observed anomalies hampering mechanical safety including untrained operators on machines and machine-specific standard operating procedure (SOP) was ignored. Moreover, lack of machine-specific efficiency tests, lack of maintenance, negligence in using personal protection equipment (PPE), unprotected wheels and gears, and inadequate care during risky machine operations could have caused mechanical accidents.

Working in noisy engine rooms were harmful to the workers. Prolonged exposure to noise may impair hearing and gradually make workers deaf. In compressor rooms, ammonia cylinders can burst and kill workers; leaking ammonia gas, if inhaled, can also injure or kill workers. Freon, although a safe refrigerant gas, is still very limited in the shrimp processing industry in Bangladesh.

Chemical safety and health risks

In addition, faults in storage of fuels and lubricants may cause fire. Use of chemicals for laboratory tests like sulfuric acid and other chemicals may cause health hazards. Chlorinated water and detergents are used for cleaning of utensils and floors through pressure hosepipes inside processing factories and this may cause inhalation of aerosols and cause eye irritation if adequate protective measures are not taken.

Incidence of accidents in the workplace

Over the year prior to the survey, 15 % of female and 22 % of male workers reported experiencing accidents. Out of injured female workers, 30 (out of 57) had been absent from their work and, if the absence was for two weeks or more, they were permitted leave without pay. For the 14 female workers who had major injuries, the employers bore full treatment costs. The labour laws had provisions wherein the employer had to bear the full cost if an accident was not caused by worker negligence. In addition, the worker was eligible for full wages for first 2 months, two-thirds wage for the next two months and half wage for 8 months if the worker needed that period for treatment and recovery. For accidental death, the bereaved family would be awarded a one-time payment of BDT 100,000 and BDT 125,000 if a worker was reduced completely disabled by accident (BLA 2006).

Accident prevention and training on OSH

Personal Protective Equipment (PPE) or safety equipment was an important element of prevention and most of the respondents indicated this equipment was provided. Despite this, some reported that important PPE such as safety goggles for welding, gas masks in the compressor room, and ear plugs in the engine room had not been used regularly. PPE commonly supplied included aprons, gum boots, caps, and masks. Warm clothes were supplied in the majority of the factories (61 %), but 45 % of the female workers had no warm clothes. Gloves for shrimp peeling had not been used by many female workers because they could not peel shrimp quickly when wearing them and this reduced their earnings as most of the peeling workers were paid piece rates.

The survey revealed that only 3 % of workers received training on machine operations by the employer; and 33 % received training on fire safety provided jointly by the Fire Brigade and Civil Defense, Ministry of Labour and Employment and non-government organisations (NGOs). None, however, received training on occupational safety and health despite the imperative to do this.

Rules and directives provide the legal basis to ensure occupational safety and health for the workers. The responsibility for maintaining safe and healthy workplaces lie with the employers, who are expected to arrange regular training and awareness programs on OSH to build a healthy and productive workforce.

Recent progresses

Overall, OHS related issues are still concerns for the shrimp processing industry, even if they are less severe compared to other export-oriented industries such as RMG. To improve the OSH situation and minimise the sorts of risks outlined above, both the industry and concerned government departments have been keen to take some positive steps. Considerable early stage progress has been made.

Apart from the present fact finding assessment carried out by the Economic Research Group, the industry has been striving to overcome some of the shortcomings through the United Nations Industrial Development Organization (UNIDO) and ILO shrimp projects to explore the way out of fixing the OSH problems. Under the financial support from the Better Works and Standard Project – Better Fisheries Quality (BEST-BFQ), UNIDO, the Bangladesh Frozen Foods Exporters Association (BFFEA) hosted a series of OSH workshops, the first time of their kind, in April 2014 in Khulna and Chittagong at the BFFEA Conference Halls. Technical officials from the processing industries, officials from the Department of Inspection, Medical Officers from the MOL&E, experts from Fire Brigade and Civil Defence (Table 8) were invited. The workshops aimed at exploring the concept of occupational safety and the occurrence of health problems at the different stages of shrimp and seafood processing. Ground level technical officials who attended the OSH needs assessment workshop included plant engineers, factory managers,

overseers, electricians, shift-in-charge staff, boiler operators and machine room operators. The needs assessment identified a number of problems (Table 9).

Table 8. OSH initiatives undertaken by the shrimp processing industry, 2014-2015

Project	Activities	Participants	Location	# Events	# Participants
BEST-BFQ, UNIDO	OSH Workshop	Factory Managers, Over sheers, Plant Engineers, Electricians Shift-in-Charge Boiler operators	Khulna & Chittagong	4	120
ILO Shrimp Project	Occupational Safety & Health Risk Assessment	General Manager, Compliance Officer, HR Manager	Khulna & Chittagong	3	85

Table 9. OSH problems identified.

1. Unqualified or underqualified staff can hold technical positions and operate machines, plant and equipment
2. Standard operating procedures (SOP) for important machines not available; when available, may not be in local language
3. Machines are not under regular maintenance/overhauling
4. Workers in machine rooms work with loud sounds and strong vibrations
5. Electrical fittings, cables and joints are often faulty
6. Ammonia is used as refrigerating gas; danger of toxic gas leakage
7. Regular fire drills not practiced in most of the factories
8. Doctors and nurses are not available as per requirement of the laws
9. First aid supports and emergency medicines are often inadequate
10. Insufficient supply of PPE and lack of awareness of use of PPE
11. No training on OSH
12. Absence of factory safety committees or safety officers
13. Lack of factory inspection for OSH from the government departments

During the ILO shrimp project, 2014-2015, the expertise of an international Industrial Health Risk Assessment expert from ILO Head Quarters was available during visits to shrimp processing factories, shrimp landing centers and shrimp farms across Khulna region. Along with local OSH experts, the ILO project developed an OSH training manual based on factory based Health Risk Assessments and, in June 2015, held several training workshops in the Khulna region. From both the projects, the training resources were gathered and translated into an OSH Training manual in Bangla and published by the

BFFEA. The OSH training manual has been used for factory based workers' training across all functioning shrimp processing factories in Bangladesh.

Tangible outcomes form both the UNIDO and ILO shrimp projects included providing labour laws training for about 7,500 workers and staff from the industry; preparation and printing of Guidelines on Labour Laws Implementation by the UNIDO shrimp project; Labour Laws and OSH Training Manuals, Employers Handbook; and OSH Training Manual from the ILO shrimp project.

The Bangladesh Government has amended the Labour Laws 2006, published Labour Rules 2015 and reorganized and upgraded the Department of Factories and Inspection and recruited about 200 factory inspectors to streamline factory inspections.

Despite the progress, however, challenges remain. Recently, many workers and staff have been trained in the Labour Laws, factory rules and in industrial relations across the shrimp industry. Despite this training, and training for trade union leaders, participation committee members and safety committee members, the majority of the industry owners apparently lack interest in better labour compliance. Additional situation analyses may be needed to better understand this situation.

Severe lack of raw shrimp supply in the local market drove most of the processing companies into unhealthy competition with each other. Brokers and middlemen bid higher prices to attract more shrimp from the auction markets and landing centres for influential companies. Such competitive pricing through open auction should be good for the shrimp farmers, but it caused small processing companies to purchase less and under-utilise their processing capacities. Processing workers were in less demand and the Fish Inspection and Quality Control, Department of Fisheries, reported that export performance has been skewed with only 15 to 20 good processing factories out of 90 factories running shrimp processing business.

Recent price fluctuation and low demand for black tiger shrimp (*Penaeus monodon* (Fabricius 1798)), plus dumping of white shrimp (*Penaeus vannamei* (Boone 1931)), by the international market made the business situation further uncomfortable for Bangladeshi exporters. Bangladesh produces

black tiger shrimp which constitutes about three-fourth of its export, and this trade becomes vulnerable when price and demand for black tiger goes down. Poor export performances jeopardise the chances of more attention to worker OSH.

Conclusions

The OSH issues discussed so far are not exhaustive and need to be explored further with continuous in-depth observations. Working in cold and moist condition for extended periods without proper warm clothes can cause problems for the workers. Various respiratory diseases and ailments may reduce workers' productivity as well as cause workers to dislike the industry. Proper gloves should be supplied and their use ensured so that workers can avoid suffering from hand infections. Work while standing for long periods has already been changed in other countries by using adjustable and comfortable chairs. Peeling and deveining of shrimp can be done wearing special plastic nails which has already been used in Thailand and other counties. Backache and musculoskeletal pains for repetitive work in certain postures can be reduced by shifting duties and arranging physiotherapy for the affected workers.

The shrimp industry plays an important role in terms of employment creation, rural development and foreign exchange earnings for Bangladesh. The sector employs a large number of workers across the value chain along with the potential to employ many more in future with an even greater contribution to economic growth and development. Since women are employed here in increasing number, the performance of the industry also plays an important role in empowering women in Bangladesh.

To reap the potential benefits from this industry we need to address OSH issues with outmost care and sincerity. Sustainable development of a sector or industry always requires a congenial working atmosphere for the workers and a better understanding among the stakeholders across the value chain. Most of the issues raised in the present study may not be fully understood and cannot be solved overnight, but they require further investigations, moving forward with solutions, and reporting on progress made.

Acknowledgments

The authors express sincere gratitude and acknowledgement to the BEST – BFQ Project UNIDO and the ILO Shrimp Project in Bangladesh that allowed them to work and do the study across the shrimp processing industry. Special thanks to the GAF6 organizers for the travel grant to attend the conference and present the paper at GAF6 Bangkok, Thailand.

References

BLA (Bangladesh Labor Acts). 2006. Bangladesh Gazette. Ministry of Law, Justice and Parliamentary Affairs, Dhaka, Bangladesh. 115 pp.

Bangladesh Labor Rules. 2015. Bangladesh Gazette. Ministry of Law, Justice and Parliamentary Affairs, Dhaka, Bangladesh. 334 pp.

OSHE (Bangladesh Occupational Safety, Health and Environment Foundation). 2016. Compilation of media reports on occupational accidents and casualties from industrial sector. 28 pp.

DoF. 2016. Fish week compendium. Department of Fisheries, Ministry of Fisheries and Livestock, Dhaka, Bangladesh. 148 pp.

EPB. 2015. Bangladesh export promotion bureau report. Statistics for July-May, 2014-15. Dhaka, Bangladesh. 552 pp.

EJF (Environmental Justice Foundation). 2014. Impossibly cheap: Abuse and injustice in Bangladesh's shrimp industry. London, United Kingdom. 44 pp.

FAO. 2016. The state of world fisheries and aquaculture 2016. Contributing to food security and nutrition for all. Rome. 200 pp.

Hensler, L. 2013. A sustainable future for shrimp production in Bangladesh? An ethical perspective on the conventional and organic supply chain of shrimp aquaculture in Bangladesh. Sustaining Ethical Aquaculture Trade (SEAT). 20 pp.

Islam, Md. S. 2008. From sea to shrimp processing factories in Bangladesh: Gender and employment at the bottom of a global commodity chain. Journal of South Asian Development 3: 211-236.

Mahmud, W. U. 2008. Bangladesh: Development outcomes globalization and challenges in the context of globalisation. In: The Future of Globalization: Explorations in Light of Recent Turbulence (ed. Ernesto Zedillo), pp. 253-257. Routledge, London and New York.

MOF (Ministry of Finance). 2016. Bangladesh Economic Review, 2016. Dhaka, Bangladesh. 331 pp.

Nuruzzaman, M. 2006. Dynamics and diversity of shrimp farming in Bangladesh: Technical

aspects. In: Shrimp Farming and Industry: Sustainability, Trade and Livelihoods (eds. A. Rahman, AHG Quddus, Bob Pokrant and M. Liaquat Ali), pp. 431-460. Bangladesh Centre for Advanced Studies (BCAS) and University Press Ltd. Dhaka

Nuruzzaman, M. and S. H. Kabir. 2013. Environment, workplace safety and labor standards: Status of shrimp processing industries in the South-west Bangladesh. Bangladesh Frozen Foods Exporters Association Shrimp & Fish News, January-April : 47-50

Nuruzzaman, M., S.U. M. Selim and Md .H. Miah. 2014. Rights, benefits and social justice: Status of women workers engaged in the shrimp processing industries of Bangladesh. Asian Fisheries Science 27S: 151-163

SAFE (Solidarity Center and Social Activities for Environment). 2012. The plight of shrimp processing workers of South-Western Bangladesh. Solidarity Center, Washington DC. 36 pp.

Tasnoova, S. Y. T. and I . Iwamoto. 2010. Market structure and procurement system of shrimp export industry in Bangladesh. In 4th international conference of Asian Rural Socialogy Association (ARSA) proceedings, pp. 236-245. Bicol University, Legazpi City, Philippines.

Verité, 2009. Research on indicators of forced labor in the supply chain of shrimp in Bangladesh. Verité's Bangladesh-based partner, Sheva. 134 pp.

Gender in Aquaculture and Fisheries: Engendering Security in Fisheries and Aquaculture
*Asian Fisheries Science Special Issue **30S** (2017): 199-217*

ISSN 0116-6514
https://doi.org/10.33997/j.afs.2017.30.S1.010

Technical Paper

Assessing Pre and Post Tsunami Impacts on the Livelihoods of Coastal Women Using Socio-Economic and Gender Analysis (SEAGA)

B. SHANTHI[*], P. MAHALAKSHIMI and V.S. CHANDRASEKARAN

Social Sciences Division, ICAR-Central Institute of Brackishwater Aquaculture, 75, Santhome High Road, R.A. Puram, Chennai – 600 028, Tamil Nadu, India

Abstract

The people in coastal villages, particularly the women, face different challenges due to disaster threats such as the 2004 Indian Ocean tsunami, climate and environmental changes. Coastal women in India have in recent years started adopting new livelihood practices apart from their traditional occupations. Detailed gender and livelihood analysis in assessing the impact of disaster threats, climate and environmental changes on the livelihoods of coastal women in India is scanty. 200 women and men including the tribal people from four coastal districts of Tamil Nadu, South India, were selected. A participatory rural appraisal (PRA) tool and socio-economic and gender analysis (SEAGA) were used for data analyses. This study reveals the impact of disaster threats, climate and environmental changes on the livelihoods of women and men, the village environment, the village infrastructure and institution, gender and social issues. This study, as a successful model, can help the concerned development organizations and policy makers to plan and develop programmes for the upliftment of coastal women, actions to be taken towards disaster mitigation and adoption, environmental management and appropriate technologies to be disseminated to develop sustainable livelihoods among the fishers.

Introduction

Climate change impacts are being increasingly observed and coastal communities are especially vulnerable with poor adaptive capabilities

[*] Corresponding author. Email address: drshanthi@ciba.res.in

(Salagrama 2012; Shyam et al. 2014; WHO 2009). It has also been observed that the impacts on women and men are different (UNDP 2013). Most disaster preparedness and management plans do not contain a gender perspective to address the differential vulnerabilities and needs of women and men. Women's roles have been generally underestimated among the coastal communities and they are often excluded from conservation initiatives though their contributions to these can be significant (FAO 2016). As a result of climate change and resultant migration of men in search of livelihood opportunities, women's labour has increased with them assuming responsibilities as heads of families, in addition to carrying out family chores and coping with low family incomes (WHO 2009). Several studies have shown that disaster mortality rates have been also higher in the case of women and children than in men, due to the social status of women and their lack of awareness of the risks (Anderson 2000; Fothergill 1996; Cochrane et al. 2009; Leduc 2008; Elinder and Erixson 2012; WHO 2009 and Government of Tamil Nadu 2017). In the tsunami that hit the Indian coast in December 2004, Nagapatinam was the worst affected district with 6,065 people dead along the Tamil Nadu coast. Fisheries and aquaculture were the sectors most severely hit by the disaster; many boats, fishing gear, ponds and support installations were destroyed or damaged.

In Indian coastal areas, the existing problems need to be identified, and awareness level and adaptive measures taken by the coastal populations towards addressing the short and long-term impacts of climate and environmental changes and to study the challenges faced by coastal women towards these changes. Evidence from participatory rural appraisals of fishing communities suggests that when the tsunami struck, the limited livelihood resources available to people may have been driven down further. Greater impacts on livelihoods are now becoming apparent, with oversupply of boats and gear in some locations, increasing fuel prices and lower fish prices, adding to pre-existing issues concerning illegal fishing methods and fishing by foreign vessels (FAO 2007). In a study, Shyam et al. (2014) found that 75 % of the fishers knew about climate change but only 67 % were actually "aware". The major sources of climate change knowledge were through media, information exchange between family members, friends and village administrative guidelines.

In view of the reduced livelihood options both in fisheries and allied sectors after natural disaster events in the coastal areas, there have been

occupational changes and increased social pressures on women. With the advent of technological advances in the field of aquaculture, new and profitable occupational patterns may be directed towards small-scale aquaculture projects that can be easily taken up by rural folks, especially women (WHO 2009). Brackishwater aquaculture has been identified as a potential means for increasing fish and shellfish production. It can be taken up in ponds, canals, creeks and lakes and can generate employment and improve the socio-economic conditions of the coastal poor (Shanthi et al. 2010; 2012). The gap between technology development and adoption could be bridged more successfully through participatory action plans where all stakeholders form a part of the decision-making process (Chambers 1994; Vivekanandan 2011).

There is a need for gender-oriented methodologies, indicators and policy plans for the upliftment of coastal women in order to assess the impacts of disaster threats, environmental and climatic variations on them. Overall, impacts of the tsunami on fisheries are more related to ongoing and new tsunami-related human factors, rather than the physical or biological effects of the disaster on resources and ecosystems. That is, existing over-exploitation trends had already brought many of the fisheries under severe stress before the tsunami. For the present study, the Socio-economic and Gender Analysis (SEAGA) developed by FAO was used for assessing the pre and post tsunami impacts on the livelihoods of coastal women in fisheries/aquaculture sectors in Tamil Nadu (FAO 1995; FAO 1996; FAO 2004; FAO 2007; Shanthi et al. 2010 and Shanthi et al. 2014). In a comprehensive manner, the livelihoods of coastal women and men, the village environment, the village infrastructure and institutions, and gender and social issues were assessed.

Materials and Methods

200 coastal fisher women and men, comprising 50 people each from Tiruvalur, Kancheepuram, Cuddalore and Nagapatinam coastal districts of Tamil Nadu, South India (Fig.1) were selected for a study conducted by the ICAR-Central Institute of Brackishwater Aquaculture (CIBA), Chennai, Tamil Nadu, India, under the project sponsored by the Indian Council of Social Science Research (ICSSR), New Delhi for assessing the impact of environmental changes on the livelihoods of coastal women in Tamil Nadu. Representatives of the community members, with a mix of socio-economic

groups (men and women (35 %) (middle aged), young (20 %) and old (22.5 %) both male and female, village headmen (5 %) and women self-help groups (17.5 %) participants) from the 4 coastal districts were selected for this study. These districts and villages were selected because of concentration of fisheries/aquaculture activities by coastal fishers and because these districts were affected the most by the tsunami and other environmental changes.

The research questions asked were: What is the impact of disaster threats, climate and environmental changes on the livelihoods of women and men, the village environment, the village infrastructure and institution? The present study was carried out to fulfil the need to test gender-oriented methodologies, indicators and policy plans for the upliftment of coastal women and to assess the impacts of disaster threats, environmental and climatic variations. The Participatory Rural Appraisal (PRA) tool was used for collecting data from the beneficiaries and, using these data, the SEAGA analysis (FAO 2004; Shanthi et al. 2010 and Shanthi et al. 2014) was carried out. This was the first time that the SEAGA toolkit was used in assessing the impact of environmental changes on the livelihoods of coastal women in Tamil Nadu. The SEAGA toolkit addresses: the development context; livelihood analysis; and stakeholders' priorities for development.

Fig. 1. Map showing the coastal districts selected for the study in Tamil Nadu, South India

Results

Each of the elements of the SEAGA toolkit helps in assessing the impact of pre and post-tsunami changes on the livelihoods of coastal women and men, the village environment, the village infrastructure and institutions, and on gender and social issues.

Impact of pre and post-tsunami changes on the livelihoods of women and men

Fish marketing of fresh and dry fish, and wild shrimp collection were the major activity of all coastal women in the above-mentioned villages in both pre and post-tsunami periods. This was followed by other livelihoods such as jellyfish processing, clam collection, goat rearing, crab fattening (in concrete tanks) and as labour on shrimp farms and in agriculture. However, during the post-tsunami period, almost 80 % of coastal women in all the 4 coastal districts participated in the National Rural Employment Guarantee Act (NREGA) Programme, an employment guarantee scheme of the Government of India which assured 100 days of employment. This was followed by crab fattening (in pens and in tide fed ponds), seabass nursery rearing in hapas, polyculture of seabass and crab farming in community ponds, farm-made fish feed development along with fish vending, clam collection, goat rearing, and laborers in shrimp farms and agricultural fields. Men dominated off-shore activities like fishing and also participated in activities such as jellyfish processing and marketing.

Post-tsunami, brackishwater aquaculture technologies were transferred by ICAR-CIBA to the Women's Self Help Groups (WSHGs) at Thonirevu, Light House, Kulathumedu and Kattur villages of Tiruvallur district and New Perungulathur and Allambaraikuppam of Kancheepuram district as an alternative livelihood option. Welfare measures directed by various government agencies and NGOs also brought about positive changes in attitudes among the women and they were able to improve their contributions to family incomes. Aquaculture is an alternative option to cope with climate change. It has considerable adaptation potential via selective breeding, regulating the environment, and resilient species opportunities (Vivekanandan 2011). Coastal aquaculture technologies integrated with agro-based technologies like goat farming, poultry farming, quail farming, mushroom farming, sales of snacks

and running small grocery shops will also be of help during off season or the lean season of aquaculture.

During the post-tsunami period, the women were supported by men in the villages for activities like construction of crab pens, harvesting of crabs, pond management and farming polyculture of seabass and crab, fish transportation, as watchmen, in purchase of water crabs and sales of the fattened crabs. Women were involved in household chores followed by onshore activities, whereas, men's contribution towards household management was limited. It was noted that women's work load had increased by about 8 hours daily due to migration of many men to the cities during the post-tsunami period and their subsequent employment in on-shore fishing activities and engagement in other government run programs. Recreation included visiting religious centers, shopping and the cinema. Household chores included washing clothes and kitchen utensils, cleaning the house, child care, cooking, serving food to the family members and purchasing groceries and household items. Dry fish sellers engaged in fish drying primarily during the summer season. Assistance was rendered to husbands by their wives when the fish catch arrived at the shore. During leisure time they were found to play dice locally known as "Dhayam" and "Pallanguzhi".

Men engaged in fishing activities during the pre-tsunami period achieved nominally good fish catches and regularly went on fishing trips with few breaks. In the post-tsunami period they reported that the fish catch was poor; and they had to go farther out to sea to fish, taking breaks between their fishing trips. The fishermen were able to spend time with their children, take them to school and spend more time on recreational activities. In these villages, very few men participated in the NREGA scheme for income generation. During recreation, men watched television, smoked or consumed liquor and gambled with dice or cards.

The WSHGs of Kattur, Thonirevu and Kulathumedu of Tirvuluvar district facilitated the resettlement of families affected by the tsunami, helped develop new livelihoods, fund raise for new business activities and helped the members in income generation through non-fisheries or aquaculture activities. There was a flow of resources like fish, crab, shrimp, poultry, egg, nets, ice, fresh and dry fish, boats, motor, diesel and vegetables like drumstick, coconut

and plantain between households on a payment basis. There was also a flow of resources and marketing from the village to the town and city. This included fresh and dry fish, salt, processed jellyfish, hardened crabs, seabass fry, value-added fish products, aqua feed and cultured shrimp. From nearby towns and cities, resource materials and purchased inputs flowed to the villages, such as those required for farming activities like diesel, nets, poles, feed, water crabs, and building materials.

Impact of pre and post-tsunami changes on the village environment

In the selected villages, natural resources as well as aquatic resources like fishes, shrimps and crabs declined. The fish catch was reported to be good during 2002-04. After the tsunami in December 2004, a sudden decline in the fish availability and in certain fish species in the sea were reported (FAO 2007 and Vivekanandan 2011). Day-to-day fluctuations in the fish catch per unit effort were also observed due to the environmental changes. This created the need for an alternate livelihood for these coastal populations.

Post-tsunami, a sea level rise and seawater intrusions were reported in some coastal villages in Cuddalore and Nagapitinam districts. The freshwater ponds in the villages were also observed to be shrinking and the fresh water in the wells was turning saline resulting in a decline in availability of potable water. This added to the burden of the women folk as they had to walk long distances to fetch drinking water.

Impact of pre and post-tsunami changes on village infrastructure and institutions

During and after the tsunami, the women's groups clearly recognized that institutions like state government departments, research institutions (like ICAR-CIBA), fishermen's associations, non-government organisations (NGOs), community halls, temples and churches (where meetings were held), banks, ration and provision shops and markets served as important institutions which rendered their emergency services in the most affected villages. Other institutions such as primary health centers, hospitals, panchayat offices, youth organizations, schools, police stations and town panchayats served as secondary support institutions. The tertiary support institutions were auctioning centers, colleges, ice factories, post offices and electricity boards.

The perceptions of men's groups were similar. However, in addition, a minor institution like a small tea shop in the village served as an important venue where communication of radio news, TV news and daily news in newspapers was shared among the men fishers and their friends.

Impact of pre and post-tsunami changes on gender and social issues

The coastal communities of Nagapatinam district have been prone to loss of life and property due to major environmental threats like cyclones and tsunami. Nagapatinam district alone accounted for 76 % of the deaths of the entire state of Tamil Nadu and was the worst affected district in India. As a result of the tsunami, many fishers lost their possessions, houses and property in Nagapatinam and Cuddalore districts and shifted their dwellings to safer places inland, particularly making use of the post-tsunami houses built and provided by Government institutions and NGOs (Govt. of Tamil Nadu 2017).

Gender and social issues

The majority of the households in the study areas were found to be led by women who were responsible for supporting the livelihoods and for generating family income. Most of the men had migrated to the cities in search of new jobs; a few women were widows. The family incomes ranged from INR 1,000 to about INR 10,000. The majority of the selected beneficiaries belonged to the Scheduled Caste and Scheduled Tribe communities (80 %), while the rest belonged to most backward classes (20 %). (The Gazette of India. National Commision for Backward Classes).

The fishers in Nagapitanam were highly disturbed by the tsunami. Fishers were very slow to adopt alternative livelihoods. Due to previous taboos and customs in some villages, women were not permitted to participate in village meetings and discussions. But the formation of women's SHGs was encouraged by men because of the benefits available to family members in the WSHGs through government welfare schemes. The women, being members of the WSHGs, have facilitated the adoption of the aquaculture technologies. The previous taboos and customs in the village were overcome due to these interventions and the resulting social mobilization.

Table 1. Institutional profiles of Women Self Help Group (WSHGs) (Villages of Kattur, Thonirevu and Kulathumedu, Tirvulluvar district, Tamil Nadu, South India)

Goals	• To participate in the development and community programmes • To serves as linkages between women and other organizations to receive welfare measures • Helps to initiate income generating programme • Facilitates in adoption of alternate livelihoods among the groups members who are in need of income during male migration to other villages and also facing unemployment problems
Management	• Group leader is elected by group members. • Any woman who is 20 years or older may be a member. • Meeting conducted once a month • Links with women's groups in other villages • Involved in developmental activities • Create institutional linkages • Lending of loan among the groups • Savings helps in re-investment of their savings in their business
Achievements	• Saving the lives of victims • Resettlement of families and victims who are affected by tsunami. • Adoption of new livelihoods • Fund raising for new business activities • Helps in revolving funds within the group • Helps in resource management • Mitigation towards environmental threats • Helps in income generation through non fisheries/aquaculture activities
Needs	• Training and demonstrations in fisheries/aquaculture technologies and adopt alternative livelihoods in aquaculture and allied sectors. • Entrepreneurship development programme • Financial support and other linkages • Infrastructure facilities • Community support • Awareness programmes on environmental changes and its threats

The goals, management, achievements of WSHGs in 3 coastal villages revealed that they were able to address many issues such as the resettlement of families and victims who were affected by the tsunami and help in income generation through non-fisheries or aquaculture activities (Table 1). Youth organizations of Nagapatinam and Cuddalore districts facilitated many social services like saving the lives of victims affected by the disaster and voluntary services for the victims of tsunami, cyclone and floods (Table 2).

Table 2. Institutional Profiles of Youth Organizations (Village of Nagapatinam and Cuddalore district, Tamil Nadu, South India)

Goals	• Objectives include maintaining security; solving routine problems; encouraging community cooperation and income generation. • Founded by educated young people in the villages.
Management	• Village developmental activities • Conduct relief and rehabilitation programme, sports, and health camps • Aquaculture activities • Utilization of available water resources in the village • Coordinate in environmental sanitation programme
Achievements	• Maintained security to the village • Helped in school construction work • Volunteered in teaching the village children • Resettlement of displaced people. • Planting and conservation of water resources, afforestation, • Road maintenance • Repairing boreholes • Conducting sports activities • Monitoring mid-day meals and programmes conducted at schools • Voluntary services to the victims of tsunami
Needs	• Training and demonstrations on disaster management • Training and demonstrations on fisheries/aquaculture and allied sector technologies • Meeting room and office • Stationery and operational tools. • Communication and transport • Awareness programmes on environmental changes and its threats

In the post-tsunami period, the majority of the women were involved (alone or with the men) in taking major decisions on how to use the fish products, how to use the profit from sales and the cash with respect to usage and expenditure of by-products (Table 3).

Table 3. Benefit analysis chart of fisheries and aquaculture activities

Fish products	How it is used	Decisions made	
		Pre tsunami	Post tsunami
Fish sales	1. Home consumption		
	2. Local sales		
	3. Supplied to trader		
	4. Supplied to city market		
	5. Export		
	If sold who decides on cash use		
	1. Invested in business		
	2. Basic needs (Edn., food etc.)		
	3. Savings		
	4. Buying assets		
Shrimps	1. Home consumption		
	2. Sold within the households in the village		
	3. Supplied to traders		
	4. Sold in outlets		
	If sold who decides on cash use		
	1. Invested in business		
	2. Basic needs		
	3. Savings		
	4. Buying assets		
Dry fish	1. Home consumption		
	2. Sold within the households in the village		
	3. Supplied to traders		
	4. Supplied to feed and fertilizer companies		
	If sold who decides on cash use		
	1. Invested in business		
	2. Basic needs (Edn., food etc.)		
	3. Savings		
	4. Buying assets		
Value added fish food Products	1. Sold within the village		
	2. Supplied to local shops outside		
	3. Supplied to market agents		
	If sold who decides on cash use		
	1. Invested in business		
	2. Household needs (Edn., food etc.)		
	3. Savings		
	4. Buying assets		
Crab fattening (in pens)	1. Home consumption		
	2. Sold in local market		
	3. Supplied to traders		
	4. Supplied to exporters		
	If sold who decides on cash use		
	1. Invested in business		
	2. Basic needs (Edn., food etc.)		
	3. Savings		
	4. Buying assets		

Polyculture of crab and seabass	1. Home consumption		
	2. Sold in local market		
	3. Supplied to traders		
	4. Supplied to exporters		
	If sold who decides on cash use		
	1.Invested in business		
	2.Basic needs (Edn., food etc.)		
	3.Savings		
	4.Buying assets		

Index: Men = ; Women = ; Both =

The women and men faced the stress and problems like unemployment among the women, irregular employment, interrupted power supplies, non-availability of seasonal fishes, low prices fixed for fishes, land pollution, increasing fishing fleets and associated efforts and use of very small mesh size fishing nets by trawlers, difficulty in drying fish due to lack of space and the migration of men from their coastal villages to cities in search of new jobs due to climate change threats. A study by WHO (2009) showed that when confronted with long-term weather shifts, men showed a greater preference to migrate, while women showed a greater preference for wage labour. In times of crises they mortgaged their assets or had to use the money from their savings for living. The women had no access to the sea for fishing and their involvement was mainly to share the on-shore work after the fish was landed. In the post-tsunami period, the women were found to have access and control of brackishwater areas like creeks, canals, ponds and lakes in the villages for small scale fishing and aqua-farming activities.

During the post-tsunami period, the women's income from different sources were: sales of fresh fish (25 %); dry fish (20 %); fattened crabs (10 %); fish-feed sales (6 %); fish vending (6 %); value-added fish products (6 %); wild shrimp collection (5 %); sales of nursery reared sea bass fingerlings (4 %); clam collection (4 %); labour force in agricultural fields (4 %); labour force in shrimp farms (2 %); kitchen garden products(2 %); dairy and poultry products (2 %); jellyfish processing (2 %); and goat rearing (2 %). The income for men was generated from: fishing business (30 %); sale of fresh fish (20 %); trading of fresh and dry fish (10 %); fattened crabs (15 %); fish export (10 %); salary from employment in government, private and other sectors (5 %); net making (4 %); boat repair (3 %); and dairy and poultry products (3 %).

The most important problem that men faced was “low fish catch”. The effect of this problem was that it leads to unemployment, low income, social evils, poor health and early mortality. To overcome this problem, it was suggested that the Government needed to initiate steps to fix fishing schedules and regulations in coastal villages, ban fishing on juvenile fish and the use of very small mesh size fishing nets, adopt fish farming technologies, and create linkages with Government institutions, NGOs and bankers to adopt alternative livelihood opportunities. The perceived outcomes of these solutions were higher incomes, better family status, and better health leading to a good society.

The most important problem as far as women were concerned was “lack of sustainable livelihoods”. The causes of this were male migration, lack of WSHG support, and community support. The effect of these problems was more leisure time, social evils, low family status, low income, poor health and early mortality. To overcome the problems, the main solution suggested was “diversification of livelihoods”. For this there was a need for family support, support from research institutions, government and private institutions, NGOs, banks, WSHGs and community support. The outcomes were perceived to be gainful usage of leisure time, higher incomes, better family status and better health.

Men and women fisher participants identified the strategies to tackle the problem of “how to cope with natural disaster threats”. They identified the affected, losers, gainers and supporters for this problem. The affected were village people, village resources, village infrastructure and the village environment. The losers were the neighboring village who were similarly affected by loss of resources and infrastructure. The supporters were identified as the department of fisheries, research organizations and other institutions and the gainers as the traders, food outlets, medical shop and petty goods shop.

The best bets action plan produced by men’s and women’s groups showed their planning of developmental activities to address the priority problems of handling natural disaster management, irregular employment and lack of income generation activities. For problems such as natural disaster management, men expressed the solution as creating disaster management awareness through training, taking pollution control measures and initiating more community development programmes in their villages.

Table 4. Best bets action plan

Problem: Natural disaster threats	
Solution	• Disaster management awareness through training • Pollution control measures • Initiate community development programmes
Activities	• Training and demonstration programmes • Awareness camp • Afforestation • Avoid polluting the lake, river, brackishwater area and sea • Housing • Erect walls near sea shore
Who will do it	• Community people (labour) • NGO support • Government institutions (fund) • Pollution control board • Research Organization (technical expertise)
Cost	• Local labour and willingness to work • Building materials • Training programme • Financial support to NGO
Duration	Six months
Problem: Irregular employment & lack of income generation activities	
Solution	• SHG formation • Income generating programme • Vocational training • Work in NREGA • Diversification of alternate livelihoods through brackishwater aquaculture • Entrepreneurship Development programme
Activities	• Training and demonstration programmes • Awareness camp • Seminar/ workshops • Exhibitions • Building
Who will do it	• Community people (labour) • NGO support • Government institutions (fund) • Research Organization (technical expertise)
Cost	• Local labour and willingness to work • Building materials • Training programme • Financial support to NGO
Duration	6 months

For problems such as irregular employment and lack of income generation activities, the women's solutions were to have an effective, cohesive group of people such as the WSHG, more income generating programmes, and alternate livelihood opportunities to adopt through brackishwater aquaculture technologies and entrepreneurship development programme etc. (Table 4)

Gender differences and emotions both influence risk-taking and decision-making and thus are significant factors in how climate-related risks are managed. This study adds an example, from an aquaculture context and the impact of another form of natural disaster – a tsunami, to the body of knowledge that shows risk decisions are not just analytical considerations but also influenced by emotions (Breakwell 2010; Loewenstein et al. 2001).

Although significant, moderate gender differences in behavior were found in this study. In Thailand, gender differences were greater for cage culture in reservoirs as this activity takes place further away from home (Lebel et al. 2016) than river cage culture which is often undertaken close to home (Lebel et al. 2014). Overall, most farm-level risk management options in Tamil Nadu were equally accessible to both men and women, and in many households, decisions and actions were taken jointly.

At the collective level, participation in risk management, or governance, by women was much less than that of men. In this region men dominate water user groups and play a much more prominent role in conflicts over water shortages and decisions on water allocation (Lebel et al. 2015). Research on the roles of women in community-level water management, and gendered social norms in northern Thailand (Lebel et al. 2017) suggest that it will be difficult for women to reduce risks to their farms at the larger, collective scales than it is for men. Further work is needed on how gender relations influence the management of water uses by aquaculture, as this another area critical to the management of climate-related risks.

Conclusions

From this study multiple coastal changes were evident, including sea level rise resulting in seawater intrusions, shrinking freshwater ponds and salinization of the fresh water in some village wells resulting in drinking water

problems. As a result, women had to walk long distances to fetch drinking water, due to the out-migration of men. When the majority of the men migrated from their villages to cities post the tsunami in search of new alternative livelihoods, women's workloads were increased. Added to their previous responsibilities were decision making for farm and home activities. Fish marketing was the major activity of all coastal women in the villages in pre- and post-tsunami periods, followed by other livelihoods. The decline in the fish catch and natural resources in the selected villages created the need for alternate livelihoods for these coastal populations.

During the post-tsunami period, brackishwater aquaculture technologies transferred by ICAR-CIBA to the Women's Self Help Groups served as alternative livelihoods and served as a significant opportunity for income generation. The welfare measures directed by various non-governmental agencies and government organizations brought in many positive changes in the attitudes of the women who were able to contribute better to their families' incomes. The women's and men's groups clearly recognised the primary, secondary and tertiary institutions which served as important institutions during the tsunami and rendered emergency services during the tsunami and its aftermath in the most affected villages. The death toll among coastal families was high due to many natural calamities and a lack of awareness of the risks. In some villages, women were not permitted to participate in village meetings and discussions. Now, the women, being members of the WSHGs, have facilitated the adoption of new aquaculture technologies, solving many issues and taking up many welfare measures. Youth organizations also facilitated social services in saving the lives of victims affected by disaster.

The women, although having no access to the sea for fishing, found, post the tsunami that they could make better use of brackishwater areas for small scale fishing and aquaculture when helped with the technology. Coastal aquaculture technologies integrated with agro-based technologies help during off season and in lean fishing seasons. These can bring extra income for the costal women and offer new but familiar options. These options can help women regain their dignity and respectability through increased employment and income.

As a model, the present study could help development organizations and policy makers to plan development programmes and strategies for uplifting the lives of coastal people, particularly women. This will also help in planning the action for disaster and environment management and for disseminating appropriate technologies to develop sustainable livelihoods among the fishers.

Acknowledgements

The authors are grateful to the Dr. K. K. Vijayan, Director, ICAR-Central Institute of Brackishwater Aquaculture, Chennai for his encouragement and support in the field work for this study and the authors are also thankful to Indian Council of Social Science Research, New Delhi, India for granting the project titled "Assessment on the impact of environmental changes on the livelihoods of coastal women in Tamil Nadu" under which this study was carried out.

References

Anderson, W.A. 2000. Women and children facing disaster. http://worldbank.mrooms.net/file.php/350/communitypdf/women_and_chikdren.pdf. Accessed 20 February 2017.

Breakwell, G. M. 2010. Models of risk construction: Some applications to climate change. Wiley Interdisciplinary Reviews: Climate Change 1: 857–870.

Chambers, R. 1994. Participatory Rural Appraisal (PRA): Challenges, potentials and paradigm. World Development 22: 1437-1454.

Cochrane, K., C. De Young, D. Soto and T. Bahri. 2009. Climate change implications for fisheries and aquaculture: Overview of current scientific knowledge. FAO Fisheries and Aquaculture Technical Paper. No.530. FAO. Rome. 212 pp.

Elinder, M. and O. Erixson. 2012. Gender, social norms and survival in maritime disasters. http://www.pnas.org/content/109/33/13220.full. Accessed 25 April 2017.

FAO (Food and Agriculture Organization of the United Nations). 1995. Understanding farmers communication networks: An experience in the Philippines. http://www.fao.org/docrep/v9406e/v9406e00.htm. Accessed 2 March 2017

FAO (Food and Agriculture Organization of the United Nations). 1996. Improving extension work with rural women. http://www.fao.org/docrep/x0249e/x0249e00.htm. Accessed 2 March 2017

FAO (Food and Agriculture Organization of the United Nations). 2004 .SEAGA Field Handbook-Gender Analysis in Agriculture. Vicki Wilde in collaboration with the Socio-economic and Gender Analysis (SEAGA) programme, Gender Development Service. Rome. 1-140 pp. http://www.fao.org/docrep/012/ak214e/ak214e00. Accessed 25 October 2017.

FAO (Food and Agriculture Organization of the United Nations). 2007. An overview of the impact of the tsunami on selected coastal fisheries resources in Sri Lanka and Indonesia. http://www.fao.org/3/a-ai000e.pdf. Accessed 1 March 2017.

FAO (Food and Agriculture Organization of the United Nations). 2016. Promoting gender equality and women's empowerment in fisheries and aquaculture. http://www.fao.org/3/a-i6623e.pdf. Accessed 25 October 2017.

Fothergill, A. 1996. Gender, risk, and disasters. International Journal of Emergencies and Disasters 14: 33-56.

Govt. of Tamil Nadu. 2017. http://www.nagaipattinam.tn.nic.in/relief.html. Accessed 2 March 2017.

Lebel, P., N. Whangchai, C. Chitmanat, J. Promya and L. Lebel. 2014. Access to fish cage aquaculture in the Ping River, northern Thailand. Journal of Applied Aquaculture 26:32-48.

Lebel, L., P. Lebel, P. Sriyasak, S. Rattanawilailak, R.C. Bastakoti and G.B. Bastakoti. 2015. Gender relations and water management in different eco-cultural contexts in Northern Thailand International Journal of Agricultural Resources, Governance and Ecology 11: 228-246.

Lebel, L., P. Lebel and B. Lebel. 2016. Impacts, perception and management of climate-related risks to cage aquaculture in the reservoirs of northern Thailand. Environmental Management 58:931-945.

Lebel, L., P. Lebel and B. Lebel. 2017. Gender and the management of climate-related risks in northern Thailand. International Social Science Journal, 147-158. DOI: 10.1111/issj.12090

Leduc, B. 2008. Climate change in the Himalayas: The women's perspective. http://www.capwip.org/Gender%20%20Climate%20Change%20in%20the%20Himalayas.pdf. Accessed 26 October 2017

Loewestein, G.F., E.U. Weber, C.H. Hsee and N. Welch. 2001. Risk as feelings. Physiological Bulletin 127: 267-286.

Shanthi, B., M. Krishnan and V.S. Chandrasekaran. 2010. Socio-economic and gender analysis in aquaculture. CIBA Special Publication No.48. CIBA, Chennai. 58 pp.

Salagrama, V. 2012. Climate Change and Fisheries: Perspectives from small scale fishing communities in India on measures to protect life and livelihood. http://re.indiaenvironmentportal.org.in/files/file/Climate%20change%20and%20Fisheries%20%20Perspectives%20from%20SSF%5B1%5D.pdf. Accessed 8 October 2017

Shanthi, B., M. Krishnan and A.G. Ponniah. 2012. Successful women entrepreneurs in Aquaculture: Case studies from Tamil Nadu, India. Asian Fisheries Science 25S: 177-185.

Shanthi, B., P. Mahalakshimi and V.S. Chandrasekaran.2014. A handbook on socio-economic and gender analysis in assessing the impact of environmental changes on the livelihoods of coastal women in TamilNadu. CIBA Special Publication No.76. CIBA, Chennai. 3-57 pp.

Shyam S. Salim, Kripa, V., Zachariah, P.U., Nivedita S. and T.V. Ambrose. 2014. Climate change awareness, preparedness, adaptation and mitigation strategies: Fisherfolks perception in coastal Kerala. Journal of Aquatic Biology and Fisheries 2: 670-681.

The gazzete of India. National commision for backward classess. Govt.of India. https://tribal.nic.in/DivisionsFiles/clm/13.pdf;http://www.ncbc.nic.in/User_Panel/GazetteNotificationList.aspx. Accessed 2 March 2017.

UNDP. 2013. Overview of linkages between gender and climate change. http://www.undp.org/content/dam/undp/library/gender/Gender and Environment/PB1-AP-Overview-Gender-and-climate-change.pdf. Accessed 25 October 2017.

Vivekanandan, E. 2011. Climate change and Indian marine fisheries. Marine Fisheries Policy Brief-3. CMFRI Special Publication No. 105. CMFRI, ICAR, Kochi, Kerala. 98 pp.

WHO. 2009. Gender, climate change and health. http://www.un.org/apps/news/infocus/sgspeeches/search_full.asp?stat/D=500 Accessed 2 March 2017

SHORT COMMUNICATIONS

Gender in Aquaculture and Fisheries: Engendering Security in Fisheries and Aquaculture
*Asian Fisheries Science Special Issue **30S** (2017): 221-229*

ISSN 0116-6514
https://doi.org/10.33997/j.afs.2017.30.S1.011
Short Communication

The Water-Energy-Food Nexus: Women's Lens for Fisheries Security

MARIETA BAÑEZ SUMAGAYSAY*

University of the Philippines Visayas Tacloban College, Tacloban City, Leyte, Philippines

Abstract

The water-energy-food (WEF) nexus, in an environment of increasing climate variability, is one lens which stakeholders must develop and embrace. Changes in the climate are intensifying the pressures on natural resources on which food production is primarily dependent. An increasing population further impacts on the ecosystem. The challenge is mounting on the fish drying food chain in Brgy Duljugan in Palompon, Leyte, Philippines. Heightening the women fish driers' awareness about the nexus and strengthening their roles within the nexus are crucial towards attaining sustainable and resilient livelihoods. Likewise, policymakers' appreciation of the WEF nexus is necessary as a basis for crafting integrated policies on climate, environment, and socio-economics.

Introduction

Climate variability is a major change driver in the water and energy ecosystems which in turn affect the food production value chain. There is a complex and interrelated structure that runs through the life cycle pathways of the water, energy and food nexus amid climate change in terms of temperature, precipitation changes, and rises in sea level (Liu 2016). Women, who are at the core of fish processing activities particularly in fish drying, are heavily affected. They are highly vulnerable to climate change as they depend on local natural

*Corresponding author. Email address: mayet_uptac@yahoo.com

resources for their livelihood (UN Women Watch 2009). The women fish dryers of Duljugan, a coastal village in the municipality of Palompon in Leyte, Philippines, depend on the sun for drying fish and on water from the wells to clean the fish to be dried.

The criteria used in the choice of Duljugan as the research locale included the presence of a significant number of women fish dryers, the high volume of dried fish production, and the number of coastal villages in the municipality from where research respondents can be randomly chosen.

Materials and Methods

32 women fish dryers were interviewed, and another set of 16 women fish dryers joined a Focus Group Discussion. The women represented various sectors of the fish dryers community such as the women's producers cooperative, village officials, women with long or short stints as fish dryers, women with large or small volumes of production, as well as those from various age groups and educational attainment.

Questions revolved around the women fish dryers' perception of climate change and variability, their utilization levels of resource inputs in fish drying, their knowledge and practices in fish drying, and their understanding of the interrelationships of water, energy and dried fish production.

This paper is based on a study funded by the National Research Council of the Philippines in 2013. It aimed to ascertain the water-food, energy-food, and energy-water nexus in fish drying, as well as to generate insights on ways to heighten the awareness of the small-scale women fish dryers about the importance of the water-energy-food nexus vis-a-vis climate variability as it affects the sustainability of their livelihoods and the supply of dried fish.

Results

The concept of the water-energy-food (WEF) nexus and its understanding by stakeholders is extremely important particularly in a country like the Philippines where the corresponding ecosystems are adversely affected by both slow and sudden-onset disasters. The interrelationships between food,

water and energy are complex. Such complexity is deepened when climate change concerns are added into the discourse, particularly as they impact on the need for sustainable resource use.

An estimated 60 % of the Philippine population is living near a coastline, and they are exposed to frequent climatic variations and extreme climatic hazards (Bohra-Mishra et al. 2016). The country ranks fourth in the Climate Risk Index (CRI) among the top 10 countries with the highest exposure and vulnerability to climate-related risks (Sonke et al. 2015). It is a climate hotspot and is highly vulnerable (Jabines and Inventor 2007). At the local level, the island-province of Biliran which is located around 57.12 kms from the study area of Palompon, is identified by the Manila Observatory as one of four areas that is most at risk to climate and weather related changes. Literature shows that where vulnerability is high, the poverty incidence is high, too. This vulnerability worsens the existing disparity of living standards across socio-economic classes since the relatively poorer are hardest hit by climate change impacts, having less or no access to alternative resources (Jabines and Inventor 2007; Sonke et al. 2015). Hence, they are less resilient.

The coastal village of Duljugan in Palompon belongs to the Eastern Visayas region which had a poverty incidence of 33.3 % in 2006. After typhoon Haiyan in November 2013, its poverty incidence increased to 39.3 % (NAPC 2016). That is, two in every 5 households fall below the poverty threshold. More than the occurrence of Haiyan as a sudden extreme event, women fish dryers continue to experience daily climatic variability which they describe as follows:

> “It is not the rainy season, yet it rains a lot.”
> “The weather is unpredictable. It suddenly rains even in summer.”
> “The rains and the sun have lost their normal paths.”
> “The rains and the sun have gone crazy and berserk.”

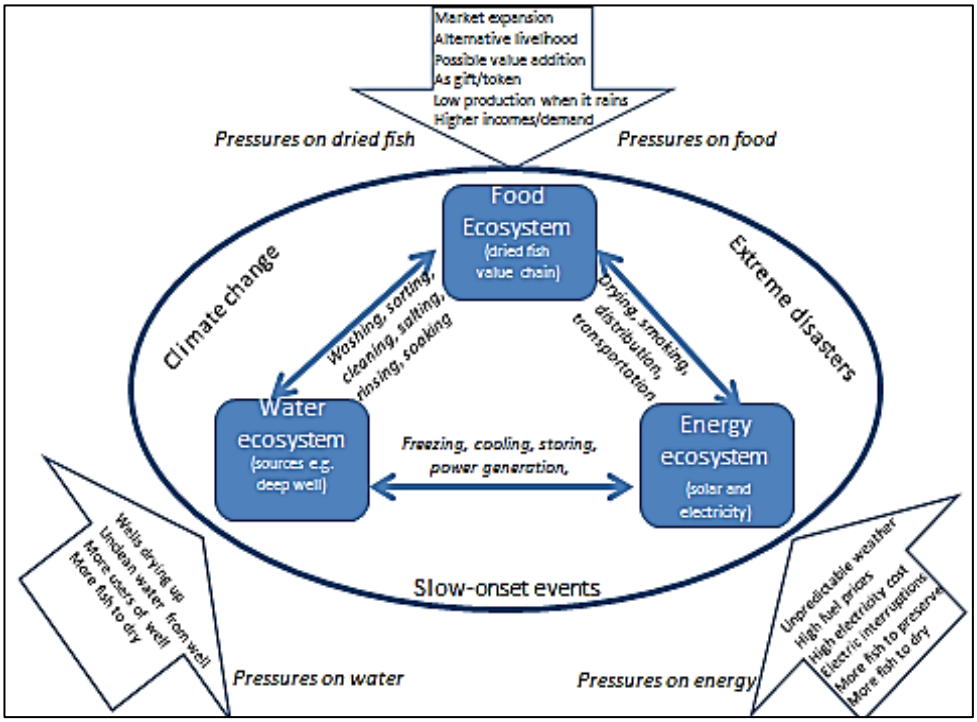
The effects on the volume of dried fish produced and, consequently, on the women’s cash incomes and their conribution to the family coffers are adverse. Since fish drying requires water as well as energy (solar and electricity), any pressure on these resources and/or limitations on their access pose challenges to the women who have been assigned, by social norms,

practices and cultural traditions, the task of drying fish. The dried fish food chain is weakened by the impact of climate changes since the water-energy-food ecosystem processes are disrupted.

Fish drying on a raised fine-meshed rack takes 4 hours under the sun. However, when the weather is cloudy, drying takes longer by 2-3 hours. When rain falls suddenly, the women have to gather the fish on the racks. Depending on the degree of dryness or moisture content of the fish as well as the anticipation of good weather later in the day, the women have options to take. When the fishes are almost dry, and the sun is no longer expected to shine during the rest of the day, the fishes are dried either by smoking or by air using an electric fan, both of which will require energy (Table 1).

Table 1. Water-energy-food nexus: Case of fish drying under the sun (Brgy Duljugan, Palompon, Leyte, Philippines)

Eco systems	Fish Drying Activities	Requirements
Water - energy ecosystems	Ice-making (Purpose: used to preserve fish when it cannot be spread to dry due to sudden rains and cloudy skies)	2 l of water to produce 7 ice blocks 5 h of electricity to convert water into ice inside the freezer 7 to 10 pcs of ice 15 kg^{-1} of fish placed in ice box
Water - food ecosystems	Cleaning fish for drying	12 l of water 15 kg^{-1} fresh fish
	Sorting fish for drying	12 l of water 15 kg^{-1} fresh fish
	Salting fish for drying	2 l of water 15 kg^{-1} fresh fish
	Washing fishing paraphernalia and fish drying tools	24 l of water
	Rinsing fish (which has started to dry) for re-salting to preserve it in times that it suddenly rains	12 l of water 15 kg^{-1} fresh fish
	Soaking fish in vinegar to lengthen shelf life and wait for the sun to come out again	2 l of water 15 kg^{-1} fresh fish
Energy - food ecosystem	Sun drying the fish	4 h (longer time to sun-dry on cloudy days: add 2 to 3 h)
	Electricity to fan-dry the fish when it rains	5 h
	Smoking the fish to dry on rainy days	3 to 6 h
	Kerosene lamp at sea	2 l kerosene
	Gasoline for the engine of fishing boats	4 l per short trip
	Operating generator sets when there is a black out	10 l gasoline



Source: Survey and FGD results, Brgy. Duljugan, Palompon, Philippines, 2013

Fig. 1. Water-Energy-Food Nexus in Fish Drying

The water-energy ecosystem processes make freezing, storing, cooling, and power generation possible, while the energy-food ecosystem processes take care of energy for the boat's engines used in fishing trips, the drying, smoking, distribution, and transportation when the fish is taken to the market (Fig. 1). The water-food ecosystem processes, on the other hand, deal with cleaning, washing, sorting, salting, rinsing, and soaking in order to produce dried fish. Frequent and higher intensity climate changes put more stresses on these ecosystems. Consequently, the women fish dryers' livelihoods are compromised.

Discussion and Conclusions

The Rio + 20 declaration, "The Future We Want," focuses on the need to address the core issues of food, water and energy security in ways that are least destructive to nature and biodiversity (Rasul 2014). With an increasing demand for food coupled with the adverse impact of climate change on limited resources, the critical role of water security and energy sufficiency in ensuring food supplies in the future cannot be undermined. The challenges that women

fish dryers face in food production revolve around the pressures on water and energy that arise from: (1) the impact of climate change, (2) the increasing demand for dried fish due to a bigger population and a higher capacity to buy and (3) the volume/proportion of the fish catch that fishers allocate for drying among other uses.

Firstly, because of climate change, the wells from where water is sourced to clean, rinse, wash and soak fish for drying are drying up due to increased usage for preparation of dried fish and also due to drought. Heavy rains, on the other hand, have made water from the wells unclean and murky. They have also caused production costs to increase since women fish dryers resort to alternative drying methods which require electricity, fuel, and gasoline. Interruptions in electricity supplies and the high cost of these energy supplies limit women's productivity. Dried fish production is low.

Secondly, the demand for dried fish has increased. The reasons include: a larger population with higher incomes, a preference for dried fish including the use of dried fish bought as a "pasalubong" (token/gift) item for guests. There has been market expansion outside the municipality of Palompon and value added to dried fish, for example through better packaging, which has enabled penetration into another sector of the market, so that fish drying has become an alternative source of income. This increase in demand has put pressure on scarce water resources. There are more users of wells, who compete with domestic users, for example mothers who must ensure adequate and regular water supplies for family consumption.

Finally, a larger fish catch means more fish to dry and more fish to preserve. This requires more water and more energy resources. This makes it imperative for women fish dryers to spend more time at work. After spreading the fish to dry on raised fine-meshed racks which have been improvised by the household, the woman does not have the option of engaging in other income-generating activities other than drying fish. Drying of fish is a demanding activity which warrants utmost attention and care from the woman fish dryer who has to be a keen observer of changes in the climate, for example a sudden spurt of unprecedented weather events such as rainfall or sunshine.

Women fish dryers need to close the knowledge gaps in the WEF nexus. Fish drying is an energy-intensive production activity, yet the women whose lives revolve around fish drying are in energy-deficient coastal communities. Today, the method of dried fish production is highly dependent on the sun. Clean water supplies are inadequate. Incomes are not maximized due to the impact of climate variability on water and energy. It is imperative, therefore, to seriously consider wastewater management before wells dry up. Moreover, spoilage of fish that cannot be dried due to the unpredictable rains must be reduced by providing alternative gender-responsive technologies and/or common service facilities that will enable women fish dryers to benefit.

At the core of the matter is the need to make stakeholders recognize the nexus and take proactive steps to make fish drying resilient to water and energy shortages that may be brought about by climate variability. However, there is a seeming lack of awareness and understanding on the importance of these interrelated and interweaving connections between the supply of water, the availability of energy (solar or electricity or fuel), and the capacity to sustain fish drying as a basic food source and as a primary source of women's incomes in coastal communities. With an integrated approach, some trade-offs may be possible. Sectoral issues must not be treated in isolation from the others. The issues are highly interlinked and the solution of one may even worsen the situation of the other (World Economic Forum 2011).

Women fish dryers will have to be engaged in the WEF nexus discourse and decision making. Developing a nexus lens will provide a framework for assessing the use of the limited resources, managing the interconnections and interdependence of these resources, and maximizing synergies in order to address the challenges facing sustainable livelihoods for women in the dried fish industry, as well as to contribute to the food security of the wider community. Awareness-raising activities for women fish dryers and their households are urgently needed. These could be spearheaded by the stakeholders involved, including academic researchers, the private sector, and development agencies.

On the policy side, a continuous effort is needed to make policy makers and planners appreciate the inclusion of the WEF nexus in governance. That is, to recognize that water, energy, and food (in this case, dried fish) are resources

that are essential to life, yet are finite, are not accessible to some people, and are getting scarce due to pressures from climate change and population increases.

A major step would be creating policies and draft plans that integrate climate, environment, socio-economics, and infrastructures (Wicaksono et al. 2017). This will require bio-physical perspectives together with economic modeling and simulations in order to more accurately determine the resource levels and interlinks vis-à-vis resource utilization rates under different climate variability conditions. In addition, a social network analysis and a gender-responsive set of WEF interventions are advocated to bring to the surface and address the gender differentials in parts of the fish drying value chain, i.e., roles, responsibilities, relationships, opportunities, constraints, and the impact of climate variability on women and men.

References

Bohra-Mishra, P., M. Oppenheimer, R. Cai, S. Feng and R. Licker. 2016. Climate variability and migration in the Philippines. Population and Environment, Springerlink.com. http://download.springer.com/static/pdf/ Accessed 16 March 2017.

Jabines, A. and J. Inventor. 2007. The Philippines: A climate hotspot (Climate Change Impacts and the Philippines). http://www.greenpeace.org/seasia/ph/Global/seasia/report/2007/4/the-philippines-a-climate-hot.pdf. Accessed 10 December 2015.

Liu, Q. 2016. Interlinking climate change with water-energy-food nexus and related ecosystem processes in California case studies. Ecological Processes. Springer Open. https://ecologicalprocesses.springeropen.com/articles/10.1186/s13717-016-0058-0. Accessed 6 January 2017.

NAPC (National Anti-Poverty Commission). 2016. Poverty incidence: Eastern Visayas, 39.3 %. http://napc.gov.ph/articles/poverty-incidence-eastern-visayas-393. Accessed 19 January 2017.

Rasul, G. 2014. Food, water and energy security in South Asia: A nexus perspective from the Hindu Kush Himalayan Region. Environmental Science and Policy 39. http://www.elsevier.com/locate/envsci. Accessed 8 June 2017.

Sonke, K., L. Dorsch and L. Fischer. 2015. Global climate risk index 2016. German Watch. http://www.gemanwatch.org/en/cri. Accessed 18 November 2016.

UN Women Watch. 2009. Women, gender equality and climate change. Factsheet. http://www.un.org/womenwatch/feature/climate_change/ Accessed 18 November 2016.

Wicaksono, A., G. Jeong and D. Kang. 2017. Water, energy and food nexus: Review of global implementation and simulation model development. Water Policy 19. http://wp.iwaponline.com/content/ppiwawaterpol/19/3/440.full.pdf. Accessed 6 August 2017.

World Economic Forum. 2011. Water security. The Water- food-energy-climate Nexus.http://www3.weforum.org/docs/WEF_WI_WaterSecurity_WaterFoodEnergyClimateNexus_2011.pdf. Accessed 8 June 2017.

Gender in Aquaculture and Fisheries: Engendering Security in Fisheries and Aquaculture
*Asian Fisheries Science Special Issue **30S** (2017): 231-244*

ISSN 0116-6514
https://doi.org/10.33997/j.afs.2017.30.S1.012

Short Communication

Roles of Men and Women in Sergestid Shrimp (*Acetes* spp.) Value Chain in Oton and Tigbauan, Iloilo Province, Philippines

MYRA MARIE B. IGUBAN*, JUNAUELLE KYLA B. ANDRES and ALICE JOAN G. FERRER

Division of Social Sciences, University of the Philippines Visayas, Miagao, 5023, Iloilo, Philippines

Abstract

This paper describes the roles of men and women in the sergestid shrimp (*Acetes* spp.) value chain to provide a better view of the industry in Oton and Tigbauan, Iloilo, Philippines. The qualitative and quantitative data used came from interviews of 16 women and 21 men that comprise 46 % of the total number of 80 main players in the study sites. These were supplemented by key informant interviews and a focus group discussion. Results show that if the value chain is examined, the sergestid shrimp industry turns out to be a sphere of both women and men. While certain activities are more commonly undertaken by men, others are dominated by women. Although few women were involved in the capture segment, more women were in the processing and trading segments. Women and men both contribute to the sergestid shrimp industry and play important roles in addressing poverty and food security issues in the area.

Introduction

The Philippines, an archipelago of 7,641 islands, has a land area of 343,448 km^2 and vast territorial waters of about 2.2 m. Fisheries is an important sector that provides food, livelihood, and income to more than 100 million population, half of which resides in the coastal areas. The country has been one

* Corresponding author. Email address: mm_iguban@yahoo.com

of the top fish producers in the world. In 2013, the country's production of 4.7 million metric tonnes constituted 2.46 % of the total world production and ranked the country 7th among the top fish producing countries in the world (Bureau of Fisheries and Aquatic Resources, 2014). In 2014, the fishing industry contributed 19.6 % of the total Gross Value Added (GVA) in agriculture and 1.8 % in the total Gross Domestic Product (Philippine Statistics Authority 2015).

In particular, the catching of wild small shrimp or sergestid shrimp (*Acetes* spp.) is an important local industry in the coastal municipalities of Oton and Tigbauan in southern Iloilo, Philippines. Sergestid shrimp (locally known as 'hipon') occur in abundance in the territorial waters of these municipalities in the months of December to May. The sergestid shrimps are small (with a maximum size of 30 mm), planktonic, nearly transparent shrimps that swim in enormous numbers in the water column (Dore and Frimodt 1987). Most of the catch are processed into either sun-dried shrimps (locally called "kalkag"), shrimp paste (locally called "ginamos") or mixed with juvenile fishes to be salted and fermented into "tinabal" (Bagarinao 2008). These products are sold locally or shipped to big cities of Cebu and Manila, and abroad.

The commercial exploitation of sergestid shrimp in the area started in 1950s and it has thrived through the years. It has been an important source of livelihood in the coastal barangays of Tigbauan and Oton, particularly to shrimp catching operators and the crew, the processors, and the traders. Shrimp catching was found to be highly profitable either using filter nets (locally called "saluran", "saludan", or "tangab") or skimming or push nets (locally called "sungkit") (Ferrer et al. 2004). Bagarinao (2008) estimated that more than 500 coastal households in Tigbauan were dependent on this industry. No current official record is available on how many households are dependent on this industry but local fishery managers estimated that more than half of the population in the 3 coastal barangays in Tigbauan are currently dependent on this industry for food, income, and livelihood.

The local shrimp industry is under threat by declining catch caused by a number of factors from overfishing to climate change, which has implications for the livelihood and food security of households dependent on the resource. In Oton, the recorded catch was 246.92 metric tonnes of sergestid shrimps during

the years 2009 to 2010 and 131.76 metric tonnes during the years 2010 to 2011 (Burgos 2011). These catch volumes had an estimated value of P 5.7 million and P 3.3 million, respectively. In Tigbauan, the total catch of sergestid shrimps recorded in 2010 was 90.13 metric tons (estimated value of P 2.07 million), in 2011 was 81.85 metric tonnes (estimated value of P 1.9 million), and in 2012 was 79.55 metric tonnes (estimated value of P 1.91 million) (Tigbauan Municipal Agricultural Office 2013).

Available studies on sergestid shrimp in the study sites were on fishing gear that catches this shrimp (Bagarinao 2008; Monteclaro and Abunal 2014), profitability of the shrimp catching (Ferrer et al. 2004), training on processing (Baylon 2007), and on governance and management (Burgos 2011; Espectato et al. 2012). This paper focused on the roles and responsibilites of the men and women in the local shrimp industry of Oton and Tigbauan. An attempt was made to show the number, roles, and responsibilities of men and women in the value chain of sergestid shrimp catching, trading, and processing. Gender lens and value chain approaches were chosen to see how the roles changed in each segment of the chain to provide a better view of this local industry (Williams 2008). The main purpose was to have a good understanding of the issues in the local shrimp industry and to contribute information in the design and selection of a responsive and appropriate action such as the development of gender sensitive local policies and planning that can help both men and women in the sergestid shrimp industry.

Methodology

The data for this paper came from a bigger study on value chain analysis of sergestid shrimp in the adjacent municipalities of Oton and Tigbauan (Fig. 1). It involved both qualitative and quantitative data. Data were collected through personal interviews of 37 players in the industry (46 % out of 80 identified players) using pilot-tested interview schedules. These included interviews of 14 shrimp catching operators (12 men and 2 women) (33 % of the 42 shrimp catching operators in the area); 2 commission men (out of 3 commission men operating in the area), 9 raw shrimp traders (8 women and 1 man; 39 % out of 23 raw shrimp traders in the area) and all of the 11 shrimp processors (6 men and 5 women). Interviews of 4 fisheries managers (all men) and a focus group discussion (FGD) with 8 residents (5 women and 3 men) who

were long time shrimp catchers, processors, and traders supplemented the interview data. The interviews were conducted in January to March 2014, while the FGD was conducted in May 2016.

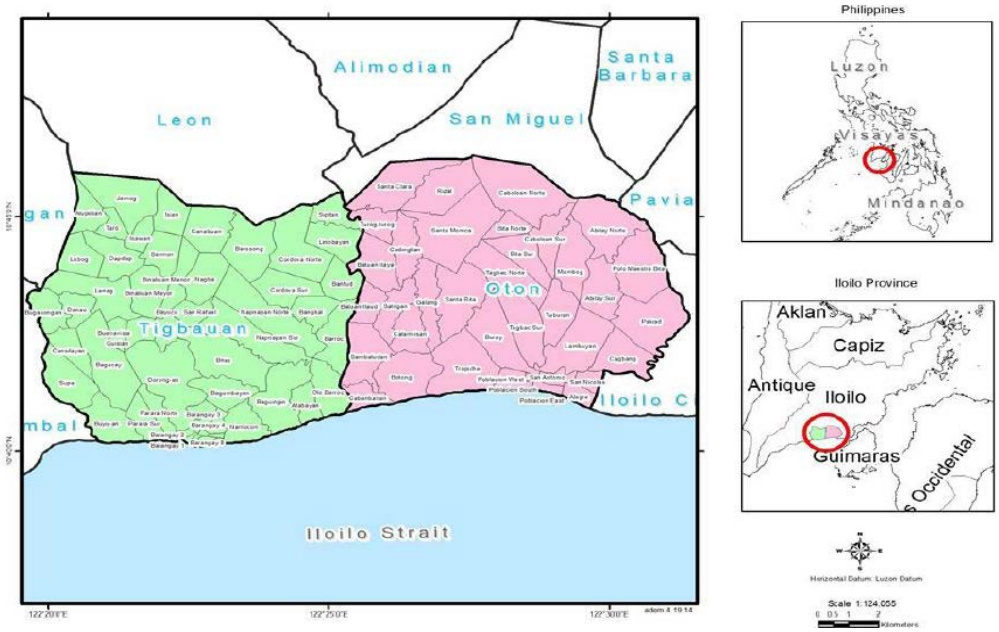


Fig. 1. The study sites: Municipalities of Oton and Tigbauan, Iloilo, Philippines

Results

The Sergestid Shrimp Value Chain

The shrimp undergoes transformations and changes in value as it moves from catching to processing or trading until the final consumer is reached. A number of players were involved in these shrimp value chain in Oton and Tigbauan (Fig. 2).

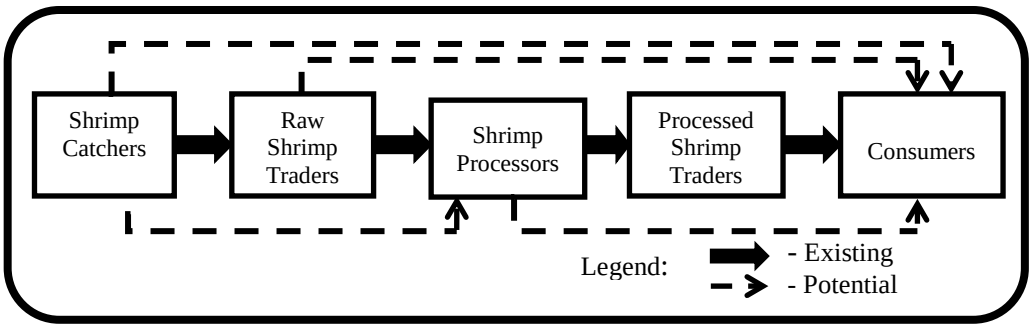


Fig. 2. The players in the value chain of sergisted shrimp in Oton and Tigbauan.

They were the shrimp catchers, the fresh or raw shrimp traders, the processors, and the processed shrimp traders. Table 1 shows the 37 study participants interviewed and the main role they played in the shrimp value chain. An individual, however, had several roles played such as a catcher and processor, or catcher and trader, or processor-trader.

Table 1. Number of players, the study participants and their hired workers

	Shrimp catching operators	Commission persons	Raw Shrimp Traders	Shrimp Product Trader	Shrimp Processors/ traders	All
All players*	42	3	23	1	11	80
All study participants	14	2	9	1	11	37
Women	2	0	8	1	5	16
Workers**	98	16	10	3	53	183
Women	3 (3 %)	11 (42 %)			16 (29 %)	30 (16 %)

*based on the list provided by the local fisheries managers. During the period of field data collection, a number were not available, while others have temporarily stopped operation. **hired workers of the study participants

Shrimp Catching

The two main gears in shrimp catching were the filter bag net (saludan/tangab) and the motor-operated skimming net (sungkit). The filter bag nets were stationary nets, which were set or moved against the currents in order to catch shrimp while the skimming nets were active fishing gears composed of a big triangular net and a motor-driven boat designed to catch shrimp. “Sungkit” operation depended on the weather while “saludan” operation depended on the tide of the waters.

Shrimp catching operation mostly involved men and a few women. The 14 shrimp catching operators (12 men, 2 women) in the study were the owners of the fishing vessels, gears, and other capital investments. They provided operation inputs but did not participate in the actual shrimp catching operation.

The 14 shrimp catching operators had 98 workers, where 3 were women who worked as crew members (locally called “boso”) (Table 2). These 3 women aged 19, 20, and 46 years old were all paid family members. The rest

were men, aged between 18-63, who were the boat captain (maestro), machinist, crew members (boso), and helpers (non-regular worker, locally called "bayog"). The payment to labor was a share after deducting operation cost (rental fee, storage fee, landing fee, handling fee, and fuel costs) and commission fees from sale. Men and women in the same position in the fishing crew received the same payment. The operators received weekly financial records from the commission men. Thus, the crew received payment on a weekly basis, at the minimum.

According to the study participants, men were preferred because shrimp catching requires strong muscle power, endurance and stamina in setting up and pulling up nets, loading and unloading shrimp in strainers or boxes, lifting and carrying heavy boxes, and repairing machines and nets. During the FGD and key informant interviews, however, it was emphasized, that the women, usually the operator or crew member's wife or daughter, were helping in net repair and in preparing the food and other provisions for the crew when they went out to catch shrimps. According to the catchers, the women were their source of strength, giving them support and "cheering" them in their work.

Table 2. Tasks Performed by Hired Men and Women in Shrimp Catching

	N = 98			
	Men		Women	
Tasks	*n* = 95	%	*n* = 3	%
Pulling the nets	89	93.68	1	33.33
Storing	81	85.26	3	100.00
Sorting	70	73.68	3	100.00
Unloading	52	54.74	1	33.33
Carrying	42	44.21	0	0. 00
Setting up nets	27	28.42	0	0. 00
Loading	32	33.68	0	0. 00
Sewing nets	28	29.47	0	0. 00
Looking for shrimp	25	26.32	0	0. 00
Repairing machines	20	21.05	1	33.33
Rowing the boat	14	14.74	0	0. 00
Assist in Selling	8	8.42	0	0. 00
Driving	2	2.11	0	0. 00

*Based on interview with 14 shrimp catching operators

Shrimp Trading

The shrimp traders were two commission men (locally called "komisyonista", they acted as the marketing agent of the shrimp catching operators), and 9 raw shrimp traders. 8 traders were women. According to the

key informants and FGD participants, the commission houses were named after the husbands. However, running the commission house was a family business where the wife and the children are helping. They added that most raw shrimp traders were women and their number increased with the opening of the commission houses in the middle of the 2000s. The women-traders purchased shrimp for selling in nearby barangays and municipalities (i.e., retailers). Others delivered the shrimp to restaurants and food establishments in the city, about 20 km away (i.e., wholesalers selling to institutional buyers).

Most of the catch were landed in the commission houses; two commission houses in Tigbauan while one in Oton. If the catch in Oton waters was less than 5 boxes (with capacity of 48 kg), then the catchers brought the catch to the commission house located near the boundary between the 2 municipalities. The commission men as marketing agents for the catch received a certain percentage (3 % to 5 %) of the sales in exchange for their labor. Both men and women were seen in the commission houses as early as two in the morning, waiting for the shrimp to be brought in by the catchers. Trading usually started as soon as boxes of fresh shrimps arrived.

The 2 commission men and 9 raw shrimp traders identified 26 workers, where 15 were men and 11 were women (Table 3). The 11 women were aged 15 to 53 years old and 3 were unpaid family labor. The 15 men aged 17 to 58 years and 3 were also unpaid family labor.

The men were involved in more activities than the women. The men were carrying or moving boxes of shrimps, loading and unloading shrimps in boxes, cleaning boxes or the selling area, selling or buying shrimps, record keeping, negotiating with price with the buyers/sellers, and driving.

Only 3 tasks were identified for the women: carrying or moving boxes of shrimps, selling or buying shrimps, and record keeping. The 2 women identified doing record keeping were workers in the commission houses. These women were in-charged of listing purchases and sales, other record keeping tasks, and receiving payments. The men in commission houses were in-charged of receiving the boxes, negotiating with the buyers and in releasing the shrimps to buyers. According to a key informant, the involvement of women in trading at the commission houses started only when the two commission houses became

operational in the second half of 2000s. The men were preferred as hired help because the work involves the lifting of heavy boxes of shrimp.

Table 3. Tasks Performed by Hired Men and Women of the Commission Men and Raw Shrimp Traders

Tasks	Men n = 15	Women n = 11	All N=26
Carrying/moving boxes of shrimp	9	6	15
Loading shrimp	9	0	9
Cleaning boxes/area	9	0	9
Unloading shrimp	8	0	8
Assist in selling/purchasing	6	8	14
Listing/Record keeping (office)	4	2	6
Negotiating Price	4	0	4
Driving	2	0	2

*based on interview with 2 Commission Men and 9 Raw Shrimp Traders.

Shrimp Processing

Shrimps were transformed into shrimp paste (*guinam*os), dried shrimp (*kalkag*), and shrimp crackers. These products were then sold in various markets and even exported outside the country. The processors were visited by buyers from outside of the area who placed their orders. The shrimp products were promoted under the One Town, One Product (OTOP) program of the municipality, which boosted its sales.

Table 4. Tasks Performed by Hired Men and Women in Shrimp Processing

	N = 56			
	Men		Women	
Tasks	n = 40	%	n = 16	%
Mixing	27	67.50	5	31.25
Drying	25	62.50	9	56.25
Salting	22	55.00	6	37.50
Pounding	21	52.50	5	31.25
Tasting	15	37.50	7	43.75
Purchasing	9	22.50	6	37.50
"*Linas*" (crushing and mixing the shrimp using the feet)	9	22.50	0	0.00
Others	8	20.00	1	6.25
Delivery	7	17.50	6	37.50
Selling	3	7.50	7	43.75
Buying the ingredients	3	7.50	9	56.25
Carrying	2	5.00	1	6.25

*Based on interview with the 11 shrimp processors

Processing involved both men and women. Out of the 11 processors interviewed, five were women. They had 56 hired help composed of 16 women and 40 men (Table 4). The women workers were aged 16 to 66 years old, including paid and unpaid family members. More men (aged 20 to 71 years old) were hired to perform the more strenuous work involved in shrimp processing. Men and women received the same pay for the same work.

In making shrimp paste, more men were hired to dry, pound, mix, put salt, store, and transport the shrimp product. The pounding and mixing were described as a very tiresome process requiring leg muscle power as the shrimps were crushed and mixed by the feet. There were different kinds of shrimp paste such as "binisya", "pintal", "semi-pintal", "tinabal", and cooked in different flavors like sweet, sweet and spicy, and hot and spicy. The women dominated the cooking of shrimp paste and the purchasing of ingredients and other materials used in processing.

Meanwhile, most of the activities involved in dried shrimp making involved the men and women. The women were more involved in arranging and sorting the shrimps on the drying platforms and in monitoring them during the drying period. The men were involved in carrying the boxes of fresh shrimp to the drying area and in storing them.

Only women made shrimp crackers. In making shrimp crackers, dried shrimp were blended with flour, flattened, and shaped. According to the study participants, their shrimp crackers were not "perfect" but were already sold in the tourism office of Tigbauan.

The skills in shrimp processing were acquired through experience and formal training. In the 1980s, a training in shrimp paste making had 7 participants only: 5 women and 2 men. The training on shrimp cracking making in 2012 and 2015 were attended only by women.

Discussion

Beginning in the 1950s, the sergestid shrimp industry in Oton and Tigbauan has become an important source of food, livelihood, and income for a number of people including the shrimp catching operators and their crew,

traders and their workers, and the processors and their workers. The industry thrived but currently faces the challenge of declining catch, which has serious implications for the livelihood of men and women in this local industry.

It appears that the shrimp industry was a men's sphere, where more men were identified to be actively engaged as owners or members of the shrimp catching operation crew. This result would be in support of the past studies where women in fishing communities were less engaged in productive work but were generally responsible for housework (Rola 1995; Santiago 2008; Parks et al. 2014).

If the analysis did not take the value chain approach and stopped at the catching segment, then this is true. Often, the individuals or the groups that undertake the actual production activities (e.g., going out at sea to catch shrimp) are considered as the fishers. This perception can have implications for the targeting of interventions, which in turn, may have the effect of excluding other actors like the women in the production process because their main roles fall in the other segment of the value chain. The prevalence of this perception and its inability to reflect the diversity and interdependencies of men's and women's activities underscore the importance of undertaking a value chain and gender analysis of the industry.

2 women showed that they were as capable as the men to be shrimp catching operators who can manage and finance the shrimp catching operation. According to the study participants, the preference for men workers in shrimp catching was related to the physical strength requirement of setting and pulling nets, lifting and carrying heavy boxes, and other tasks. The three women crew members, however, showed that they were able to perform the tasks done by men crew members. Moreover, the work of the operator or crew member's wife or daughter (i.e., help in repairing the nets and in preparing the food and other provisions for the crew when they went out to catch shrimps) can be easily underreported or underacknowleged.

A number of studies showed evidence of women actively taking part in actual catching of fish in the municipal waters in the country (Israel-Sobritchea 1992; Jimenez 2004; de la Cruz 2005; Asian Development Bank 2013; Ferrer et al. 2014). Moreover, there were indications that there were certain tasks

performed by women that were overlooked or underacknowledged. The FGD participants mentioned that women actually help their husbands in repairing the nets and in preparing for the provisions of the crew. These were in line with the findings of past studies (Bañez-Sumagaysay 2004, 2005; D'Agnes et al. 2005) where the women's participation was viewed as a "helping-out" role, undertaken part-time and without payment; women's work was considered an appendage to men's main tasks.

The picture shifted when moving to the trading phase, where the women dominated as traders. Most of the women traders were wives of the shrimp catching crew members. As shown in other studies, women dominated trading because this involved negotiation and verbal skills, which according to men, the women were good at (Ferrer et al. 2013). According to a key informant, the income of women traders was usually higher and certain compared to the income received by members of the shrimp catching crew. Income in shrimp catching was dependent on the volume of catch (affected by weather and other factors), price (set by the market), and the sharing system between the crew and the operators. In shrimp trading, earnings were assured and the level was dependent on the negotiating skill of the trader, amount sold, and time and effort spent on selling. In this case, women traders significantly contributed in the household economy and food security.

It appeared that the most powerful players in the local shrimp industry in the study sites were the 3 commission men. Most of the catch landed in only 4 commission houses owned by the 3 commission men. This made the fresh sergestid shrimp market an oligopoly with the 3 commission men as price leaders. They determined the price of the fresh shrimp sold to lower level traders (wholesalers and retailers), processors, and consumers. It was emphasized that these commission houses, although in the name of the husband, were run as a family business, with the wife and children helping.

In processing, men and women were owners of processing businesses. There were, however, more men workers because of the dominance of making of shrimp paste over other processed forms of shrimps. Physical strength and leg work were required in the mixing of the dried shrimps, which were expected of the men. Women's role was in the cooking of the shrimp paste and shrimp crackers.

Conclusions

The fisheries or the sergestid shrimp industry, in particular, has long been perceived as a male sphere as focus has been primarily on the actual catching, rather than the chain of activities involved. If the value chain is examined, the sergestid shrimp industry turns out to be a sphere of both women and men. While certain activities are more commonly undertaken by men, others are dominated by women. Although few women are involved in the catching operation, many of them are in the processing and trading. The notion that women participate minimally in fisheries economies as they focus on their reproductive roles at home does not hold true in the case of sergestid shrimp industry in the 2 study sites. Women are actively involved in a number of activities either as main actor in the value chain or a complement to men's labor in other segments.

The study shows that any development interventions in the local shrimp industry requires a contextualized understanding of men's and women's labor allocation and nature of involvement if interventions are to be more effective in targeting them for support. Gender analysis can aid in making interventions more inclusive by ensuring that the key players in the local shrimp industry are identified, their roles understood, and the target outcomes of a project are more suitable to their needs.

Acknowledgements

The support of the local government of Tigbauan and Oton headed by their local chief executives, Mayor Suzette T. Alquisada and Mayor Vicente B. Flores, is gratefully acknowledged. Special thanks to Mr. Ariel Tentia, Mr. Roel Burgos, Mr. Alan Dino Moscoso for the help; to Punong Barangays Rodolfo Tilano, Thomas Camiña, and Nestor Muñez and Kagawad Ranil Tejero for the assistance during the fieldwork; and, most of all to the study participants for their time and information shared.

References

Asian Development Bank. 2013. Gender equality and food security—Women's empowerment as a tool against hunger.Asian Development Bank, Mandaluyong City, Philippines. 114 pp.

Bagarinao, T. U. 2008. The filter net [tangab] fishery in Iloilo Strait, Philippines: Food and livelihood for coastal communities in the midst of waste of non-target fishery resources. Fish for the People 6: 42-47.

Bañez-Sumagaysay, M. 2004.Working wives in Philippine coastal fisheries. In global symposium on gender and fisheries: Seventh Asian Fisheries Forum.(eds. Choo, P.S., S.J. Hall and M.J. Williams), pp.113-123. WorldFish Center, Penang, Malaysia.

Bañez-Sumagaysay, M. 2005. Gender stratification in fish production systems: Women do have economic power. In Proceedings of the Third Conference on Gender and Fisheries (Assessing Gain, Negotiating Challenges in Gender and Fisheries Development. September 29-30, 2005. UP Visayas, Iloilo City. Organized by The National Network on Women in Fisheries in the Philippines, Inc (NNWFPI).12 pp.

Baylon, C.C. 2007. Micro-enterprise development in selected fishing communities in the province of Iloilo, Philippines. In Conference Paper (17).18 pp. http://pubs.iclarm.net/resource_centre/WF_37460.pdf. Accessed 16 August 2016.

BFAR (Bureau of Fisheries and Aquatic Resources). 2014. Philippine Fisheries Profile 2014. BFAR, Quezon City, Philippines. 36 pp.

Burgos, R. 2011. Governance in the sergested shrimp (*Acetes* spp.) industry Philippines: The case of Oton, Iloilo. Institute of Fisheries Policy and Development Studies, College of Fisheries and Ocean Sciences. University of the Philippines Visayas. 20 pp.

D'Agnes, H., J. Castro, L. D'Agnes and R. Montebon. 2005. Gender issues within the population-environment Nexus in Philippine Coastal Areas. Coastal Management Journal 33: 1-18.

de la Cruz, M.T. 2005. Women are fishers too. Profile of women fishers in Eastern Samar, Philippines. Proceedings of the third conference on gender and fisheries.Organised by The National Network on Women in Fisheries in the Philippines Inc. (NNWFPI).UP Visayas, Iloilo City. 9 pp.

Dore, I. and C. Frimodt. 1987. An illustrated guide to shrimp of the world. Osprey Books,Huntington, New York. 229 pp.

Espectato, L.N., R.P Napata and G.D Serofia. 2012. A unified fisheries ordinance for effective resource management in Southern Iloilo, Philippines. Journal of Environmental Science and Management 15: 40-51

Ferrer, J.C., M. L. Perez, A.T. Roxas and E. M. Avila. 2014. Expanding roles of men and women in aquatic agricultural systems in the Philippines. Asian Fisheries Science 27S: 166-175.

Ferrer, A.J.G., M. A. Maroliña and Y. Tampos. 2004. Profitability of Sergisted Shrimp (Acetes spp.) catching using saludan and sungkit in Tigbauan, Iloilo.Danyag. UP Visayas Journal of Social Sciences and Humanities 7: 19-33.

Ferrer, A.J.G., A.T. Roxas and E. M. Avila. 2013. Trends affecting the development challenges in Philippine fisheries and agriculture: Opportunities for growth and development. Research Paper. AAS PH-2013-TP-003. CGIAR Research Program on Aquatic Agricultural Systems. Penang, Malaysia. 25 pp.

Israel-Sobritchea, C. 1992. An anthropological study of economic change, gender and power in a Visayan fishing community.Condensed from the paper read during the 4th Philippine Studies International Conference held at the Australian National University, Canberra, Australia.15 pp.

Jimenez, C.N. 2004. Understanding the role of gender in fishing community development. Danyag, UP Visayas Journal of Humanities and Social Sciences 8:66-68.

Monteclaro, H.M. and E.P Abunal. 2014. Catch rates and composition of the beach seine fishery in Northern Panay Gulf, Philippines: Implications for management. Philippine Journal of Natural Sciences 18:1-10.

Parks, M. H., M. E. Christie and I. Bagares. 2015. Gender and conservation agriculture: Constraints and opportunities in the Philippines. GeoJournal DOI 10.1007/s10708-014-9523-4.

Philippine Statistics Authority. 2015. Philippine Statistics Authority Conducts Quarterly Commercial and Municipal/Inland Fisheries Surveys. http://nap.psa.gov.ph/pressreleases/2015/PR-CTCO-SS-201507-02_fisheries.asp. Accessed 15 October 2016.

Rola, M.F. 1995. The role of women in upland farming systems: A case study of a Philippine village. In: Proceedings of a Workshop: Women in Upland Agriculture in Asia, CGPRT Centre – Regional Co-ordination Center for Research and Development of Coarse Grains, Pulses, Roots and Tuber Crops in Humid Tropics of Asia and the Pacific.(eds.van Santen, C.E, J.W.T. Bottema, and D.R. Stoltz), pp. 251-258.Chiang Mai, Thailand.

Santiago, C. 2008. Philippines: Country gender profile. http://www.jica.go.jp/activities/issues/gender/pdf/j03phi.pdf. Accessed August 30, 2016

Williams, M.J. 2008. Why look at fisheries through a gender lens? Development 51:181-185.

Gender in Aquaculture and Fisheries: Engendering Security in Fisheries and Aquaculture
*Asian Fisheries Science Special Issue **30S** (2017): 245-264*

ISSN 0116-6514
https://doi.org/10.33997/j.afs.2017.30.S1.013

Short Communication

Gendered Participation in Seaweed Production - Examples from Indonesia

RIA FITRIANA*

Independent Consultant for Coastal and Marine Resource Management, Gardenia Boulevard, Jl. Warung Jati No 12, Jakarta, Indonesia.

Abstract

Despite the significant presence of women in seaweed production in Indonesia, most of the data collected in official statistics fail to capture their participation. These data gaps reinforce the policy neglect of gender issues in seaweed culture that also affects strategy to increase seaweed production and quality. This study examines the role of women and men in seaweed production in Nusa Tenggara Timur Province, Indonesia. The case study took place in three districts (Alor, Rote and Kupang districts) which represent the production area of seaweed in Nusa Tenggara Timur (NTT). The study presents the different characteristics of producers, including their socio-economic classes, and ethnic groups. A value chain analysis was used to provide insights and to help develop strategies to improve women's contributions to increasing seaweed production. The results demonstrate that men and women contribute similar amounts of labour to most processes in seaweed production in NTT. Therefore, to address issues of improving production and quality, women and men farmers need comprehensive basic and upgraded skills to reduce post-harvest losses. The involvement of both genders in seaweed farming needs recognition and both need to be taken seriously in the planning, and implementation of initiatives in order to improve production and quality.

Introduction

Seaweed is globally traded, used and consumed. Much of it is produced by rural villagers in remote areas, processed by companies in other places or countries, for example in China, Philippines, Spain, Japan, USA and Denmark, and consumed all over the world in end products such as tooth paste, capsules, cosmetic products, processed meat, dairy products, water gels, soft candy, pet

*Corresponding author. Email address: rfitriana@gmail.com

food among others. In 2014, the worldwide culture of seaweed reached 27 million tonnes (FAO 2016). Cultured seaweeds are mainly those that produce carrageenan (*Kappaphycus alvarezii* (Doty) Doty ex P.C.Silva 1996, and *Eucheuma* spp. - 10.9 million tonnes), followed by the alginate-producing brown seaweeds (kelps – 7.6 million tonnes) (FAO 2016). Indonesia is one of the major producers of cultured seaweed.

In Indonesia, seaweed production increased from 2002 to 2014. The production reached more than 10 million tonnes in 2014, and contributes 70 % of mariculture production by volume (MMAF 2015). In 2014, more than 70 % of seaweed production was for export and 29 % was absorbed by national industries (Ministry of Industry 2016). This production increased gradually and the target for seaweed production in Indonesia is 19.5 million tonnes by 2019 (MMAF 2016a). The government of Indonesia supported 3,000 seaweed seedlings farm units in 2016 and planned to support 500 packages for seaweed farming development in 2017 (MMAF 2016b). The government also plans to continue to support seaweed farming. Many private sector companies and NGOs also provide support to increase seaweed production. All of these interventions need to carefully consider the beneficiaries. This paper presents an insight into the actors, their roles and relationships under this trend of increasing production and support. The objective of the study is to contribute to initiatives for selecting the beneficiaries and strategies for approaching the potential beneficiaries in an effective way.

Seaweed farming is important for small scale farmers who live in remote areas and have few economic alternatives. A study in 6 major seaweed producer countries showed seaweed farming was a profitable business that contributed to family incomes (Valderrama et al. 2013). In Solomon Islands, the average annual cash income of seaweed producers was 52 % higher than non-seaweed farming families (Kronen et al. 2010). In Tanzania, the revenue from seaweed farming empowered women and helped family food security (Besta 2013). Phillips et al. (2016) found that a growing number of small producers were operating seaweed farms. In the Philippines, seaweed farming revenue increased the income of the communities (Alin et al. 2015; Espaldon et al. 2010). These studies showed that seaweed farming can be essential as a family's source of cash income.

To increase production and improve the quality of seaweed, farmers and supporters need to understand how the system works in seaweed farming. Opportunities to improve production and quality are in the hands of the actors, the relations among them, and the farming management skills. Any intervention needs to recognize the key actors if it is to be effective. The aim of this paper is to demonstrate the gender dimension of seaweed farming. The specific objectives are to: (1) to examine the role of women and men in seaweed production in NTT Province, Indonesia; and (2) identify the different characteristic of producers, including socio economic classes, and ethnic groups.

Materials and Methods

The study areas are in Nusa Tenggara Timur Province, Indonesia. Nusa Tenggara Timur (NTT) is the second largest producer of seaweed in Indonesia. In 2013, three provinces were large producers of seaweed: South Sulawesi that produced 2.3 million tonnes; East Nusa Tenggara that produced 1.8 million tonnes and Southeast Sulawesi that produced 9.17 million tonnes (MMAF 2015).

3 districts were selected as study areas in NTT province: Kupang, Alor, and Rote Ndao (Fig.1) 10 villages from which represented the center of seaweed production in NTT Province. Villages in the respective districts were: 4 villages in Alor District (Kabir, Blangmerang, Kayang and Marisa); 3 villages in Rote (Oeseli, Oenggaot and Daiama); and 3 villages in Kupang District (Onansila, Akle, Nakean).

In NTT, the characteristics of seaweed production are that it is located in small islands in remote areas that have poor infrastructure. The proportion of women in the population were: 48.8 % in Kupang District, 51.2 % in Alor and 49 % in Rote Ndao (Table 1). In all 3 districts, more than 20 % of the population were poor (Table 1), which was higher than the national level of 11 % (WFP 2015). NTT province is also vulnerable to food and nutrition insecurity, as indicated by the percentage of households with no access to drinking water, female illiteracy levels and the Human Development Index. The percentage of households with no access to drinking water in NTT is above the national percentage. Female illiteracy in Kupang was 12.35 % in 2015 followed

by Rote Ndao at 9.28 % and Alor 7.1 % (Table 1). The Human Development Index (HDI) was between 66 and 69 and was considered as average for NTT province.

Table 1. Characteristics of study area

Study area	Population Census in 2010	% of women in population	Poverty (%)*	Household with no access to drinking water (%)*	Female illiteracy (%)*	HDI in 2013 (BPS 2015)
Kupang District	321,384	48.8	20.26	36.44	12.35	66,74
Alor District	196,179	51.2	20.11	51.69	7.1	68,93
Rote Ndao District	127,911	49	28.25	34.50	9.28	67.7
NTT Province	4,683,827	50.3	20.24	44.2	11.31	68.77
Indonesia	183,931,945	49.7	10.96	34.4	8.6	73.81

* Source: WFP (2015)

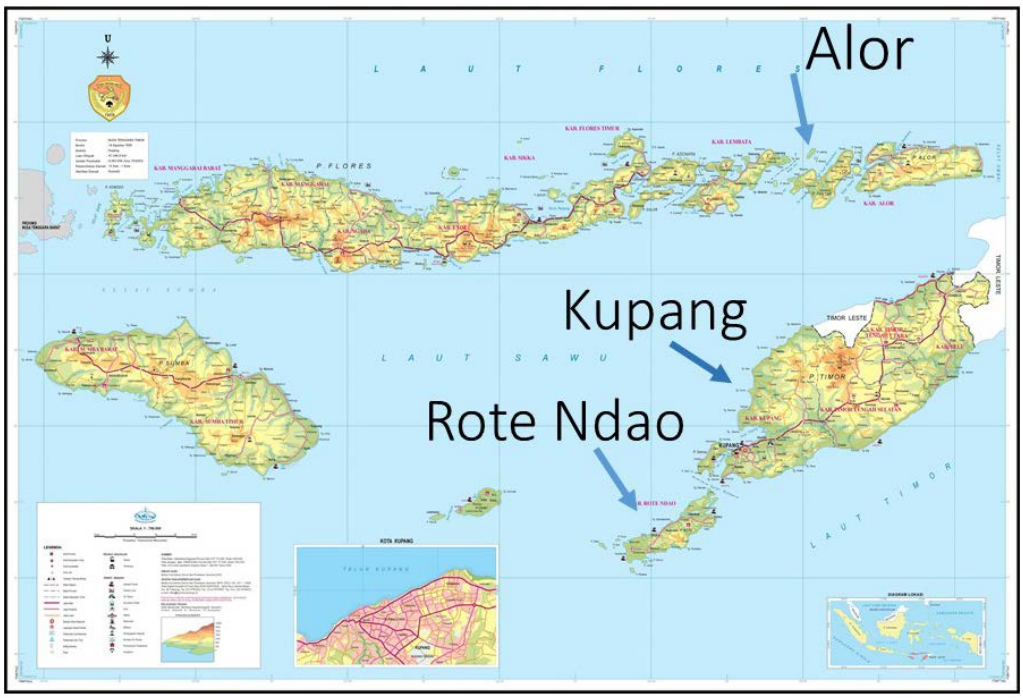


Fig. 1. Maps of study sites in Nusa Tenggara Timur Province, Indonesia

The author used elements from a value chain analysis (VCA) to understand the role of men and women in seaweed production and their relations to others. VCA is a tool to analyse how the market works, by identifying the core processes and full range of activities (e.g. production, processing, and distribution) conducted by actors and their relationships and the product values transferred along the chain as the product is brought to the final consumers (Kaplinsky and Morris 2001; M4P 2008; Hempel 2010). The VCA was combined with a gender division of labor approach to highlight the role, benefits and risks of women and men in seaweed farming (Choo et al. 2008; Harrison 2000; Kruijssen et al. 2013). Utilising the gender division of labor approach in VCA helps in understanding the constraints and identifying strategies to increase benefits and reduce the risks of each actor including men and women (Giuliani et al. 2005; Loc et al. 2010; Mitchell et al. 2011).

The study applied the following steps in mapping the value chains of seaweed from the study sites: (1) mapping the core process in farming activities; (2) describing the activities conducted by actors along the value chain, especially at producer level; and (3) identifying leading actors and the relationships between actors.

The data used in the present paper are a compilation from several works collected in different years. The data from Alor were collected as part of PhD research in 2009-2010; data collected in Kupang were part of a study of "Participatory Value Chain Analysis and Development Plan for Seaweed in Kabupaten, Kupang" in 2014; and the data collected in Rote were part of a study of "Sustainable Use of Marine Resources that Benefit People and Biodiversity in Rote Ndao" in 2015.

Data were collected through observation and discussion with producers, local traders and community leaders. The main data and information were collected through focus group discussions with producers. Only in Oenggaot and Daiama, Rote, data were collected through interviews with local leaders (Table 2). During focus group discussion at village level, several leading questions were used. It related to attributes along the chain such as activities, actors, and the relationship between actors. Information about activities related to what they did to get the best harvest, while information about actors identified the actors and with whom they did business. The relationships

between actors identified how each set of actors interacted, such as rules of agreement in business transactions, channels of information, and reward systems. Questions were also asked about challenges in the businesses. Further information was verified during the discussion and with key leaders.

At least one focus group discussion was conducted in each village, except in the cases of Oenggaot and Daiama where the information was gathered through interviews with local leaders (Table 2). The participants of the discussions were mainly farmers. Men farmers dominated the participation in the focus group discussions in all villages. This related to male domination in the public sphere; females were generally shyer than males when attending public meetings. The discussions were conducted in farming areas or in the village halls.

Table 2. Number of people involved for the discussion at village level and number of farmers

Sites	# of FGD	# of participants		No. of Farmers	Dominant ethnicity of farmers
		Male	Female		
Kupang*					
Onansila	2	32	4	100 households	Helong, Rote, Bajau
Akle	2	33	4	243 households	Helong, Rote
Nakean	2	35	18	72 households	Helong, Rote
Alor**					
LabuhanBajau	1	10	0	44 farmers	Alorese
Blangmerang	1	8	6	14 farmers	Bajau
Kayang	1	10	8	72 farmers	Alorese
Marisa	1	35	16	100 farmers	Alorese, Bajau
Rote Ndao***					
Oeseli	1	4	0	213 female; 184 male	Rote
Oenggaot	1	1	0	918 farmers	Rote
Daiama	1	1	0	800 farmers	Rote, Bajau
Total	13	169	56		

*Source: Fitriana (2014a), ** Source: Fitriana (2014b), *** Source: Fitriana (2015)

Based on the data collection, in Kupang district, the farmers in the study sites were identified as working in family businesses and, therefore, farmers were counted per household (Table 2). In a family business, the farm is owned by a family and the farming activities are conducted by family members. In Rote Ndao and Alor, on the other hand, individual women or men farmers were identified as the owners of seaweed farming and counted accordingly (Table 2). The dominant ethnicities of farmers in Kupang were Helong and Rote. In

general, these two ethnic groups live in the farming villages. In Onansila village, a group of Bajau also farmed seaweed. In Alor, the dominant ethnic seaweed farmers were Alorese and Bajau. In Rote, Rote people mostly farm seaweed, although a group of Bajau farmed in Daiama village.

Results

Seaweed Farming

The seaweed value chain includes: inputs, production, collection stage, intermediary trade that includes exporting to China or Philippines, processing, retailing and consumers. For this study, the scope only covers pre-farming, farming and post-harvest stages. Inputs at the beginning of the value chain provide supplies to farmers, such as ropes supplied by kiosk owners at the village level or credit by village collectors, seedlings gathered from neighbouring farmers, dugout canoes for harvesting, and equipment for sun-drying the seaweed. The dominant species farmed in these 3 districts were *Kappaphycus alvarezii* (Doty) Doty ex P.C. Silva 1996 and *Eucheuma* spp. Seedlings were mostly gathered from mature harvested plants. Farmers either buy or cut off their existing plants to become the seedlings for the next farming cycle or buy these from neighbouring seaweed growers. The participants of group discussions in Rote and Kupang considered they could maintain their seedlings now by keeping and harvesting about ten ropes of seaweed in 20 days and then culling the healthy branches of propagules and attaching them to new ropes. Farmers in Akle, Kupangand Marisa-Alor sourced seedlings locally as the waters in front of their village could be used for farming year round. Similarly, in Rote farmers had no difficulty in sourcing seedlings as they could farm and harvest all the year. Villagers in Nakean and Onansila (Kupang), however, had concerns about seedlings during the low season for farming. Similarly in Rote, Oeseli and Daiama (Rote Ndao) villagers could farm the whole year and had few problems with supplies of seedlings.

Ropes, important equipment for seedlings, could be gathered in the farmers' home villages and in the capital cities of each district. When the rope was provided by local traders, farmers had to sell the harvested seaweed to the local collectors. In special cases, the farmers could also sell to other collectors and had to pay after they received the cash from seaweed sales.

The farming methods included “long line” and “off bottom” methods. The use of long line term refers to a farming method that uses ropes floating in the water column. Meanwhile off bottom farming method uses ropes that are held near the surface of the seafloor. In one site, the farmers applied several methods (long line and off bottom) depending on the monsoon and tidal systems (Table 3). The average length of rope was about 50 m but the average varied from farmer to farmer. In Kupang District, in Onansila, farmers each had 36 ropes on average, in Akle 132 ropes, and in Nakean 135 ropes. In Rote, the average number of ropes per farmers were 80-90 ropes in Oeseli, 150 ropes in Oenggaot and 100 ropes in Daiama.

Table 3. Farming characteristics

Sites	Farming Method	Length of ropes	Average number of ropes/farmers	Best Harvest Season
Kupang				
Onansila*	long line	45 m	36 ropes	June to August
Akle*	long line	30-50 m	132	March to August high productivity season. Farm all the year
Nakean*	long line	35 m	135 ropes	March to May
Alor				
Blangmerang**	Off bottom, long line	50 m	-	January to May
LabuhanBajo**	Off bottom, long line	50 m	-	January to May
Kayang**	Long line	50 m	-	January to May
Marisa**	Long line	50 m	-	January to May
Rote Ndao				
Oeseli***	Off bottom, long line	35-50 m	80-90 ropes	Off bottom: November to March Long line: May to August
Oenggaot***	Off bottom but flexible	25-30 m	150 ropes	November to March
Daiama***	Long line	50 m	100 ropes	April–September: 3 times; Nov-Dec: 1 time; Jan-March: 1 time

* The asterisks refer to the sources of data as given in Table 2

The best farming season varied from area to area (Table 3). In Kupang, Onansila village experienced its best harvest season from June to August while villagers in Nakean experienced the best harvest season from March to May.

Akle village could farm all year, with high productivity from March to August. In Alor, the best harvest season was from January to May. In Rote District, seaweed had high productivity from November to March in Oeseli and Oenggaot. In Daiama village, villagers were able to farm 3 times between April and September.

The seedlings of seaweed were attached to the ropes (rope diameter 5-6 mm) using plastic rope or smaller size nylon rope (2 mm size). Having attached the seedlings to the rope, the ropes with attached seedlings were carried to the sea and attached to the main rope. The seaweed would be maintained by clearing the ropes from other algae or mud or re-tying seedlings that fell down. In many cases, the farmers let the seaweed grow with little maintenance, even though regular inspection and maintenance from planting to harvesting was crucial to ensure the plants were clear of sediment, diseased plants removed, branches growing well, lines and stakes were not broken or loose.

Seaweed was harvested approximately 45 days after ropes with seedlings were deployed. At high tide, the farmers harvested seaweed using dugout canoes, and, at low tide, by walking. One dugout canoe could carry only one or two lines. Seaweed was brought to the shore and untied. The untied seaweed was then sundried by spreading it on the rubble or plastic that lay on the ground or using “para-para” (bamboo racks). The sundrying process took 2-3 days depending on the availability of sunlight. Then, the seaweed was packed into a sack and sold to village traders or collectors.

The different ways of sundrying seaweed affected its quality. The use of *para-para* helped water to drain and kept the sundried seaweed clean from sand. When farmers sundried the seaweed on the rubble, they had to collect it carefully to avoid sand being collected.

In other areas in Indonesia, people sundry seaweed like drying clothes. This way, farmers do not have to untie it first and sundry. The hanging method helps water drain easily but the plastic rope is exposed directly to the sunlight, destroying its integrity. As some of the destroyed plastic rope could fall into the sack for sale, this reduced the purity of the product.

During the focus group discussion, we asked farmers why they still sundried on the ground although it allowed contamination. Farmers in Akle Kupang said they sundried on the ground only during times of high production when they lacked sufficient bamboo racks. Meanwhile farmers in Nakean and Onansila (Kupang) didn't realise the benefit of bamboo racks and kept the seaweed pure although dried on the ground. Also, bamboo racks meant additional investments. Considering the investment and quality tradeoffs, awareness raising initiative to improve the quality of seaweed by encouraging group efforts to build bambo racks is essential.

The village traders weighed the harvested and dried seaweed and paid the farmers in cash. Normally the village traders had the scales, and farmers accepted their accuracy. The village traders collected the seaweed from several points of sale and then the collectors transported it to a warehouse in Kupang, the capital city of NTT Province. The traders in Kupang randomly checked the quality of seaweed. They stored the sundried seaweed in a warehouse, waiting until the quantity was sufficient to be sent by container to, e.g., Surabaya. The traders gave new empty plastic sacks to village traders, replacing the sacks they collected.

Labour and gender participation

Seaweed farming was conducted by family members, including women, and men. The core processes in seaweed farming included providing inputs (seedlings and ropes), cleaning the ropes, tying seedlings to ropes, attaching these to the main rope sat sea, daily maintenance at sea, collecting fallen seaweed, harvesting, untying seaweed, sun drying, and selling it to traders.

In providing input (Table 4), men mostly obtained the inputs as this sometimes entailed travelling to other villages. In some cases, buyers provided inputs by agreements that farmers sell all of their harvest to the buyers. Men and women were involved in cleaning the ropes on land before the seedlings were attached. All members of the family helped in tying the seaweed seedlings to the ropes, although the women dominated this activity. The farmers considered this activity as "family work". Men would take the ropes with seaweed to sea by dugout canoe and attached the tied seaweed to the main ropes. The men were helped by their relatives or neighbouring farmers. The men checked and cleaned

the ropes daily. During harvest time, women collected fallen seaweed and untied the seaweed from the ropes. In Alor District, women dived to collect fallen seaweed, while, in Kupang and Rote, women collected seaweed along the coast. Other activities were conducted by both genders (Table 4). For selling to traders, women sold their seaweed if the trader was also a woman. This may have made them feel comfortable in dealing with the traders. Data shows that women and men contribute similar amounts of labour to most processes in seaweed production.

Table 4. Gender differentiation in Seaweed activities

Activities	Male	Female	Notes
Providing input (Seedlings, ties, ropes)	√	-	Find seedlings; mostly conducted by men as it required travelling to other villages
Clean the ropes	√	√	Men and women involved in cleaning the ropes before seedlings were tied
Tying seedlings to rope	√	√√	Family work, predominantly done by women. Sometimes children were involved.
Attach to the main rope in the sea	√√	√	Mainly conducted by men as they needed to attach ropes to the main ropes at sea. Women helped.
Daily maintenance in the sea	√	-	Seaweed left to grow but maintained by checking the ropes and cleaning them from other algae and mud.
Collect fallen seaweed	√	√√	Women mostly collected fallen seaweed. In Alor, women dived to collect fallen seaweed; in other areas women collected the fallen seaweed along the coast.
Harvest	√	√	Men harvested the seaweed at sea, using dugout canoes and bringing it to shore.
Untie seaweed	√	√√	Women mostly untied seaweed.
Sun-drying process	√	√	This was family work; once untied, seaweed was sundried on the rubble/plastic rack for two days. Dried seaweed was put into plastic sacks.
Selling to traders	√	√	Men normally dealt with local traders. If the local trader was a woman, the woman producer dealt with the woman trader.

Note: √= this gender does this activity
√√= more number of people in this gender do this activity

Working system and farming location

Different study areas had different working farm systems (Table 5). The working system was basically run by family members in Labuhan Bajo, Kayang and Marisa in Alor (Table 5). At times, the farmers worked in groups with their neighbouring farmers in Onansila, Akle in Kupang, Blangmerang in Alor and Daiama in Rote Ndao. In Kupang, farmers worked in groups during the tying and untying processes. The working system was called Madene, and members of the groups were normally relatives or friends whose farm locations were close to each other. About ten people worked together attaching the seaweed to ropes or during harvesting. No formal agreements existed. Assistance given was expected to be returned in kind. In most cases, people sat and worked together.

Table 5. Working system in seaweed farming

Kupang	
Onansila	Working in groups "Madene" for tying and untying the seaweed during post-harvest
Akle	Working in groups "Madene" for tying and untying. Members were those whose seaweed ropes was close to each other; helping was mutual.
Nakean	Hired people to tie the seaweed
Alor	
Blangmerang	Working in groups during tying process
LabuhanBajo	Family work
Kayang	Family work
Marisa	Family work
Rote	
Oeseli	Individual work
Oenggaot	Individual work, hired labour for tying seaweed
Daiama	Working in group during tying process

One person tied seedlings onto 4-5 ropes per day, with the rope about 40-50 m long. Ten people in a group could tie seaweed onto around 15-20 ropes per day, attach to each of 40-50 lengths of rope. At harvest, for the loop tied system which used nylon rope, the farmers, in a group, could release about 30 ropes each day, and 10 people could untie 15-20 ropes per day of plastic line as each of these had to be untied manually. In Nakean village Kupang district,

farmers hired others to help them in tying the seaweed, paying each person 1 USD for each rope. In Alor District, farmers consider seaweed farming family work and all members of the family were involved in the farming.

Where farming was considered family work, all members of a family, husband, wife, children and other relatives, conducted it and the family owned the farming enterprise. As a family owned business, the head of the household, the man, was considered as the farmer. Females were considered as supporting their husbands to conduct seaweed farming. This system applied in Kupang and Alor Districts. In Rote, seaweed farming was considered individual work and individuals owned and conducted the enterprises. Women and men (wife and husband) owned their seaweed farms separately and had different farm locations (e.g. Oeseli and Landu Island). During the tying process, however, they worked in groups as it was intensive labor.

The farming areas were open to anybody from within the village. The first person who farmed in a spot was considered the owner. Nobody could trespass on the farm of another community member. If someone did trespass, the neighbours would reproach him/her. If a seaweed farmer abandoned a farm, the site was still considered as his/her property. If another farmer planned to use the abandoned site, she/he needed to ask permission from the owner. If the farming area was beyond the village area, the farmers needed to ask permission from the village leader of that area. Having obtained permission, the villager could then go ahead with the farm. Although there was no formal marine tenure in Indonesia, the first person who farmed seaweed on a spot was considered the owner.

Farming sites were close to each other, and this enabled farmers to work together when intensive work was required, e.g., during tying. Conflicts over farming sites rarely occurred, but sometimes conflict happened over claims to fallen seaweed. Accusing someone of stealing from another farm could cause disputes among farmers. Therefore, farmers had to build trust among those farming nearby. Trust was built by working together, e.g., “Madene” in Kupang District helped to build trust as well as helping each other in seaweed farming.

Discussion

Seaweed farming is a prosperous industry for small scale coastal villagers. In eastern Indonesia, seaweed farming has become one of the main commodities and many people in remote and small islands depend on it. The present case study showed the extent to which women and men are involved in seaweed farming in NTT Province. Such participation also occurs in other provinces of Indonesia. For example, in South Sulawesi (Eranza et al. 2015), North Sulawesi (Crawford 2002), and Aceh (Jamandre et al. 2009). NTT province is the second largest contributor to seaweed production in Indonesia. NTT has a high rate of poverty (20 % of the total population) (WFP 2015). In 2013, seaweed has contributed 1.4 million USD to the economy of NTT Province, based on calculations of production and the price in local trades. Seaweed has rapidly emerged as a major cash mariculture in NTT Province.

Seaweed is a productive activity as a family business and the farmers benefit economically. The farmers, either men or women, earn cash and use it for their daily family expenses. During focus group discussions, the participants in the 3 sites told how seaweed farming gave them extra income for renovating their houses, buying motorbikes, in addition to other daily expenses. Women used the extra money for daily expenses, whereas men used their extra money for bigger investments, such as buying motorbikes and renovating houses. Children also experienced additional pocket money, as reported by kiosk owners who found that the number of their underage customers increased during the high season of seaweed farming.

All these examples show that the significant additional cash income from seaweed farming was used to improve people's lives. On the other hand, seaweed farmers also need to save for unfavourable times in farming, to repair the ropes and buy new seedlings. The main ropes can be used for up to 3 years, while plastic ropes only could be used for up to one year. In addition, seaweed farming in NTT has undergone boom and bust cycles due mainly to disease and price fluctuations. Many men and women farmers used all their gains from seaweed farming without considering possible bad seasons that could cause their farming businesses to collapse. Farmers who did not save to re-invest had then to depend on external support. Although women and men farmers experienced good benefits from seaweed farming, they were likely to be

vulnerable. Local traders are some of the key helpers, however, they tend to put pressure on their client farmers over prices and product quality. Farmers risk being trapped into long term relationships with the traders.

Efforts are needed to increase farmers' awareness of re-investment and savings needs, and to relate income and expenditures within families to controlling household budgets and resilience. Participants in Rote, Alor and Kupang considered women to be the day to day managers of the home and in control of family money. Typically, larger expenses were decided jointly by husbands and wives. To increase awareness of re-investment, interventions should target both women and men so the family can discuss and prioritise budget allocations and both genders have equal roles in farm development.

These 3 study areas in NTT province showed how households and individuals were connected to seaweed farming. In Kupang and Alor, the farm owner and typically the head of the household is a man. Women, men and children supply the farm labor. Seaweed farming is considered as a family business, and both women and men work with a division of labour between them. In Rote, women and men work in different locations and ownership is classified differently.

Farm ownership needs to be understood or the wrong target beneficiaries could be selected for transferring skills and technology. Often, the heads of households are invited to meetings and women are left behind. This also happened in focus group discussions where more men than women attended the meetings. Typically, men participate in community meetings. Women felt inferior in attending and considered male participation was enough, even though both genders were encouraged to participate. Achieving gender equality at community level, e.g., in meetings, relates to changing society's views on the role of women in the public domain (Moser 1993). In NTT, women actively work in every aspect of seaweed farming, except where travel to distant places leads to men dominating the work, for all ethnicities.

Women and men have different knowledge, skills, interests and perspectives in seaweed farming and both genders have to learn how to adapt to the sea and improve farming methods. Farmers need to adjust to changing sea

temperatures. The actors in post-harvest handling need to be recognised, as well as their methods and the market requirements.

Women and men farmers described their work days as like daily work in an office. They had to start early in the morning and continue until sundown. Especially the tying and untying processes required time and energy, with long hours of work, wind and seawater. All were full time farmers. The geographical distance between family homes on the island and production sites meant the farmers had to limit their time caring for their school-age children. In Alor, the farming area was a different island from their home island. The farming area in Kupang and Rote was far from homes. Social problems sometimes resulted, such as school children living at home without their parents' guidance. Increasing production might require parents to leave their home villages for longer periods. In other cases, women, as part of their domestic role of caring for children and family, have to go back and forth from the farming area to home village more frequently than the men, adding a double responsibility and risk to the already burdened women. To function in their domestic roles, women need improved technology, services and infrastructure.

Conclusions

Achieving Indonesia's target of seaweed production of 19.5 million tonnes in 2019 (MMAF 2016) needs an effective strategy to target the real actors. One way is to recognise the participation of both genders in every aspect of seaweed production so that interventions to increase production will be effective. Women and men both have important roles in seaweed farming and post-harvesting. To address issues of improving production and quality and reducing post-harvest losses needs a comprehensive upgrading of the skills of all farmers. Ignoring men's or women's roles in seaweed farming undermines the challenge in reaching the producers. Women and men's farming knowledge covers different elements of the farming practices as both play significant roles for different tasks in farming and post-harvesting. Knowing who does what can guide strategies for efficient technology transfer and for improving product quality.

Although seaweed farming is a family business and women and men work together in Kupang and Alor, the communities still consider women as

only "helpers" and see the women's main role as helping the household. Yet, women play significant farming roles from pre-farming, farming and post-harvest. Apart from targeting the real actors, it is also important to raise awareness of both genders in re-investing family resources in seaweed farming.

Interventions for improving seaweed production should also address social problems such as that farm sites that are distant from home villages place extra burdens on women who have to go back and forth, increasing their responsibilities and risks. Better farming needs to be integrated with wider development to support women in their domestic and productive roles.

The involvement of women in seaweed farming needs to be recognised and they should be taken seriously in the planning and implementation of initiatives to improve production and quality. Equal participation in the public domain needs to be encouraged at societal forums, even though this requires change in individual, household and social relations. The opportunity for women to achieve equality and enable them to voice their concerns and priorities will require a long term intervention.

Acknowledgements

This paper is a compilation from several works. Therefore the author wishes to acknowledge the support of various organisations that enabled the author to compile data and information on the respective sites. The author acknowledges Charles Darwin University for data in Alor as part of PhD research, TNC for data collected as part of a study of "Sustainable Use of Marine Resources that Benefits People and Biodiversity in Rote Ndao, NTT" in 2015, and International Labour Organization-Indonesia and Timor Leste Country Office, for data in Kupang as a part of the study "Participatory Value Chain Analysis and Development Plan for Seaweed in Kabupaten Kupang, NTT."

References

Alin, J.M., D. R. D. Eranza, A. Bahron and R. Mahmod. 2015. Profit and loss analysis of Euchema seaweed farming in Green Island, Palawan, Philippines. Mediterranea Journal of Social Sciences MCSER: 125-128

Besta, N. A. 2013. Seaweed farming and intra-household gender relations on SongoSongo Island, Tanzania. PhD Thesis.School of International Development. University of East Anglia. 258 pp

BPS (BadanPusatStatistik). 2015. Statistik Indonesia 2015. Badan Pusat Statistik - Indonesia. Jakarta. 612 pp. https://www.bps.go.id/. Accessed 4 April 2015.

Choo, P.S., S. Barbara, B. Nowak, K. Kusakabe and M.J. Williams. 2008. Guest editorial: Gender and fisheries. Development 51:176–179.

Crawford, B. 2002. Seaweed farming: An alternative livelihood for small-scale Fishers? Coastal Resource Center, University of Rhode Island. 23 pp.

Eranza, D.R.D., M. A. James, B. Arsiah and M. Roslinah. 2015. Determinants of women's participation in seaweed farming in the regency of Jeneponto, South Sulawesi, Indonesia. Mediterranean Journal of Social Sciences 6: 43-45.

Espaldon, M.V.O., Z. M. Sumalde, M. R. Carmelita J. D. Villanueva. and M. T. Mercene-Mutia. 2010. Sustainable livelihood and seaweed farming in Calatagan, Batangas, Philippines. In: Proceedings of the Fifteenth Biennial Conference of the International Institute of Fisheries Economics & Trade on Economics of Fish Resources and Aquatic Ecosystems: Balancing Uses, Balancing Costs. (ed. A.L. Shriver), 1-12 pp. International Institute of Fisheries Economics & Trade, Corvallis, Oregon, USA.

FAO. 2016. The state of world fisheries and aquaculture 2016. Contributing to food security and nutrition for all. Rome. 200 pp. http://www.fao.org/3/a-i5555e.pdf Accessed 3 February 2017

Fitriana, R. 2014a. Participatory value chain analysis and development plan for seaweed in Kabupaten Kupang, NTT: Decent work for food security in NTT. A Report to ILO CO Office for Indonesia and Timor Leste. 66 pp

Fitriana, R. 2014b. Assessing the impact of a marine protected area on coastal livelihoods: A case study from Pantar Island, Indonesia. PhD thesis.Research Institute for the Environment and Livelihoods Faculty of Engineering, Health, Science and the Environment, Charles Darwin University. 470 pp.

Fitriana, R. 2015. Sustainable use of marine resources that benefits people and biodiversity in Rote Ndao District East Nusa Tenggara. A Report to The Nature Conservancy. 34 pp

Giuliani, E., C. Pietrobelli and R.Rabellotti. 2005. Upgrading in global value chains: Lessons from Latin American Clusters. World Development 33 : 549–573.

Harrison, E. 2000. Gender, rights and poverty Issues: Lessons for the sector. Background Paper For DFID/FGRP3/ARP. In:Workshop on Practical Strategies for Poverty Targeted Research, held in The Melia Hotel, Hanoi,Vietnam,7-11November 2000.12pp.

Kaplinsky, R. and M. Morris. 2001. A handbook for value chain research.Report prepared for IDRC.106 pp.

Jamandre, W.E., H. Hasanuddin, C. Koakrkin, U. Hatch, R. B. Bolivara and R.J. Borski.2009. Final technical report: Value chain analysis of seaweed in Indonesia. Prepared for Aquafish Innovation Lab. 26 pp.

http://aquafishcrsp.oregonstate.edu/sites/aquafishcrsp.oregonstate.edu/files/tr_2011_2013_final_0.pdf. Accessed 24 December 2013.

Kronen, M., A.Vunisia, F. Magron and B. Mcardle. 2010. Socio-economic drivers and indicators for artisanal coastal fisheries in Pacific Island Countries and Territories and their use for fisheries management strategies. Marine Policy 34 : 1135-1143.

Kruijssen, F., J. A. Albert, M. Morgan, D. Boso, F. Siota, S. Sibitiand and A. J. Schwarz. 2013. Livelihoods, markets, and gender roles in Solomon Islands: Case studies from Western and Isabel Provinces. CGIAR Research Program on Aquatic Agricultural Systems. Penang, Malaysia. Project Report: AAS-2013-22. 13 pp. http://pubs.iclarm.net/resource_centre/AAS-2013-22.pdf. Accessed 20 October 2017.

Loc, V.T.T., S.R. Bush and K. N. T. Sinh. 2010. High and low value fish chains in theMekong Delta: Challenges for livelihoods and governance. Environment Development Sustainable 12: 889–908.

Mitchell, J., A. Sheperd and J. Keane. 2011. An introduction. In: Markets and rural poverty: Upgrading in value chains. (eds. Mitchell, J.,C. Coles), pp.1-15. Earthscan, London.

MMAF. 2015. Marine and fishery in figures in 2015. MMAF. 308 pp. statistik.kkp.go.id/sidatik-dev/Publikasi/src/kpda2015.pdf. Accessed 24 February 2016.

MMAF. 2016a. KiatMenteri Susi Kembangkan Industri Rumput Laut. MMAF. Sumber: http://katadata.co.id/. Accesed 7 March 2016.

MMAF. 2016b. Program Prioritas 2016 and RencanaKerja 2017 Kementerian Kelautan dan Perikanan. Dipresentasikan Pada Rapat Kerja Teknis Terpadu Tahun 2016 Jakarta, 30 Mei 2016 Sekjen KKP. 24 pp.

Ministry of Industry. 2016. Kinerja Industri Rumpu Laut Tahun 2014. Direktorat Jendral Industri Agro (2016). http://agro.kemenperin.go.id/esiagro/komoditi/rumput-laut/. Accessed 7 November 2016.

Moser, C.O.N. 1993. Gender planning and development: Theory, practice, and training Routledge. London. 285 pp.

M4P (Making Market Systems Work Better for the Poor). 2008. Making value chains work better for the poor: A toolbook for practitioners of value chain analysis, version 3. Making Markets Work Better for the Poor (M4P) Project, UK Departtment for International Development (DFID) Agricultural Development International. Phnomp Penh, Cambodja. 145 pp. http://aciar.gov.au/files/node/14580/making_value_chains_work_better_for_the_poor_a_to_14413.pdf. Accessed 20 December 2013.

Phillips, M., R.P. Subasinghe, N. Tran, L. Kassamand and C.Y. Chan. 2016. Aquaculture big numbers. FAO Fisheries and Aquaculture Technical Paper 601.FAO,Rome. 60 pp. available at www.fao.org/3/a-i6317e.pdf. Accessed 16 October 2017.

Valderrama, D., J.Cai, N.Hishamunda and N.Ridler. 2013. Social and economic dimensions of carrageenan seaweed farming. Fisheries and Aquaculture Technical Paper No. 580. FAO, Rome. 204 pp. Available at www.fao.org/3/a-i3344e.pdf . Accessed 19 July 2016.

WFP. 2015.Food security and vulnerability atlas of Indonesia 2015.Dewan Ketahanan Pangan, Kementrian Pertanian dan WFP. 172 pp.

Gender in Aquaculture and Fisheries: Engendering Security in Fisheries and Aquaculture
*Asian Fisheries Science Special Issue **30S** (2017): 265-275*

ISSN 0116-6514
https://doi.org/10.33997/j.afs.2017.30.S1.014

Short Communication

Involving Women in Field-Testing of Periphyton Enhanced Aquaculture System for Nutrition Security

SUNILA RAI[1*], MADHAV SHRESTHA[1], JAMES S. DIANA[2] and HILLARY EGNA[3]

[1]Agriculture and Forestry University, Rampur, Chitwan, Nepal
[2]University of Michigan, Ann Arbor, MI 48109-1115,USA
[3]Oregon State University, Corvallis, OR 97331, USA

Abstract

An on-farm trial of carp polyculture was carried out with participation of women farmers from Sundardeep Women Fish Farmer's Cooperative (15 women farmers) in Chitwan District and Mishrit Fish Farmer's Cooperative (22 women farmers) in Nawalparasi District to field-test the enhancing effect of periphyton on use of feed and fish production. The trial was conducted for 8 months from April to December 2015. Women farmers stocked six carp species and two small indigenous species (SIS) to ponds. Women farmers were divided into two groups. One group fed their fish with dough of rice bran and mustard oil cake, while the other group installed bamboo substrates in their ponds and fed their fish with half the amount of the feed used by the first group. Women farmers netted and weighed fish monthly to check fish growth and calculate rations. Women farmers were provided with a book to record fish harvested for consumption or sale and fish mortality. Final harvest was done after 8 months of culture. The netted fish were counted, weighed, and returned to the pond as the farmers wanted to keep fish for their biggest festival "Maghi" in mid-January. In aggregate, 84 % of farmers consumed fish at home, and 41 % of farmers sold carps. The trial showed that culturing carps with SIS with 50 % feeding amount and with bamboo substrates in ponds resulted in a 22 % higher fish production as compared to the culture of carps with normal feeding. More interestingly, the gross margin of the half-fed periphyton enhanced carp polyculture was almost two times as much as that of the normal fed polyculture system. Women farmers also benefited socially as well as economically from the interactions within the cooperatives, which increased their self-confidence and developed leadership skills in some members.

*Corresponding author. Email address: sunilarai@yahoo.com

Introduction

The Government of Nepal has recognized the contribution of aquaculture to poverty alleviation, and food and nutritional security (MoAC 2009; NARC 2010). Fisheries and aquaculture development has been prioritized, with special attention paid to productivity and production enhancement (MoAC 2009; NARC 2010). Carp polyculture in ponds has developed as the most viable and popular aquaculture production system in Nepal accounting for over 90 % of total production (FAO 2016). Carp polyculture systems do not however promote household fish consumption because most farmers sell the carps rather than consume them (Rai et al. 2012). Realizing this problem, the Institute of Agriculture and Animal Science (now Agriculture and Forestry University AFU) has developed a production system that incorporates nutrient-rich small indigenous species (SIS) to increase household consumption and income over that of carp polyculture (Rai et al. 2012). Addition of SIS to the carp polyculture system raised fish production above the national average, doubled the consumption rate of household members, and provided Rs. 3,025 income per household in 270 days, which helped families become economically empowered (Rai et al. 2012).

In commercial fish farming, feed alone accounts for approximately 60 % of total input cost (Bhujel 2009), which is expensive for small-scale farmers, so it is essential to provide opportunities to reduce feed cost. Adding substrates such as bamboos to carp ponds can facilitate growth of periphyton, which serves as food for carp and increases production (Azim et al. 2002; Rai et al. 2008). Since the combination of species and type of feed would influence the yield and income in a semi-intensive system, it was necessary to test the combination of feed inputs, periphyton enhancement, and production to truly understand the best system to use for commercial production (Diana 2012a). Considering this need, an experiment was carried out at the Agriculture and Forestry University (AFU), Chitwan, Nepal to determine the best combination of carps, SIS, and periphyton enhancement to maximize net fish yield and profit in ponds. Two best treatments obtained from the trial were extended successfully to women farmers in 2 districts, Chitwan and Nawalparasi in Nepal.

Materials and Methods

The two best treatments; i) carp + 100 % feed and ii) carp + SIS + 50 % feed +bamboo substrate at 1 % of pond surface area were determined after on-station trials at AFU and were then tested in the community using household ponds of 15 women farmers from Sundardeep Women Fish Farmer's Cooperative in Chitwan and 22 women farmers from Mishrit Fish Farmer's Cooperative in Nawalparasi districts (Fig. 1). Selection of farmers for the training and the trial was done by an Executive Committee of the respective cooperatives on consensus through meetings. There were only women members in the Sundardeep Women's Cooperative while the Mishrit Cooperative had 16 women and 13 men members. From the Mishrit Cooperative, only women counterparts from selected households participated in the trial as per the need of the project. At the beginning, an inception meeting was conducted in each site to share protocols and objectives of the trial to the selected women farmers. The project provided financial supports for fingerlings, feed and fertilizers to the participating farmers.

In April 2015, farmers stocked 1,500 carps, namely rohu (*Labeo rohita* (Hamilton 1822)), silver carp (*Hypophthalmichthys molitrix* (Valenciennes 1844)), bighead carp (*Aristichthys nobilis* (Richardson 1845)), mrigal (*Cirrhinus mrigala* (Hamilton 1822)), common carp (*Cyprinus carpio* (Linnaeus 1758)), and grass carp (*Ctenopharyngodon idella* (Valenciennes 1844)) and 25,000 SIS fish, namely, "dedhuwa", (*Esomus danricus* (Hamilton 1822)) and "pothi", (*Puntius sophore* (Hamilton 1822)) per hectare in their household ponds. The average pond size was 259 m^2 (range 145-500 m^2) in Chitwan and 413 m^2 (range 163-552 m^2) in Nawalparasi. Men fixed bamboo strips as substrate in the form of mats in the water column of ponds covering about 1 % of the pond surface to enhance periphyton growth. The purpose of installing bamboo strips was to provide space for periphyton growth that served as supplemental natural food to carp and reduced feed cost. The women also fed carp with dough of rice bran and mustard oil cake (1:1) and grass carp on banana leaves and grass every morning. In large ponds, both men and women fed fish. Each farmer was provided with a log book to record fish that were consumed, sold, or died so that fish production and profitability could be determined from the recorded data after harvesting. In December 2015, the final harvest was conducted by netting fish in shallow water following partial water

draining from ponds after 8 months of culture. Harvesting was performed by both men and women and also sometimes assisted by their children during school holidays. The total production was calculated by total weight of fish consumed, sold and finally harvested. Gross income was calculated from total production, assuming all carps were sold, whereas gross margin was calculated by deducting variable costs (fingerling, feed, fertilizer) from gross income. Fish production, gross margin and family fish consumption data were compared by using Student's t-test. Significant differences were considered at an alpha level of 0.05 ($P<0.05$). All means are given with ± 1 standard error (S.E.). A one-day training on periphyton-enhanced carp-SIS technology was also provided to 35 (7 men and 28 women) non-adopters from Chitwan district on 30 November 2015, just before final harvest of the other ponds. In addition, women farmers were encouraged to share their stories and views on fish farming systems during project meetings to get feedback on the effectiveness of the intervention. Experiences were also shared from women farmers of other cooperatives.

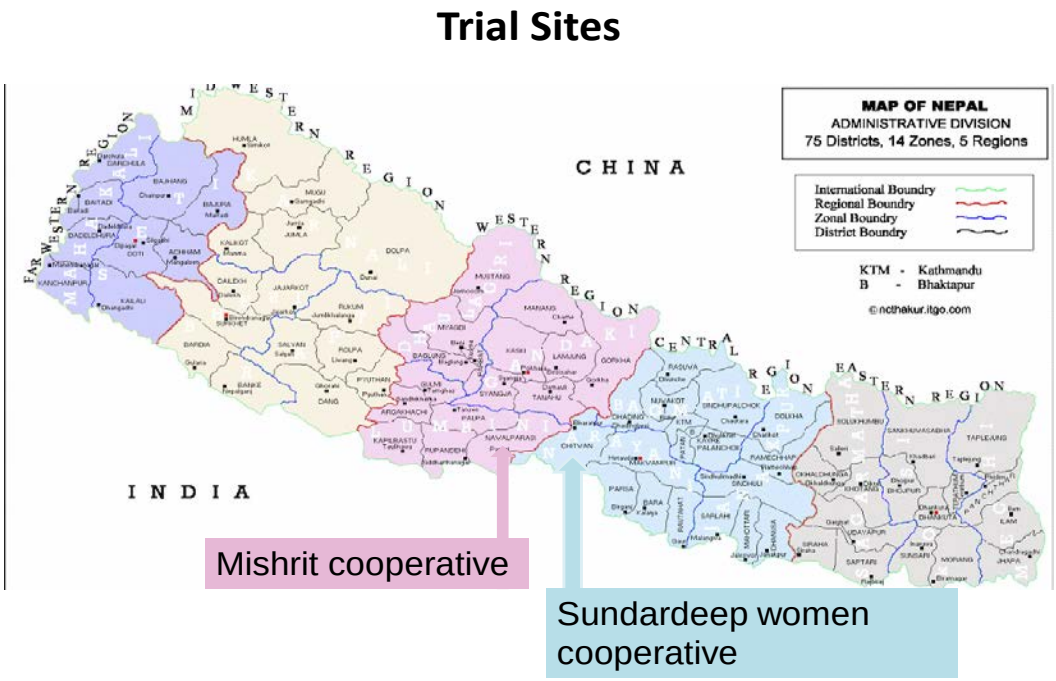


Fig. 1. Map of Nepal showing project sites

a.

b.

c.

d.

Fig. 2. Preparing dough of rice bran and mustard oil cake for fish feeding (a), Split bamboo substrate (b), SIS harvested from pond for household consumption (c) and Final harvesting of carp (d)

Results and Discussion

Both the cooperatives from where the beneficiaries were selected were dominated by Tharus, an ethnic group of Nepal. In aggregate, 92 % of participants were Tharus and the rest were Ghartis (5 %) and Ranas (3 %). The majority of farmers (54 %) were young (20-40 years) and the rest (46 %) were middle aged (41-60 years). Around 19 % women had higher education (intermediate to Bachelor's level), 32 % had studied up to secondary school level (Grades 6-10) and 49 % had primary level education (grades 1-5).

About 84 % of the farmers consumed carp fish at home. Over 40 % of farmers sold surplus carps whereas all the SIS fish were consumed at home without selling. Women began harvesting SIS partially from the month of July (maximum 3 times per month) and this increased the frequency of fish

consumption (Rai et al. 2014). Increased intake of SIS which is related to frequency of harvesting obviously improves women's and children's health and nutrition as the small fish are rich in vitamins and minerals (Roos et al. 2006; Rai et al. 2014). About 95 % of farmers sold carps on the pond site, while 5 % sold in the nearby local market directly to consumers without involvement of middleman. In the cases of on the pond site sales, both men and women were involved whereas selling at local market was solely done by women. By avoiding the middleman farmers sold fish at higher prices than when they sell to middleman at Rs. 220 kg^{-1} (1 US $ = 107 Rs) and received more profits. Mishrit cooperative farmers sold carps at Rs. 20 higher price (Rs. 270 kg^{-1}) than Sundardeep cooperative farmers (Rs. 250 kg^{-1}), which is reflected in both income and profit. Income earned by women from selling fish was used to pay children's education fees, buy stationery for the children, kitchen items and other domestic needs. Farmers did not empty their ponds on final harvesting because they kept some fish for "Maghi", their biggest festival that fell in mid-January. During Maghi, major sales of fish occur because fish is an important food item for this celebration. Some farmers also saved fish in ponds for year-round consumption and to fetch higher prices later when there were fewer fish in the village.

Carp + SIS + 50 % Feed + Substrate farmers obtained 22 % (10.2 kg.100 m^{-2}) higher ($P<0.05$) fish production and 90 % (3237 Rs.100 m^{-2}) higher ($P<0.05$) gross margins than carp + 100 % feed farmers due to better utilization of periphyton and supplementary feed by carp (Table 1).

Table 1. Fish production, consumption and profit earned by farmers in two treatments in 8 months

	Carp+100 % feed	**Carp + SIS + 50 % Feed + Substrate**
Production (kg.100 m^{-2})	46.5 ± 16.2^{b}	56.7 ± 17.8^{a}
Gross margin (Rs.100 m^{-2})	3586 ± 2984^{b}	6823 ± 3045^{a}
Consumption of carps (kg.household^{-1})	14.7 ± 13.4^{a}	15.3 ± 12.7^{a}
Consumption of SIS (kg.household^{-1})	0.4 ± 0.3^{b}	2.4 ± 1.2^{a}

Table 2. Fish production, consumption, sale, and gross income per pond by farmers in 8 months for the two treatments in two cooperatives

Cooperative	Treatment		Carp sold (kg.pond^{-1})	Carp consumed (kg.pond^{-1})	SIS consumed (kg.pond^{-1})	Total production* (kg.pond^{-1})	Gross Income from fish sale (Rs.pond^{-1})
Sundardeep women cooperative (n=15)	Carp + 100 % Feed (n=7)	Avg.	10.0	15.0	0.3	75.0	18761
		Max.	60.0	35.0	2.0	150.0	37530
		Min.	0.0	6.0	0.0	24.0	5974
	Carp + SIS + 50 % Feed + Substrate (n=8)	Avg.	31.0	23.5	2.6	109.6	27411
		Max.	170.0	45.0	5.0	302.4	75598
		Min.	0.0	8.0	2.0	30.0	7510
Mishrit cooperative (n=22)	Carp + 100 % Feed (n=12)	Avg.	44.4	15.7	0.5	128.8	34766
		Max.	260.0	55.0	5.0	261.4	70575
		Min.	0.0	0.0	0.0	41.0	11062
	Carp + SIS + 50 % Feed + Substrate (n=10)	Avg.	25.8	8.7	2.2	164.0	44290
		Max.	155.0	20.0	10.0	275.8	74454
		Min.	0.0	0.0	0.0	107.5	23055

*Includes carp left in the pond and not consumed or sold at harvest.

Higher production was due to additional SIS fish and periphyton enhancement while higher gross margins were due to reduced feeding in the SIS ponds. Adding substrates to ponds provides both periphyton food and cover against predators like birds to prevent fish loss through predation. Reduced feeding rates have been found to provide comparable growth and better profit than full feeding for Nile tilapia (Diana 2012b). Similar result has been found for carps in the present study. Contribution of SIS to total production was small and ranged between 1.3-2.6 % by weight in carp + SIS + 50 % feed + substrate ponds. SIS production was very low in Nawalparasi because farmers used well water and had no source for SIS colonization. In Chitwan, farmers used canal water to top up the ponds, so, they sourced SIS easily from the canals. SIS was also harvested in carp-only ponds, as they could enter over time from canal water. Though collection of SIS from canals for pond stocking and harvesting of SIS from ponds for consumption was done by both men and women, water

management was done by men. In carp-only ponds, a maximum 2 kg of SIS were harvested per pond in Chitwan and 5 kg per pond in Nawalparasi, SIS consumption by households was 5 times higher in households which included SIS treatments (2.4 kg.household^{-1}) than without SIS treatment (0.4 kg.household^{-1}) (Table 2).

However, carp consumption by households did not differ between the two treatments which indicated farmers prefer carps over SIS. Present gross margin analysis did not take the cost of SIS and bamboo into account because SIS were collected from canal water free of cost while bamboo was freely available in the village. All farmers received a profit except one in Chitwan, who lost Rs. 1674 due to poaching of her fish.

Fish farming had become instrumental to women farmers to improve their group cohesion and socio-economic status. Since fish farming was carried out through cooperatives, the activity gave them the opportunity to meet each other in monthly meetings at the cooperative office and during collection of fish feed and fertilizers supplied by project staff at respective collection centres.

According to Lila Mahato, Vice President of the Mishrit Cooperative, prior to beginning carp farming she remained inside the house occupied in household chores and she had minimal communication with fellow farmers. Now she meets fellow farmers regularly in the cooperative meetings and project activities are taken up together. In meetings, they share their problems and seek solutions. Over a period, the activity has increased her self confidence and she is now leading her cooperative. The activity has also been economically empowering. Each member deposited Rs. 100 per month in a cooperative fund, which was loaned to the members for repair of pump sets, fish nets and to meet other requirements at a nominal interest rate of 1 %. So, farmers did not need to go to the bank and meet all the paper formalities for securing a small loan. In the Tharu community, having a fish pond is a matter of prestige in the society. Fish forms part of the menu at every important occasion and festival. Serving fish to guests is a matter of honour. Fish is now available in their own ponds.

“Growing Carp and SIS in the pond is much easier and better than paddy farming. For small scale women farmers like me, Carp-SIS farming is an easier

way to earn income by selling fish and to improve family nutrition by eating fresh fish and nutrient rich SIS from own pond".

Bijaya Chaudhary from Sundardeep cooperative

She knows that fish is good for health and SIS is even more nutrient rich and eating them is more beneficial for health because these are eaten whole without dressing and losing nutrients. She adds:

"Fish in the market is already a day old and might be spoiled, so, it is not safe. Moreover, such fish is not tasty either. Eating fish from own pond is safer and tastier".

SIS are self recruiting fish, so, farmers can harvest them regularly and fulfill the micro-nutrients needs of children and the women farmers who are among the most vulnerable groups in Nepal (MoHP 2006; UNICEF 2012). Unlike carp, SIS can grow well in shallow water and farmers can harvest them year round, even in the dry season. Those who had over production of SIS performed post harvest techniques such as solar drying in bamboo trays or smoking, and kept the fish in plastic bags and bamboo baskets for future use. Bhundi Chaudhary from Sundardeep echoed Bijaya and advocated that Carp-SIS-Substrate farming was the easiest and lower cost way of income generation because it required low inputs in terms of labour, time and money.

"Feeding is not laborious and is done only one time in the morning. Feeding does not take time, I can feed fish while cooking dishes at the kitchen. Feed ingredients like rice bran and mustard oil cakes are available from the farm and are less expensive. Adding bamboo substrates to the pond not only saved feed but also saved my fish from poaching".

However, she found making split bamboo mats difficult, so, her husband made them and also fixed them in the pond.

Conclusions

The women-led field trial showed that culturing carps with SIS with 50 % reduced feed compensated by bamboo substrates resulted in a 22 % higher fish production as compared to the traditional culture of carps with complete

feeding. More interestingly, the gross margin was almost double that of the traditional system. Periphyton enhanced Carp-SIS polyculture is suitable and affordable to small-scale women farmers because it is a very simple and low-cost technology that gives higher fish productivity and profits, and it also has a potential of enhancing family nutrition and income as compared to the existing carp polyculture. The technology utilizes locally available bamboo and some farmers may access it free of cost in rural villages of developing countries like Nepal. Aquaculture is a male dominated practice in Nepal where only 33 % of farmers are female (Mishra 2014). In order to increase female participation in aquaculture and enhance empowerment, simple technology like that of peryphyton-based green aquaculture is appropriate.

Acknowledgements

We would like to thank women farmers of Sundardeep Women Fish Farmer's Cooperative and Mishrit Fish Farmer's Cooperative for their participation and allowing us to use their household ponds for the on-farm research and training. Special thanks to Mr. Sovan Mahato, President of RIDS (Rural Integrated Development Society) and Ms. Usha Chaudhary who assisted most of the field work. This research is a component of the AquaFish Innovation Lab supported by the US Agency for International Development (USAID CA/LWA No. EPP-A-00-06-0012-00).

References

Azim, M.E., M.C.J. Verdegem, H. Khatoon, M.A. Wahab, A.A. van Dam and M.C.M Beveridge. 2002. A comparison of fertilization, feeding and three periphyton substrates for increasing fish production in freshwater pond aquaculture in Bangladesh. Aquaculture 212: 227-243.

Bhujel, R. C. 2009. Increasing role and potential of small-scale aquaculture: National and regional perspectives. In symposium on Small-scale aquiculture for increasing resilience of rural livelihoods in Nepal. (eds. M.K. Shrestha and J. Pant), pp 10-18. Institute of Agriculture and Animal Science, Rampur, Chitwan, Nepal and The WorldFish Center, Penang, Malaysia.

Diana, J. S. 2012a. Is lower intensity aquaculture a valuable means of producing food? An evaluation of its effect on near-shore and inland waters. Reviews in Aquaculture 4: 234-245.

Diana, J.S. 2012b. Some principles of pond fertilization for Nile tilapia using organic and inorganic inputs. In: Pond fertilization: Impacts of nutrient input on aquaculture production (ed. C. C. Mischke), pp163-177. John Wiley and Sons, Inc., New York..

FAO. 2016. National aquaculture sector overview. Food and Agriculture Organization. http://www.fao.org/fishery/countrysector/naso_nepal/en. Accessed 7 September 2016.

Mishra, R.N. 2014. Status of aquaculture in Nepal. Nepalese Journal of Aquaculture and Fisheries 1:73-84.

MoAC. 2009. National agri policy 2061 (in Nepali). Ministry of Agriculture and Cooperatives, Government of Nepal, Kathmandu. http://www.moac.gov.np/publications/index.php. Accessed 5 August 2009.

MoHP. 2006. Nepal demographic and health survey 2006. Ministry of Health and Population Division, New Era, and Macro International Inc., Kathmandu. 291 pp.

NARC. 2010. NARC's strategic vision for agricultural research (2011- 2030): Meeting Nepal's food and nutrition security goals through agricultural science and technology. Nepal Agricultural Research Council (NARC), Kathmandu. http://www.narc.org.np/narc_vision/NARC_vision.pdf. Accessed 30 December 2010.

Rai, S., Y. Yi, M.A. Wahab, A.N. Bart and J.S. Diana. 2008. Comparison of rice straw and bamboo stick substrates in periphyton-based carp polyculture systems. Aquaculture Research 39: 464-473.

Rai, S., S.H. Thilsted, M.K. Shrestha, M.A. Wahab and K. Gharti. 2012. Improvement of women's livelihoods, income, and nutrition through Carp-SIS-Prawn polyculture in Terai, Nepal. Asian Fisheries Science 25S:217-225.

Rai, S., S.H. Thilsted, M.K. Shrestha, M.A. Wahab and M.C. Gupta. 2014. Carp-SIS polyculture: A new intervention to improve women's livelihoods, income and nutrition in Terai, Nepal. Asian Fisheries Science 27S:165-174.

Roos, N., M.A. Wahab, C. Chamman and S.H. Thilsted. 2006. Fish and health. In: 2020 vision: Understanding the links between agriculture and health (eds. C. Hawkes & M. T. Ruel) pp. 44 Focus 13 (Brief 10 of 16). Washington D. C., U.S.A.

UNICEF. 2012. A milestone plan launched to improve maternal and child nutrition in Nepal. http://www.unicef.org/Nepal/5476_7891.htm. Accessed 13 January 2014.

Gender in Aquaculture and Fisheries: Engendering Security in Fisheries and Aquaculture
*Asian Fisheries Science Special Issue **30S** (2017): 277-290*

ISSN 0116-6514
https://doi.org/10.33997/j.afs.2017.30.S1.015
Short Communication

Engendering Statistics for Fisheries and Aquaculture

JENNIFER GEE[1*] and KATHRIN BACHER

FAO, Food and Agriculture Organization of the United Nations (FAO), Viale delle Terme di Caracalla, 00153 Rome, Italy

Abstract

A curated set of sex-disaggregated statistics on employment in the fisheries and aquaculture sectors was disseminated by Food and Agriculture Organization of the United Nations (FAO) for the first time in 2016. For the period of 2009-2014, only 27 % of FAO Member countries reported sex-disaggregated employment data for the fishery sector and 33 % for the aquaculture sector. The FAO data on employment focuses on the primary sector and does not include information about the secondary sector of post-harvest processing activities. In 2014, the average number of women engaged in both fisheries and aquaculture in the reporting countries was 19 % of the total workforce and, when considered across a four year average, the figure was 15 %. This paper presents a focus section on the reported statistics for Asia, where women, on average, made up 15 % of the workforce in the primary sectors for those countries reporting. An attempt has not been made to provide estimates for countries not reporting. Enhanced statistics for the secondary post-harvest and service sectors, not presently covered in FAO fisheries and aquaculture statistics, would greatly improve the understanding of the importance of women's contribution to fisheries and aquaculture, food security and livelihoods. To complement the encouragement for improved national reporting, FAO offers support through tools and guidelines to improve data collection efforts that form the foundation of reporting. Future work needs to continue to support the use of inclusive activity definitions to better include the fisheries and aquaculture activities in which women are typically engaged. Finally, in 2017 the employment dataset for fisheries and aquaculture will be released including the reported sex-disaggregated figures.

[*] Corresponding author. Email address: jennifer.gee@fao.org

Introduction

A lack of sex-disaggregated data for the fisheries and aquaculture sectors has been well noted in the literature (Ifeka 1989; Aguilar and Castañeda 2001; Williams et al. 2006; Gopal et al. 2014) and this has resulted in an incomplete understanding of women's and men's roles in the sectors and the gaps that persist between them. A lack of understanding, and data, on the multitude of roles women play throughout the 2 sectors means that women are often invisible to policy-makers. By failing to consider the role of women or address gender-specific constraints to improving production and productivity massive losses have been found to result in both sectors in terms of production, household food security and income, particularly for the poor (FAO 2013). Further, women have usually been excluded from decision-making mechanisms and roles in fisheries and aquaculture management (Lentisco and Alonso 2012).

For the first time in 2016[2], FAO released a selection of sex-disaggregated statistics for employment in aquaculture and fisheries, following many decades of data collection. The collection of national employment statistics started in 1950 for the fishery sector and in 1951 for the aquaculture sector. The data presented here provides a first summary of this data and provides a particular regional focus on data reported from Asia. The regional focus on Asia is of particular interest in light of the dominance of production and employment for both the fisheries and aquaculture sectors as well as the strong participation of women in the sectors (FAO 2006). In 1970, the first country, Japan, reported sex-disaggregated employment data for the fishery sector and in 1990 sex-disaggregated data was first reported for the aquaculture sector. The FAO data is only for work in the primary sector and does not include information about the secondary sector of post-harvest processing activities.

Women play an active and important role in the secondary sectors of aquaculture and fisheries. Here, they are estimated to make up, on average half of the workers (FAO 2014) and in some cases they make up 90 % of the workforce in the processing industry (FAO 2016a). They are found in all positions and roles in the secondary sector, and the lack of inclusion in statistics

[2]FAO statistical reporting on employment always have a two-year time-lag. For instance, the 2016 reporting was on the 2014 reported data.

reported to FAO is not an indication of importance, but rather an outcome of constraints on the resources required for this reporting. Nevertheless, the omission of employment data from the secondary sectors means that the overall estimates based on primary sector data cannot be extended to cover the rate of participation of women throughout the value chains. A number of estimations of the total number of women in fisheries and aquaculture have been made. Notably, estimates were made for fisheries employment in the 2012 document Hidden Harvest (Kelleher et al. 2012). The document was produced as the result of an in-depth analysis where national and regional case studies were combined with the available, nationally reported data of FAO. Throughout the fisheries value chain it was estimated that women made up 47 % of the workforce combining large and small-scale fisheries in developing and developed countries (Kelleher et al. 2012). Making a global comparison between small and large-scale fisheries, women were estimated to have made up 46 % and 60 % of the respective value chains.

Materials and Methods

The collection of nationally reported statistics on fisheries and aquaculture, and, of relevance here, employment in the primary sectors of fisheries and aquaculture, is part of the formal mandate of the FAO.

Questionnaires are sent to all FAO member states and reporting is requested annually. To collect the employment data, a questionnaire for reporting on number engaged within the following categories is dispatched: "Working domain": Aquaculture; Inland Waters Fishing; Marine Coastal Fishing; Marine Deep-Sea Fishing; Marine fishing not elsewhere identified (nei); Subsistence; Unspecified. "The working status categories include": Full time; Part time; Occasional; Status unspecified. Finally, sex could be reported as: Female; Male; Unspecified.

Typically, the national data is transmitted to FAO between August and December, following the close of the reporting year. Once the data have been received, checked and corrected, as required, they are incorporated into the FAO databases. This cycle results in an apparent lag of 2 years for data reporting. The data presented and discussed here are those reported by member nations, and estimates, when appropriate.

Results

Current state of sex-disaggregated statistics for fisheries and aquaculture employment for FAO

In 2014 it was reported that 19 % of all people engaged in the primary sectors of both fishing and aquaculture were women (FAO 2016a). Considering the employment data from all countries as an average across the period 2009–2014, an average of 51.3 million people were dependent on the fisheries sector for their income and livelihood. Overall, 34.2 million people (67 %) were engaged in the primary sector of capture fisheries and 17 million people (33 %) in aquaculture. From this total, 79 % of workers were men, 15 % women and 6 % were recorded as sex-unspecified. Of all women, 5.2 million (70 %) were engaged in the fishery sector and 2.3 million (30 %) in the aquaculture industry.

The figures presented here were calculated using a combination of reported values and estimates made based on past reporting. The number of reporting countries and the degree of disaggregation of the data fluctuates between years, therefore estimates are made for non-reporting years. For example, in the period 2009–2014, 173 countries were included in calculations with either reported or estimated data.

Regional reporting

Sex-disaggregated reporting for employment in the fishery and aquaculture sector varies greatly between countries and regions. During the period of 2009–2014, on average only 27 % of countries worldwide reported sex-disaggregated employment data for the fishery sector and 33 % for the aquaculture sector (Fig. 1). Some countries only report men or unspecified in their employment figures. It is not always possible to tell whether these figures include women, in other words, that sex disaggregated data is not collected or if women engaged in the sector were not included in the data collection. In certain cases countries which formerly reported fully sex-disaggregated statistics, have reverted to reporting only unspecified. In these cases the estimations have been made on the formerly reported ratios of female to male workers.

The 5 world regions also strongly differ in the number of people engaged in the capture fishery and aquaculture sector (Table 1), and it is

anticipated that as reporting improves within each region the distribution of engagement in the sectors and degree of engagement within each sector by gender may shift.

Table 1. Employment numbers in the fishery and aquaculture sectors by region and gender (values show averages for the years 2009-2014)

Fishery								
Region	**Women**		**Men**		**Unspecified**		**Total**	
Africa	548,807	**13 %**	3,395,680	**78 %**	381,655	**9 %**	4,326,142	**12.6 %**
Americas	250,130	**16 %**	977,327	**61 %**	371,405	**23 %**	1,598,862	**4.7 %**
Asia	4,417,886	**16 %**	22,505,040	**80 %**	1,077,019	**4 %**	27,999,944	**81.8 %**
Europe	6,182	**3 %**	202,270	**81 %**	40,885	**16 %**	249,337	**0.7 %**
Oceania	7,607	**21 %**	26,786	**74 %**	1,649	**5 %**	36,042	**0.1 %**
Aquaculture								
Region	**Women**		**Men**		**Unspecified**		**Total**	
Africa	12,236	**7 %**	129,614	**71 %**	39,342	**22 %**	181,192	**1.1 %**
Americas	7,284	**3 %**	102,118	**41 %**	142,270	**56 %**	251,672	**1.5 %**
Asia	2,239,364	**14 %**	13,285,438	**80 %**	1,056,232	**6 %**	16,581,034	**97 %**
Europe	14,085	**19 %**	48,497	**64 %**	12,840	**17 %**	75,422	**0.4 %**
Oceania	685	**12 %**	3,760	**66 %**	1,283	**22 %**	5,727	**0 %**

The average numbers for 2009-2014 show that, 87 % of the global population working in the fishery and aquaculture sectors was in Asia, followed by Africa (9 %), Americas (4 %) and Europe (1 %). Looking at the fishery and aquaculture sectors separately, a very similar pattern can be observed. In the aquaculture sector, Asia even accounts for 97 % of total employment, while Africa, the Americas and Europe only account for 1 % each.

When only women workers are considered, a very similar pattern is depicted. In the fishery sector, 84 % of employment was recorded in Asia, followed by Africa (10 %) and the Americas (5 %). In the aquaculture sector, Asia accounts for 98 % of all women's employment.

Reporting by sector

The highest employment numbers globally were recorded for Inland Waters Fishing (56 % of total number of fishers), followed by Marine Fishing nei (23 %) and Marine Coastal Fishing (13 %) (Fig. 1). Similarly, the highest

percentage of reported numbers of women engaged in fishing were in the Inland Waters Fishing sector (70 %) (Fig. 2), followed by Marine Fishing (17 %) and Marine Coastal Fishing (5 %) (Fig. 3). Within the Inland Waters Fishing category women represented 19 % of the total workforce during the period 2009–2014.

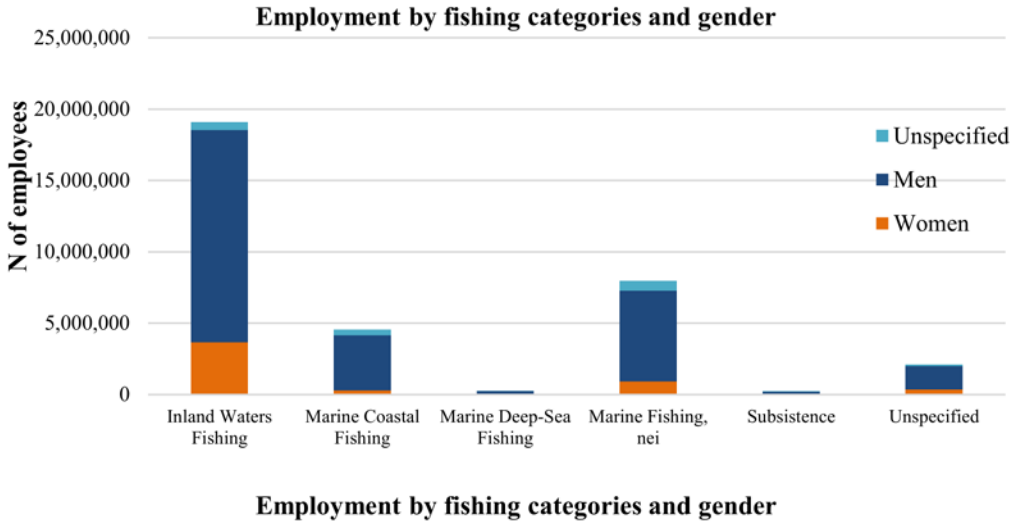


Fig. 2. Average employment numbers by fishing categories and gender (values show averages for the years 2009–2014 across 173 countries. Total number 51.3 million people.

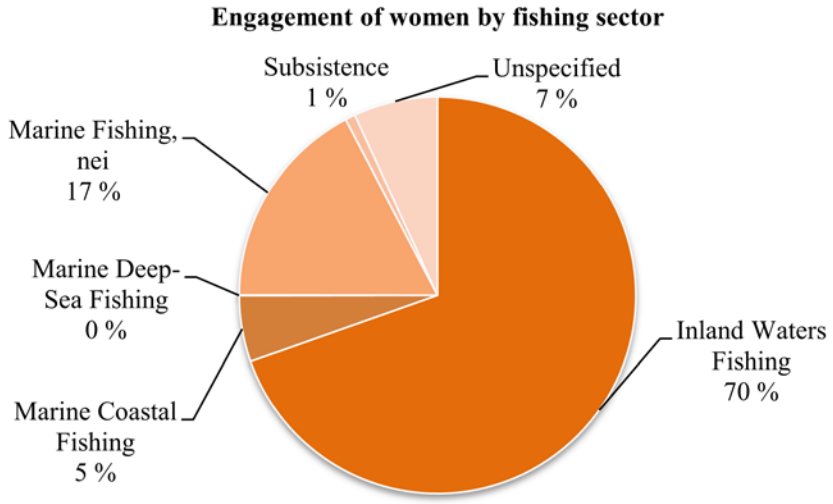


Fig. 3. Percentage of reported women engaged in the different fishing sectors (values show averages for the years 2009-2014), N=7.5 million

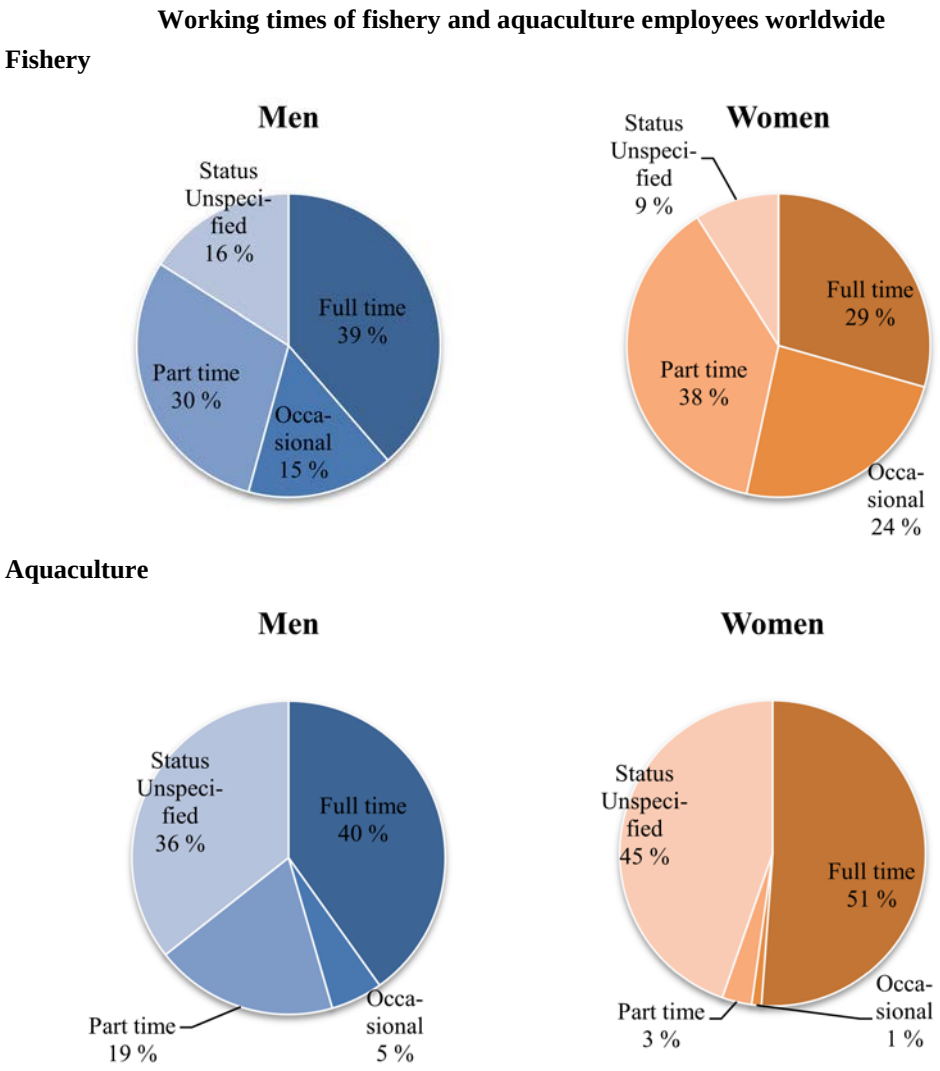


Fig. 4. Percentage of women and men engaged in the fishery and aquaculture sectors by working times (averages for the years 2009–2014)

The data compiled by FAO through national reporting provides information about number of people employed and the working times of employees in the fisheries sector. Most men were full-time employees in the fishery sector (39 %), whereas most women worked part-time (38 %) or on an occasional basis (24 %) (Fig. 4). Women may be more engaged in small-scale or subsistence fishing, splitting their time between fishing and their family obligations. In the aquaculture sector, however, 51 % of women were recorded as full-time workers. Small-scale aquaculture units may be located close to the household, making it easier for women to look after both the family and the

farm. At the same time, women working at modern aquaculture facilities may be more likely to work full-time.

Regional highlights from Asia

The data reported to FAO of employment statistics in the fisheries and aquaculture sector started in 1952, with Japan first reporting sex-disaggregated employment fisheries statistics in 1970 and aquaculture in 1990. From the 50 Asian countries that have ever reported employment statistics for the fishery sector, on average only 8 (17 %) countries reported information on female workers during 2009–2014. For the aquaculture sector, 8 (23 %) out of 36 countries reported sex-disaggregated data (Table 2). These few countries reported that overall, 4.4 million (66 %) women were engaged in the fishery sector, while 2.2 million were employed in the aquaculture sector (34 %). Some of the largest countries in the region has not been reporting fisheries statistics for a number of years and the addition of this reporting could further increase the ratio of women working in both fisheries and aquaculture.

Table 2. Average number of countries in Asia that reported employment data to FAO during 2009-2014, M = Men, U = Unspecified

Sector	Only M or U	All genders
Fisheries (50 countries)	33 countries (66 %)	8 countries (17 %)
Aquaculture (36 countries)	26 countries (72 %)	8 countries (23 %)

In Asia for the years 2009–2014, an average of 28 million (63 %) people were employed in the fishery sector and 16.5 million people (37 %) were engaged in the aquaculture sector. For both sectors, 30 % of all employment was recorded in mainland China. Overall, 80 % of the employees were men, 15 % women and 5 % sex-unspecified.

The majority of people (all genders) were employed in the Inland Waters Fishing sector (57 %), followed by Marine Fishing nei (26 %) and the Marine Coastal Fishing sector (12 %) (Fig. 4). The highest number for employment in the fishery sector was recorded in China (30 %), India (29 %), Myanmar (10 %) and Indonesia (9 %). Women were mainly reported as engaged in the Inland Waters Fishery (71 % of women) and the Marine Fishing (nei) sector (17 %).

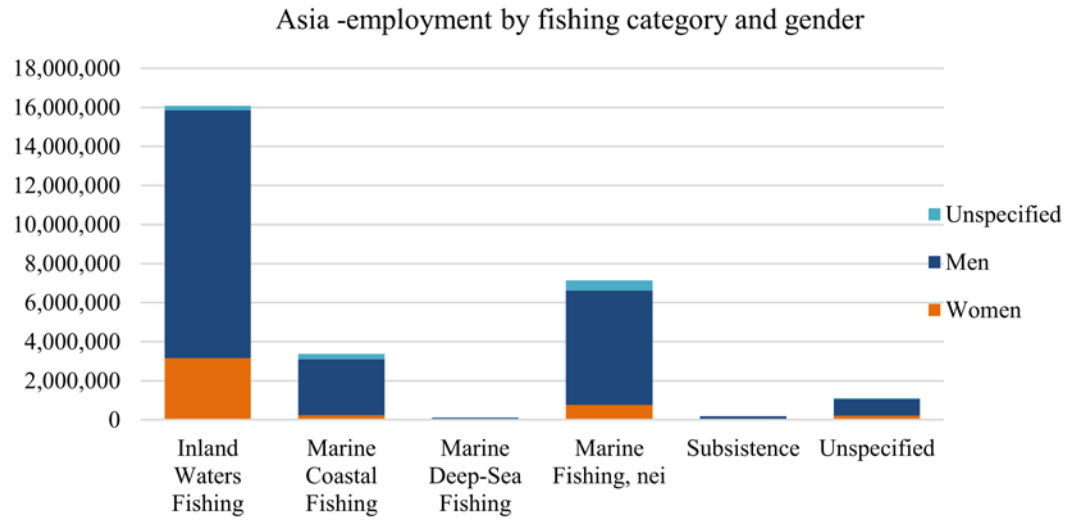


Fig. 5. Average employment numbers by fishing categories and gender (values show averages for the years 2009–2014)

Discussion

As the reported figures are examined it must be kept in mind that each of the following factors may result in nationally reported data that do not reflect the true level of participation: a lack of a national data reporting programme; the collection of only partial data; and a lack of synchronization in national reporting systems. Numerous studies exist that provide a snap-shot of available sex-disaggregated employment data. Although these are often not reflected in the national statistics reported to FAO, they should be considered in parallel with national reports to reduce the patchiness of coverage and the biases that may therefore be included.

In many areas, narrow definitions of fisheries, e.g., where activities such as shellfish gathering or gleaning are excluded, results in the exclusion of women from employment statistics. Further, in some countries “fishing” as an activity is usually only identified when the fish is caught for selling, which underestimates the importance of subsistence fishing and especially the role of women. Another form of exclusion is when women are not permitted to register as fishers, and thereby be counted in the statistics.

The FAO study, "The role of women in fisheries and aquaculture" (FAO 2015a), combined studies that were carried out in Chile, Colombia, Paraguay and Peru to investigate the engagement of women in the fishery and aquaculture sectors. The study concluded that the numerical and qualitative importance of women in fisheries and aquaculture was not adequately reflected in the available statistical information. The authors emphasized the importance of placing more focus on the whole fisheries value chain to include all pre and post-harvest activities in which women engage. According to Pereira (2001), women are more involved in seafood processing, marketing, and aquaculture, compared to capture fisheries. Although this study focused on South America, similar findings would be made in Asia and across all regions.

A recent FAO Globefish publication, entitled "The role of women in the seafood industry" (Monfort 2015) casts a global light on the various roles women play throughout the sectors. Per the report, women usually engage in small-scale activities, which demand little in terms of capital and technology and are compatible with their family obligations. Activities include fishing from shore, such as collecting benthic animals, small-scale and subsistence fishing and small-scale aquaculture. The engagement of women in small-scale fishing differs among countries and can range from women themselves fishing or taking care of the fishing equipment used by men. Women may also participate in diverse ways in financing the activity or by supporting family fishing enterprises through various tasks. Furthering this knowledge will help to formulate the right questions for data collection, avoiding the underestimation of small-scale and subsistence activities. In most regions, fish catching is male-dominated and women make up the dominant proportion of the labor force in seafood processing and post-harvest activities. It was estimated that up to 90 % of all workers in the secondary sectors are women (FAO 2012). In addition, in many Asian and African countries, women are key players in seafood trading and selling.

Similarly, in a study about the Pacific Islands Gillett (2009), found that certain definitions or categories negatively affect the accurate portrayal of the importance of women in fisheries employment, and this also applies globally. Gillett (2009) found that the concept of using "main unpaid activity" in surveys for defining the subsistence fisheries sector, downplays the importance of secondary activities, e.g., even for women who do considerable fishing,

childcare is often the main unpaid activity. Also, commercial fish processing, where many women are employed, is often recorded in the manufacturing sector and not the fisheries sector.

FAO does not currently report employment data collected for post-harvest processing, and this results in a blindspot for an area of significant engagement of women. Thus, enhanced statistics for the secondary post-harvest and service sectors would greatly improve the understanding of the importance of women's contribution to fisheries and aquaculture, food security and livelihoods. An important challenge, also, for the FAO fisheries data compilation on fish production is the different definitions for "fishing" and "fishing categories" that exist in different countries.

Collecting fisheries employment statistics seems to be more difficult than counting jobs in most other sectors. Many fishers work in isolated places and in many cases there is no source of indirect information (e.g., tax or retirement scheme records). In addition, the combination of formal and informal work together with varying degrees of participation in subsistence activities further complicates the situation. During an FAO workshop in March 2016, entitled "Regional workshop towards improving small-scale fisheries and aquaculture data collection", participants noted the need for a Master Sampling Frame for household-based fisheries and aquaculture and recognized that the most appropriate source of information to develop such a frame is the Census of Population. Considerable knowledge of the sector is required to collect meaningful information. The workshop recommended that fisheries statisticians raise the issue of inclusion of suitable screening questions in the Census of Population with relevant officers in National Statistics Offices responsible for the Census of Population. Moreover, the "Guidelines to Enhance Fisheries and Aquaculture Statistics through a Census Framework" can help countries to establish an integrated data collection and statistical system for fisheries and aquaculture (Global Strategy 2015). The document provides guidance on designing a household questionnaire survey for fisheries and aquaculture in order to establish frame information on the populations engaged in small-scale fisheries. This can serve as a basis to design further regular monitoring of the sector.

The Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines) (FAO 2015b) was the first fishery instrument addressing gender. To follow up, in late 2016 FAO hosted an expert workshop on gender-equitable small-scale fisheries in the context of the implementation of the SSF Guidelines. The SSF Guidelines recognize the multiplicity of roles, contribution and the crucial importance of women in the small-scale fisheries sector worldwide and the implementation of the SSF Guidelines and their explicit call both for better data reporting and explicit inclusion of gender should facilitate better national sex-disaggregated reporting. As gender is mainstreamed throughout fisheries with various mechanisms such as these Guidelines the motivation for regular data collection and reporting of sex-disaggregated data should become more consistent. The human dimensions must be considered in fisheries regulations, policies and plans, and this simply must include the gender perspective (FAO 2016b) or fisheries and aquaculture activities and development strategies.

Conclusions

If the work on gender-mainstreaming conducted with fisheries and aquaculture is done with the aim to foster the potential and capacity that already exists with women in fisheries and aquaculture communities around the world, then the first step is surely to establish a strong foundation of data.

Although sex-disaagregated reporting on fisheries employment statistics is slowly improving, on average only 27 % of all countries reported to FAO the participation of women in the primary fisheries and aquaculture sectors. Thus, increasing the awareness of the role women play in the seafood sectors more broadly is crucial. FAO has a role to play by providing capacity building to improve national data collection systems and by encouraging countries to report sex-disaggregated employment data. Particularily in Asia, where both sectors are so important, the very low reporting rates must be urgently improved. Looking forward the work being done on promoting standards and methodology provides pragmatic tools for countries looking to improve their statistical reporting on sex-disaggregated employment statistics.

Informed policy-making depends on high quality information. Similarly, the FAO needs good quality data to understand global trends and disseminate knowledge about social, economic and environmental aspects of global food systems. The FAO Fisheries and Aquaculture Department depends on member states to report their data in a timely fashion and according to FAO standards.

In addition, more transparent data sharing, such as the compilation of metadata, will improve the quality of FAO fisheries statistics and along with expanded definitions of fishing activities to better increase recognition of the female workforce. To meet this objective the full complement of reported sex-disaggregated employment statistics available to-date will be released going forward in 2017.

Acknowledgements

The authors wish to thank Chika Fukugama and Rumika Masuda for the contributions they made while working as interns with the FAO Fisheries and Aquaculture Department through an agreement with Nagoya City University, Japan.

References

Aguilar, L. and I. Castañeda. 2001. About fishermen, fisherwomen, oceans and tides: A gender perspective in marine-coastal zones. https://portals.iucn.org/library/node/7885.Accessed 12 December 2016.

FAO. 2016a. Promoting gender equality and women's empowerment in fisheries and aquaculture. Rome. 12 pp.

FAO. 2016b. The State of World Fisheries and Aquaculture 2016. Contributing to food security and nutrition for all. Rome. 200 pp.

FAO. 2015a. The role of women in fishing and aquaculture in Chile, Colombia, Paraguay and Peru. Integration, systematization and analysis of national studies. Final Report. Chile. 38 pp.

FAO. 2015b. Voluntary guidelines for securing sustainable small-scale fisheries in the context of food security and poverty eradication. Rome. 18 pp.

FAO. 2013. Good practice policies to eliminate gender inequalities in fish value chains. Food and Agriculture Organization of the United Nations, Rome. 120 pp.

FAO. 2014. The State of World Fisheries and Aquaculture. Rome. 243 pp. http://www.fao.org/3/a-i3720e.pdf.Accessed 10 December 2016.

FAO. 2012. The State of World Fisheries and Aquaculture 2012. Contributing to food security and nutrition for all. Rome. 209 pp. http://www.fao.org/docrep/016/i2727e/i2727e.pdf.Accessed 10 December 2016.

FAO. 2006.Gender policies for responsible fisheries. FAO. Rome. 12pp. http://www.fao.org/3/a-a0990e.pdf. Accessed 12 December 2016

Gopal, N., M. Williams, M. Porter, K. Kusakabe and P. Choo. 2014. Guest Editorial-Gender in Aquaculture and Fisheries–Navigating Change. Asian Fisheries Science 27S: 1-14.

Gillett, R. 2009. Fisheries in the economies of the Pacific island countries and territories. Asian Development Bank, Mandaluyong City, Philippines. 484 pp.

Global Strategy. 2015. Guidelines to enhance fisheries and aquaculture statistics through a census framework. 165 pp. http://gsars.org/wp-content/uploads/2015/06/Guidelines-to-Enhance-Fisheries-and-Aquaculture-Statistics-through-a-Census-Framework-WEB.pdf.Accessed 12 December 2016

Kelleher, K., L. Westlund, E. Hoshino, D. Mills, R. Willmann, G. de Graaf and R. Brummett. 2012. Hidden harvest: The global contribution of capture fisheries. Report No. 66469-GLB,The World Bank, Washington. 92 pp.

Ifeka, C. 1989. Women in fisheries. Why women count: Prospects for self-reliant fisheries development in the South Pacific compared to the Indian Ocean. In Development and social changein the Pacific Islands. London. (ed. A.D. Couper), pp. 32–48.Routledge.

Lentisco, A. and Alonso, E. 2012. On gender mainstreaming strategies and tools in fisheries development projects: RFLP gender strategy and lessons from the Asia-Pacific Region. Asian Fisheries Science 25S: 105-117

Monfort, M.C. 2015. The role of women in the seafood industry. GLOBEFISH Research Programme, 119, 67 pp.http://www.fao.org/3/a-bc014e.pdf. Accessed December 12, 2016

Pereira, G. 2001. Women in fisheries in Latin America. In Global Symposium on Women in Fisheries, Sixth Asian Fisheries Forum 29 November 2001, Kaohsiung, Taiwan.(eds. Williams, M.J., N.H. Chao, P.S. Choo, K. Matics, M.C. Nandeesha, M. Shariff, I. Siason, E. Tech and J.M.C. Wong), pp. 175-180.WorldFish Center, Penang, Malaysia.

Williams, M.J., M.C. Nandeesha and P.S. Choo.2006. Changing Traditions: A summary report on the first global look at the gender dimensions of fisheries. In:Global Symposium on Gender and Fisheries: Seventh Asian Fisheries Forum,1-2 December 2004, Penang, Malaysia. (eds.P.S. Choo, S.J. Hall, and M.J. Williams), pp 1-6. WorldFish Center, Penang, Malaysia.

Gender in Aquaculture and Fisheries: Engendering Security in Fisheries and Aquaculture
*Asian Fisheries Science Special Issue **30S** (2017): 291-301*

ISSN 0116-6514
https://doi.org/10.33997/j.afs.2017.30.S1.016
Short Communication

Comparing Awareness and Behaviour Towards Food Consumption Trends: Gender Differences among Milkfish, *Chanos chanos* (Forsskål 1775), Purchase Decision Makers in the Province of Iloilo, Philippines

REYNOLD D. TAN*

College of Management, University of the Philippines Visayas
General Luna Street, Iloilo City, 5000 Philippines

Abstract

Numerous studies have validated that consumer awareness is not univocally consistent with behavior. This study attempted to compare awareness and behavior of milkfish, *Chanos chanos* (Forsskål 1775) purchase decision makers in the Province of Iloilo, Philippines towards food consumption trends. Food consumption trends included are: (1) food safety; (2) organic food; (3) sustainability in production; (4) good agricultural practices; (5) traceability; (6) local production; (7) support to local farmers; and (8) food labeling. Knowledge of awareness and behavior is essential in designing the value offering intended for the chosen target market.

Respondents of the study consisted of 378 milkfish purchase decision-makers. Sampling of respondents was performed by multi-stage stratified random sampling with degree of urbanization and congressional district as the bases of stratification. The sampling frame was developed from a list of households in 5 municipalities and 1 highly urbanized city. To determine the level of awareness and behavior, respondents were asked to answer an interview schedule with 5-point Likert scale-type questions for awareness and 7-point Likert scale type for behavior. A one-way ANOVA was conducted to explore the effect of gender on awareness and attitude towards the 8 food consumption trends.

* Corresponding author. Email address: reynold.tan@gmail.com, rdtan1@up.edu.ph

Except for food safety, results show that there was no significant difference between male and female purchase decision makers on the level of awareness for all 8 identified consumption trends. However, there was a statistically significant difference in the level of behaviour between male and female purchase decision makers for all 8 food consumption trends. Difference in the level of behaviour was found to be highest on the issue of food safety with males having an average of 5.9 (true of me) vis-à-vis 5.2 for females (somewhat true of me).

It was concluded that dividing the market based on gender is a viable segmentation variable due to considerable differences between male and female in their levels of awareness and behaviour towards food consumption trends.

Introduction

Chanos chanos (Forsskål 1775) or milkfish is the most important fish species being farmed in the Philippines today (Yap et al. 2007). It is cultivated in freshwater, brackish water and marine environments. The Province of Iloilo is one of the major milkfish producers, contributing 9 % to the country's milkfish production (PCAARRD 2012). Other top milkfish producing provinces cited were Pangasinan (39 %), Bulacan (11 %), Capiz (11 %), and Negros Occidental (10 %).

Not only is Iloilo a major milkfish producer but a major consumer as well. Based on the Philippine Statistical Authority (PSA 2014), the primary protein sources in the Province of Iloilo are pork (7.25 kgs.person^{-1}.year^{-1}), milkfish (6.89 kgs.person^{-1}.year^{-1}) and chicken (6.81 kgs.person^{-1}.year^{-1}). Consumption of milkfish in the Province of Iloilo is higher when compared to national and regional per capita consumptions (Table 1).

Table 1. Comparative animal protein consumption, kgs.person^{-1}.year^{-1}, Iloilo, Western Visayas and Philippines, 2014

LOCATION	PORK	BEEF	CHICKEN	MILKFISH	ROUNDSCAD
Philippines	9.466	0.926	8.077	3.663	5.738
Western Visayas	7.54	1.232	6.453	6.316	5.322
Iloilo	7.275	1.019	6.806	**6.884**	4.586

Source: BAS (2014)

While demand for fishery products is rising, attributed to increasing population, growing preference towards healthy food, and, intensifying human concerns about terrestrial animal welfare, the production of milkfish in the

Province of Iloilo is slowly dwindling (Fig. 1). It can only be surmised that milkfish production is declining because of diminishing financial sustainability arising from low profitability and level of competitiveness. Published studies are suggestive of the direct link between satisfying customer needs and profitability (Kahan 2013; Narver and Slater 1990; Siguaw et al. 1998).

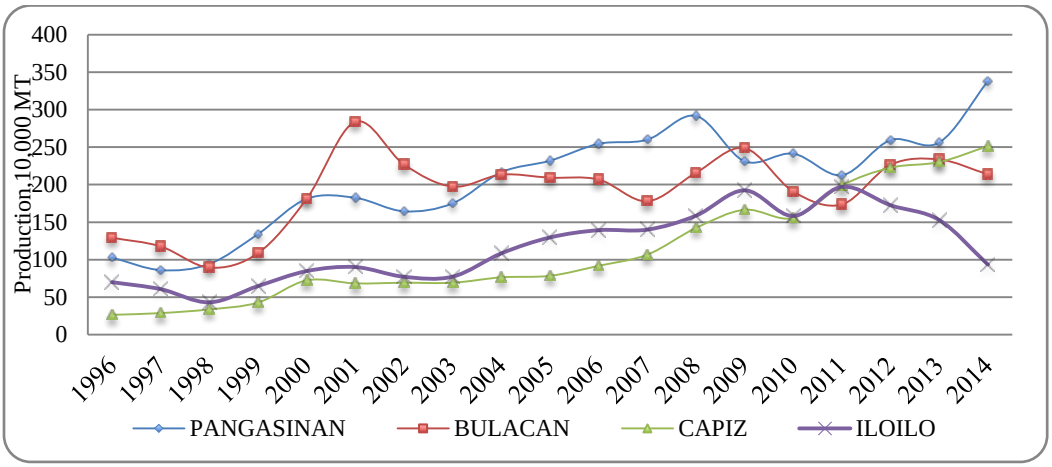


Fig. 1. Milkfish *Chanos chanos* (Forsskål 1775) production of top producing provinces in the Philippines, 1996-2014

The literature is rich on both theoretical and empirical studies on consumer demand covering various commodities and applied in many countries. In addition, many studies have been conducted to determine gender differences with respect to awareness and behavior towards food consumption trends, e.g., Wardle et al. (2004), Cavadini et al. (2000), Davy et al. (2006), Cooke and Wardle (2004) and Popkin et al. (1996). Kearney (2010) identified attitudes and behavior as drivers of food consumption. Knowledge of consumers' attitudes and behavior will be essential in designing the value-offering intended for the target market. Kotler (2013) defined market offering as 'a combination of product, services, information or experiences offered to the market to satisfy a need or a want.' Food consumption trends mentioned in FAO (2015) and considered in the present study were food safety, organic food, sustainability in production, good agricultural practices, traceability, locally-produced, support to local farmers, and food labeling.

Materials and Methods

Area of the Study

The research was conducted in the Province of Iloilo, Philippines. Iloilo is in the central part of the Philippine archipelago and it comprises the southeastern part of Panay Island and the island province of Guimaras. The capital city of the Province is Iloilo City. Iloilo is divided into 42 municipalities and 1 component city.

Types of Data and Methods of Data Collection

The study used primary data collected by trained enumerators. 378 respondents were requested to answer an interview schedule that assessed their level of awareness and behavior towards food safety, organic food, sustainability in production, good agricultural practices, traceability, locally-produced, support to local farmers, and food labeling. Level of awareness was measured using a 5-point Likert scale with the following categories: (1) not at all aware; (2) slightly aware; (3) somewhat aware; (4) moderately aware; and, (5) extremely aware. Behavior of respondents was evaluated as the self-rated likelihood of acting positively to the listed food consumption trends and was captured using a 7 point Likert scale with the following categories: (1) very untrue of me; (2) untrue of me; (3) somewhat untrue of me; (4) indifferent; (5) somewhat true of me; (6) true of me; and (7) very true of me. The survey instrument was translated into the local dialect to ensure that respondents understand the questions fully.

Sampling Procedure

Sampling of respondents was by multi-stage stratified random sampling. Those chosen as respondents were milkfish purchase decision-makers in each household. In the first stage of stratification, the basis was the degree of urbanization. This classifies the area as either urban or rural. Congressional district was used in the second stage of stratification. One representative municipality was randomly chosen in each of Iloilo Province's 5 congressional districts. This guarantees that each of the 5 congressional districts had a representative municipality.

The sampling frame was developed from the list of households obtained from the identified municipalities. Appropriate sample size per target population was determined based on 95 % level of confidence, 5 % margin of error, and 50 % response distribution. The formula used in determining the sample size was

$$\text{Sample size } n = \frac{NZ^2s^2}{Nd^2+Z^2s^2}$$

where N = total number of sampling units in a population, s $= \delta^2$, Z = normal variable and d = maximum error deemed acceptable. The sampling frame was developed from the list of households obtained from the identified municipalities. The appropriate sample size per target population was determined based on 95 % level of confidence.

The distribution of sample size per municipality including a description of the chosen municipality is shown in Table 2. Sample size allocation per area covered was determined by proportional allocation.

Table 2. Profile of 5 sample municipalities and 1 highly urbanized city and sample size per area

ITEM	ILOILO CITY	MIAGAO	LEGANES	MINA	BAROTAC NUEVO	CONCEPCION
Land area (sq.km)	78.34	56.8	32.2	3.4	94.49	86.12
District	Lone District	1	2	3	4	5
Income class (2010)	1st	1st	4th	5th	2nd	3rd
Distance from the center (km)	0	40	11	38	27.5	105.6
Population (2010)	424,619	64,545	29,438	21,785	51,867	39,617
Milkfish production Status	Deficit[1]	Deficit[1]	Surplus[2]	Deficit[1]	Surplus[2]	Deficit[1]
No. of respondents	189	59	27	20	47	36

Source: Province of Iloilo (2016)
[1] non-milkfish producing municipality
[2] milkfish-producing municipality

Analytical Technique

The level of awareness and behavior towards food consumption trends was analyzed using means, standard deviations and frequency counts. Effect of gender on the level of awareness and behavior for each consumption trend issue

was determined using a one-way analysis of variance (ANOVA). This tests the null hypothesis that there is no difference in the means of the variables across gender of the purchase decision-maker.

$$H_o = \mu_1 = \mu_2 = \mu_3 \ldots = \mu_n$$

H_1= at least one of the μ_s is different from the others

Where H_o = null hypothesis, H_1 = alternative hypothesis and μ_n = mean of the variable (awareness and behavior on food consumption trends), *n* refers to gender category as either male or female. H_o is rejected or not, based on the F-test result. Probability value (Prob>F) less than 0.10 indicates significance at the 10 % level and is interpreted as the justification for rejecting the H_o. It is hypothesized that awareness and behavior on food consumption trends does not vary across gender of the milkfish purchase-decision maker. Levels of awareness and behavior were personal assessment of awareness and behavior towards food consumption trends measured on a Likert scale. Norman (2010) argued for the use of parametric statistics with Likert data, citing consistent results in the empirical literature dating back 80 years.

Results and Discussion

Level of Awareness towards Food Consumption Trends

Food safety was the food consumption trend consumers from Iloilo were most aware of (mean =3.65, moderately aware) (Table 3). The food consumption trend consumers were least aware of was sustainability in production (mean=2.86, somewhat aware). The order of ranking of the food consumption trend that respondents were most and least aware of was consistent between male and female respondents. Awareness was highest on food safety (3.65), followed by support to local farmers (3.30), local production (3.29), food labeling (3.13), organic food (3.14), and good agricultural practices (3.02). Level of awareness was lowest in the area of sustainability in production (2.86). The level of awareness gap was highest in the area of food safety with female respondents reported to be somewhat aware while the male respondents reported to be moderately aware (0.45). The awareness gap was lowest in the areas of sustainability in production and adherence to good agricultural practices among producers (0.02).

Table 3. Comparative level of awareness towards food consumption trends among milkfish *Chanos chanos* (Forsskål 1775) purchase decision makers in the Province of Iloilo, Philippines, 378 consumers, January 2016.

Food Consumption Trend	Mean	Female	Male	Variance	f-stat	p-value	sig
Food safety	3.65	3.46	3.91	0.45	10.80	0.001	***
Sustainability in production	2.86	2.86	2.87	0.02	0.36	0.547	ns
Good agricultural practices	3.02	3.01	3.04	0.02	0.02	0.897	ns
Organic food	3.14	3.11	3.19	0.08	0.03	0.855	ns
Traceability	3.03	2.97	3.11	0.15	1.10	0.295	ns
Locally-produced	3.29	3.21	3.41	0.19	1.99	0.159	ns
Support to local farmers	3.30	3.22	3.4	0.18	1.70	0.193	ns
Food labelling	3.13	3.06	3.24	0.17	1.42	0.234	ns

*** 1 % level of significance, ns- not significant

Of the 8 food consumption trends considered, only the level of awareness on food safety varied across gender. An analysis of variance showed that difference on the level of awareness across gender was significant, $F(1,376) = 10.84$, $p = .0011$. Post hoc analyses using the Bonferroni post hoc criterion for significance indicated that the average level of awareness was significantly higher among males ($M = 3.91$, $SD = 1.20$) than females ($M = 3.46$, $SD = 1.40$). This is consistent with the findings of Nurhan (2007) that male respondents scored higer than females on food safety knowledge in his study in the homes in Turkey. Except on the issue of food safety, the non-significant difference between genders in the level of awareness to all other food consumption trends can be attributed to unrestricted access to information regadless of gender in the study area. In the Province of Iloilo where the study was conducted, education as well as access to information is open regardless of gender. The relatively higher level of awareness among male purchase decision makers vis-à-vis their female counterparts may also be explained by the higher level of education among male responendents. About 93 % of the male responendents acquired a high school education and above, in contrast to female respondents who had 87 %. The level of education has a positive relationship with the level of awareness towards food safety (Unusan 2005; Patil et al. 2005).

Behavior towards Food Consumption Trends

Respondents exhibited the highest consistency in personally-assessed behavior in accordance to food safety (mean = 5.52, 'true of me') practices

(Table 4). This means that the males in general behaved in accordance with food safety practices. Respondents were found to exhibit the lowest personally-assessed behavioral consistency score with respect to sustainability in production (mean = 4.21, neutral). The behavioral gap across gender was noted to be highest on the issue of food labeling (0.72). Male respondents, on the average, tended to behave in conformance with food labeling requirements/regulations vis-à-vis their female counterparts by 0.720. Variability in the means of personally assessed behavior towards food consumption varied between male and female respondents. Difference in behavior was noted to vary at 0.01 significance level in the areas of food safety, traceability, and food labeling. Difference in behavior was noted across gender at 0.05 significance level for organic food consumption, sustainability in production, and local production. Finally, difference between genders with respect to good agricultural practices and support to local farmers was noted to vary at 0.1 significance level.

Table 4. Comparative level of behavior towards food consumption trends among milkfish *Chanos chanos* purchase decision makers in the Province of Iloilo, Philippines, 378 consumers, January 2016.

FOOD CONSUMPTION TREND	Mean	Female	Male	Variance	f-stat	p-value	sig
Food safety	5.52	5.24	5.9	0.661	11.5	0.008	***
Organic food	4.61	4.41	4.9	0.49	6.57	0.011	**
Sustainability in production	4.21	4.04	4.46	0.42	5.07	0.025	**
Good agricultural practices	4.58	4.43	4.79	0.36	3.53	0.061	*
Traceability	4.31	4.06	4.65	0.59	9.08	0.003	***
Locally-produced	4.67	4.47	4.95	0.48	6.47	0.011	**
Support to local farmers	4.7	4.54	4.91	0.37	3.63	0.057	*
Food labelling	4.4	4.1	4.82	0.72	12.8	0.000	***

*** 1 % level of significance, ** 5 % level of significance, * 10 % level of significance

In spite of the relatively small differences in awareness between the genders with respect to food consumption trends, males generally behaved at a level that was more consistent with food consumption trends than did females. This indicated that males generally adopted food trends faster than females. In food safety, for example, male purchase decision makers generally behaved in accordance with food safety practices than female purchase decision makers. Although some claim, e.g., Verbeke et al. (2007) that awareness is not being

translated into actual purchase behavior, in Iloilo, this held only for female purchase decision-makers but not for males. Kotler (2013) contended that many factors influence consumer behavior and among those are cultural (culture, sub-culture, and social class), social (reference groups, family, and roles and statuses), personal (age and life cycle stage, occupation, economic situation, lifestyle, personality and self-concept) and psychological (motivations, perception, learning, and beliefs and attitudes) factors. Attribution to individual and combined effects of these factors on variability in behavior for all food trends across gender may be difficult but, in the present study, the over-all effects of these factors strongly influenced male rather than female purchase decision-makers.

Conclusions and Recommendations

This study investigated the level of awareness and behavior of milkfish purchase makers in the Province of Iloilo across gender. This was a study into the gender differences among consumers in awareness and behavior for potential use in understanding market segmentation.

On awareness, only food safety showed a significant difference between male and female respondents. On behavior towards food consumption trends, there was an observed difference between male and female purchased decision-makers. Males generally outscored the females in terms of level of behavior towards all food consumption trends. Information generated is vital in the segmentation of the milkfish market because product marketers would want to know more deeply how the consumers are reacting to food issues.

Based on the results of the study, food marketers would be advised to segment the milkfish market. A market segment is comprised of a homogenous group of existing and potential customers sharing the same needs, wants and demand characteristics and that would respond similarly to a given marketing action. Grouping the market based on the gender of the purchase decision maker is a viable segmentation variable due to considerable differences between males and females. If the intent of marketing communication is to increase the level of awareness, communication that would appeal largely to both genders can be adapted except on the issue of food safety where it will be more effective if addressed to women. Marketing communication to close behavior gaps between men and women can be made more effective if targeted towards women.

Acknowledgements

The author would like to acknowledge technical contributions made by Dr. Isabelita M. Pabuayon, Dr. Agnes C. Rola, Dr. Zenaida M. Sumalde and Dr. Jose Yorobe, Jr. in the preparation of the manuscript. In addition, financial support from the University of the Philippines System through its Doctoral Studies Fund, from the University of the Philippines Visayas and from the Southeast Asian Regional Center for Graduate Studies and Research is further acknowledged.

References

Cavadini, C., A.M. Siega-Riz and B.M. Popkin. 2000. US adolescent food intake trends from 1965 to 1996. Arch Dis Child 83: 18-24.

Cooke, L.J. and J. Wardle. 2004. Age and gender differences in children's food preferences. British Journal of Nutrition 93:741-746.

Davy, S.R., B.A. Benes and J.A. Driskell. 2006. Sex differences in dieting trends, eating habits, and nutrition beliefs of a group of midwestern college students. Journal of the American Dietitic Association 106: 1673-1677.

Kahan, D. 2013. Marketing-oriented farming: An overview. Farm Management Extension Guide 1. Food and Agriculture Organization, Rome, Italy. 97 pp.

Kearney, J. 2010. Food consumption trends and drivers. Philosophical Transactions of the Royal Society B 365: 2793-2807.

Kotler, P. and G. Armstrong. 2013. Principles of Marketing, 14th Edition, Pearson Education Limited, Essex, England.

Narver, J.C. and S.F. Slater. 1990. The effect of market orientation on business profitability. Journal of Marketing 54:20-35.

Norman, G. 2010. Likert scales, levels of measurement and the "laws". Advances in Health Science Education 15: 625-632.

Nurhan, U. 2007. Consumer food safety knowledge and practices in the home in Turkey. Food Control 18: 45-51.

Patil, S.R., S. Cates and R. Morales. 2005. Consumer food safety knowledge, practices and demographic differences: Findings from meta-analysis. Journal of Food Protection 68: 884-1894.

PCAARRD (Philippine Council for Agriculture Aquatic and Natural Resources Research and Development). 2012. http://www.pcaarrd.dost.gov.ph/home/momentum/milkfish/index.php?option=com_content&view=article&id=1:all-about-milkfish&catid=1:home. Accessed 22 December 2015.

Philippine Statistical Authority. 2014. http://www.countrystat.psa.gov.ph. Accessed 15 January 2015.

Popkin, B.M., A.M. Siega-Riz and P.S. Haines. 1996. A Comparison of dietary trends among racial and socio-economic groups in the United States. The New England Journal of Medicine 335: 716-720.

Siguaw, J.A., P.M. Simpson and T.L. Baker. 1998. Effects of supplier market orientation in distributor market orientation and the channel relationship: The distributor perspective. Journal of Marketing 62: 99-111.

Unusan, N. 2005. Consumer food safety knowledge and practices in the home in Turkey. Food Control 18: 45-51.

Verbeke, W., F. Vanhonacker, I. Sioen, J.V. Camp and S. De Henauw. 2007. Perceived importance of sustainability and ethics related to fish: A consumer behaviour perspective. A Journal of the Human Environment 36: 580-585.

Wardle, J., A.M. Haase and A. Steptoe. 2004. Gender differences in food choice: The contribution of health beliefs and dieting. The Society of Behavioral Medicine 27: 107-116.

Yap, W.G., A.C. Villaluz, M.G. Soriano and M.N. Santos. 2007. Milkfish Production and Processing Technologies in the Philippines. Milkfish Publication Series No. 2, Bureau of Agricultural Research , Department of Agriculture, Philippines. 96pp.

Gender in Aquaculture and Fisheries: Engendering Security in Fisheries and Aquaculture
*Asian Fisheries Science Special Issue **30S** (2017): 303-312*

ISSN 0116-6514
https://doi.org/10.33997/j.afs.2017.30.S1.017
Short Communication

Security in Adversity: Highlighting Coastal Women's Agency and Efforts to Organize after Haiyan

MARY BARBY P. BADAYOS-JOVER*

Division of Social Sciences, College of Arts and Sciences, University of the Philippines, Visayas

Abstract

In 2013, Super typhoon Haiyan wreaked havoc on the coastal communities of Northern Iloilo and other areas of the Visayas group of islands in the Philippines. Tremendous losses in livelihood and property were recorded and various international, national and local institutions responded through immediate and strategic interventions. The present paper aims to highlight coastal village women's experiences with post disaster relief and rehabilitation. Using the post-Haiyan experiences of women in the island-village of Bayas as a case study, the paper also emphasizes the opportunity that post-disaster contexts provide for coastal village women's agency. Qualitative data for the study were gathered through a series of group and key informant interviews with community members and leaders. Since the women in the coastal village of Bayas were not engaged in offshore fishing they did not directly benefit from the various boat replacement assistance efforts extended to fishing families. Thus they organized themselves and lobbied in order to address security and sustainability concerns. Such opportunity for women's agency in the context of adversity needs to be supported by existing social networks and external institutions lest it be undermined by cultural practices that continue to marginalize and disempower women in coastal areas.

Introduction

On November 8, 2013, super typhoon Haiyan, locally known as super typhoon Yolanda, a category five typhoon, wreaked havoc on the coastal communities of Northern Iloilo and other areas of the Visayas group of islands in the Philippines. Haiyan was one of the most intense tropical cyclones ever recorded in history, with 195 mi h^{-1} sustained wind speed upon landfall, wind

*Corresponding author. Email address: mpbadayosjover@up.edu.ph

gusts of up to 235 mi h^{-1} and a 13 feet surge in sea level during the storm (Mercy Corps 2013). More than 16 million people were affected by Haiyan, with the death toll estimated by some government and other institutions as over 6,000 or even closer to 10, 000.

Northern Iloilo in Panay Island in the Philippines was one of the hardest hit by Typhoon Haiyan and various local, national and international institutions responded through immediate and strategic interventions. The island-village of Bayas in Estancia, northern Iloilo, was one of the adversely affected locales that experienced the influx of various post-disaster relief operations. Post-disaster recovery and rehabilitation efforts were generally gender-blind and carried out in typical top-down militaristic tradition by the national and local government units (Badayos-Jover and Defiesta 2014). International institutions likewise extended help to the community without necessarily being mindful of gender considerations. Women's needs were thus not addressed at the outset until the women articulated their own needs in various fora.

Disaster research has mostly focused on women's vulnerability and lack of empowerment in various contexts (Weist et al. 1994; Enarson 2008; Nowak and Caulfield 2008; Enarson and Morrow 1998; Badayos-Jover and Defiesta 2014). Such emphasis is hinged upon women's pre-disaster gender roles and societal status in patriarchal societies that render them weak in the face of catastrophes and the ensuing aftermath. Post-disaster situations often find women lacking in skills and social capital and/or networks that prove crucial for adapting to and even improving ruptured lives. Thus, researchers have pointed to the distinct gendered burdens women face post-disaster, as they contend with the challenges related with family needs and stability while being marginalized in reconstruction efforts led by predominantly male community leaders and institutions providing post-disaster aid. However, there are also instances when women become active in post-disaster reconstruction, even taking on traditional male tasks like house building (Drolet et al. 2015).

The impacts of disasters on nations, social groups and individuals vary depending on their level of vulnerability. These vulnerabilities are in turn influenced by physical, social, economic and environmental conditions as well as shaped by differences in social structures defined by age and physical ability, sex and gender (Enarson and Morrow 1998; Canon cited in Enarson and

Morrow 1998). Thus, gender researchers continue to argue that disasters have differential impact on women and men, with women oftentimes doubly burdened due to pre-disaster social norms that render them sidelined in recovery and rehabilitation (Juran 2012, Enarson 2008, Enarson and Morrow 1998). Such a scenario is quite typical in the Philippines, an archipelagic country that has long been categorized as hazard-prone and has become increasingly so in the context of climate change. However, certain studies like that of Bohle, Etzold and Keck (2009) put forward new frames for analyzing difficult circumstances, such as the agency-based resilience framework which emphasizes the "crucial role of social actors and their agency" (Bohle, Etzold and Keck 2009). This perspective "looks at resilience-building as focused on empowering the most vulnerable to pursue livelihood options that strengthen their social sources of resilience" (Bohle, Etzold and Keck 2009). The said framework is useful in looking at coastal village women's adaptive capacity or resilience in post-disaster contexts, particularly how their agency as actors manifests in such crucial times.

This paper chronicles coastal village women's experiences with disaster relief and rehabilitation, following an extreme climatic event. Birkmann et al. (2010) posits that major disasters have "the potential to change dominant ways of thinking and acting but little research has been done on the circumstances under which disasters generate such opportunities for change". The present paper argues for such a circumstance, particularly the spontaneous expressions of women's agency during the difficult post-disaster context. While volatile in patriarchal settings like coastal villages, women's agency redounds to their capacity for individual and collective action, or their commitment to transformative courses of action despite restrictive societal norms (Moya 1990, cited in Eduards 1994). The paper also emphasises the need for institutional support to sustain women's empowerment at the grassroots level, especially in the context of community re-construction following a major alteration.

Methods

The data used for this paper is preliminary and utilized qualitative methods such as group and individual interviews with the community members of Bayas, an island-village in Northern Iloilo in the Philippines. Such interactions with the community members started in January and went until

March 2014, a few months after Typhoon Haiyan devastated the village. The initial exchanges came about through an extension project carried out by a group of Social Science faculty members from the University of the Philippines Visayas. The project focused largely on helping the coastal community process their disaster experience and giving initial input on community empowerment, including awareness-raising on gender dynamics through sensitising workshops that doubled as focus group interviews. A year and a half later, in mid-2015 and then again in early 2016, the author went back to the locale to do more interviews in line with designing a research proposal focusing primarily on women's agency in post-disaster contexts.

A total of 70 participants (47 females and 23 males) representing the 7 "puroks" or village zonal areas in Bayas attended several gender-sensitising orientation workshops in the first quarter of 2014. They doubled as participants of preliminary focus group interviews. Key informant interviews with village leaders were also conducted at the time and more than a year later, leaders of the new women's association were also individually interviewed. Such interviews provided salient initial insights into the emergence of coastal women's agency following Haiyan and the necessary support mechanisms that are crucial to sustaining fledging efforts aimed at empowering women in the grassroots.

Results and Discussion

The areas severely affected by Haiyan underwent changes in livelihood and personal lives. The island-village of Bayas which is the locale of focus in this paper is mainly a fishing village, with men doing mostly offshore fishing and women engaged in fish drying and shell gathering. The typhoon destroyed fishing boats and left households with very few options for alternative sources of income. Immediately after the typhoon, community members reacted in stereotypical ways, with women "gathering household items dispersed by the storm surge, washing muddied clothes, cleaning abodes…". On the other hand, the men "cleared debris blocking roads, gathered dispersed corrugated roofing and cut down damaged house posts".

When post disaster relief started coming into Bayas, women complained that they were usually "not informed". Village officials who were in contact

with institutions that provided disaster aid were mostly men and presumably spoke for everyone in the village. This scenario gives credence to what Juran (2012) notes as systemic, structural discrimination that hinder women from accessing aid resources as institutions give aid to the "household head", invariably defined as a man. What transpired in Bayas then was likewise typical in the sense that disaster relief workers usually subsume women's needs under general community needs, assuming that women, being part of the community will already benefit (Badayos-Jover and Defiesta 2014). However, there are specific needs of women that are oftentimes overlooked by relief personnel and even community leaders. In the case of Bayas, the typhoon destroyed their community birthing facility and all equipment was washed out (pers. comm. with midwife, 2014), leaving child-bearing women with only the option to go to the town proper on the mainland in order to give birth. Even that option was not readily available after the typhoon as boats that are the main mode of transportation to the mainland were destroyed.

Since Bayas is an island with fishing as the main source of livelihood, post-disaster aid usually came in the form of boats. There was an influx of boat donations from various local and international donors in the months following the typhoon because preliminary institutional assessments by both local government units and NGOs noted that fishing boats were destroyed by the storm surge. Community consultations served as venues for women to articulate their opinions and needs, particularly with regards to donated boats: "It's always boats…every time people come here to give aid, they give boats. What about aid [specifically] for women?" The foregoing simple articulation was loaded with implications, particularly in light of what Birkmann et al. (2010) referred to as "windows of opportunity for change", or disasters serving as drivers for change within a number of interacting domains - social, economic, environmental and legal systems. One significant implication of the comment on boats is the mismatch between certain community needs and post-disaster institutional responses. While the immediacy of response following a coastal disaster is imperative, aid institutions may also practice flexibility with regards community needs, as well as the needs and capacities of certain sectors like women, especially in the rebuilding phase (Drolet et al. 2015). Gender-sensitivity is a given if one is to effectively carry out institutional support to disaster survivors. At the very least, being mindful of gender dynamics allows aid workers and donors to ensure the relevance of the help they extend to as

many surviving sectors as possible. Moreover, gender-sensitivity allows one to veer away from traditional notions of fishing as solely a male activity and that men's needs, i.e., boats, take precedence.

While seemingly simplistic, Bayas women's demand for aid specifically targeting women in the post-Haiyan period speaks volumes of a greater need for autonomy from the traditional societal gendered expectations they subscribe to. Traditionally, Filipino women, particularly mothers, would subsume their own needs to that of the other family members' needs. However, a super typhoon not just changed their landscape; it became a turning point for possible transformation in gender relations to take place. They were willing to learn new skills and demand help to get them started on such new skills. Rajasingham-Senanayake (2004) argues that, "contemporary language still lacks the vocabulary necessary for women to [effectively] articulate the transformations they have experienced". However, for the women in Bayas, "there was no turning back, no return to established social orders that make them vulnerable in disasters". One lesson they learned the hard way is to not be solely dependent on fishing as means of livelihood because events such as storm surges can simply render them wanting in an instant.

The women of Bayas were not organized into any association prior to Haiyan and in the few months after the disaster. Their primary sources of income were buying and selling food items, fish selling, store vending and providing services like haircuts. Yet in the months following Haiyan, when various entities came to offer post-disaster relief, the women started to articulate their specific needs. As previously mentioned, the women noticed the rather skewed interventions that generally only benefit men. Hence, when an opportunity came for women's concerns to be articulated via one community level capacity-building project, they insisted on activities solely benefitting women. The project proponents and implementers thus negotiated with the donor agency and initiated the formation of the Active Women Food Processors of Bayas, Estancia in order to capacitate the women.

The Active Women Food Processors of Bayas, Estancia was founded in March 2014, 4 months after Haiyan. Membership is purely community-based hence there was a cross-section of women who requested livelihood workshops and were taught how to process squid as squid is one of the resources women

can access or catch on the island. The project implementers also gave modest food processing equipment to the newly formed women's organization, to get them started on new modes of earning. As in any other newly-formed group, however, the Women Food Processors of Bayas encountered sustainability concerns at the outset. The officers could not successfully impose association dues and members basically prioritised other, government-initiated networks due to monetary incentives. Hence, the group could not come up with the start-up capital to put up a viable business and they also lacked promising markets for their products. Eventually, the initial women's association in Bayas had to undergo a donor-driven reorganisation within the year of its founding to meet basic requirements for financial support by a different external institution.

Strong support by external, more established institutions seems crucial then for women-led fledgling organisations to prosper at the grassroots. The Bayas Women's Association (BAWA) was founded in September 2014, just 6 months after the first attempt at forming a grassroots women's organization. Most of its members belong to the older Women Food Processors group and the "Kalipunan ng mga Liping Pilipina" (KALIPI), a women's association organised by the town or municipal government. According to key informants, BAWA was formed so the members could avail of the post-Haiyan financial and housing assistance provided by Balay Mindanao, an NGO funded by Action Aid UK. Unfortunately, it was not made clear in the initial interviews conducted whether the said NGO specifically targeted women as beneficiaries or it just happened that a group of women wanted to access financial aid. What became apparent was the NGO's interest in the sustainability of their post-disaster assistance, hence, their prescribed mechanisms and processes prior to the actual financial grant. One condition set by the NGO was that only community organisations registered with the Philippines' Department of Labor and Employment (DOLE) could avail of their post-disaster financial help. BAWA was organised to fulfill this requirement. The municipal or town officials of Estancia assisted during the processing of documents for BAWA's registration with DOLE, which finally came about in February 2015.

Initially, BAWA was composed of 295 members. Later on, however, the association was divided into 2 groups. To date, there exists 2 chapters of Bayas Women's Association which are in the "barrio" (village proper) with more or less 170 members and in "sitio" (sub-village or zone) Maliog-liog, with 125

members. Both chapters have their own set of officers. With donations from Balay Minadanao, BAWA acquired one pump boat and established a community store. Balay Mindanao also initiated training on disaster risk reduction and business management to help BAWA members manage their community store. Moreover, the municipal or town government located in the mainland released a certificate to allow BAWA to transport supplies for their community store without paying for a gate pass at the port every time.

The members of BAWA can avail of monthly PhP 500 financial assistance from their association for health and education purposes, with only 2 % interests. They can also access rice through credit from their community store, which they can pay on a weekly basis. Moreover, the residents of the "barangay" can use the transport pump boat of BAWA for emergency purposes and they only have to pay for the gasoline and a token of the pump boat operator costs. As any other association of similar nature, BAWA encountered problems like non-attendance of some of the members during their monthly meetings and the delayed payment of those who borrowed money or accessed rice through credit in their community store. However, despite these setbacks, some degree of implicit recognition was accorded to BAWA as they have since been asked to attend village general assemblies and is consulted by the village council in the identification of possible projects. The municipal or town government also requests BAWA to send a representative during municipal or town meetings. BAWA is likewise invited to attend trainings conducted by the local government and other NGOs. Moreover, BAWA participates in the various activities initiated by the town officials like parades, as well as singing and dancing competitions. As of the second quarter of 2016, Balay Mindanao, the NGO that provided financial aid to BAWA, still occasionally visits Bayas village to monitor the progress of the women's association. According to BAWA's President, they also consult the said NGO for certain organizational concerns and Balay Mindanao seems responsive enough.

Conclusions

Extreme disasters in coastal areas disrupt lives, upset livelihoods and apparently also bring undue burdens to women as a result of societal gender norms. However, disasters can likewise provide windows of opportunity for change in coastal villages, particularly when it comes to the distinct articulation

of women's needs and the spontaneous expressions of women's agency. Such was the case in the island-village of Bayas, in Estancia, Iloilo, Philippines, in the wake of super typhoon Haiyan. Preliminary qualitative data showed that since the disaster disrupted prevailing gendered norms in the coastal village, women found a chance to articulate their needs. The women even organized themselves into a group that can potentially empower them not just financially but also politically, via representation in the coastal community's leadership bodies. Yet, the foregoing preliminary narrative also highlights that fledgling coastal women's agency requires external institutional support for sustainability, especially in the aftermath of disasters. Said institutional support has to be mindful of the prevailing gender dynamics in coastal villages that impede on the recognition of women, not just as a vulnerable group, but as distinct social actors possessing the ability to speak up for and seek the means to address particular needs. Further research may then present more nuanced understanding of women's agency and the value of formally organizing for women's empowerment, within the context of gender dynamics in coastal areas recovering from disaster.

Acknowledgements

Meaningful interactions with the community members (especially the women) of Bayas in the first quarter of 2014 were made possible through a public service grant from the Canada Fund for Local Initiatives (CFLI) and the heartwarming cooperation of the Bayas village officials. Succeeding interactions and interviews with key officials of BAWA in 2015 and 2016 are also greatly appreciated as they took time to serve as important sources of information.

References

Badayos-Jover, M.B. and G. Defiesta. 2014. Gendered concerns in coastal disasters: An analysis of women's political subordination and prospects for empowerment. Asian Fisheries Science 27S: 97-109.

Birkman, J. E., Buckle, P., Jaeger, J., Pelling, M., Setiadi, N., Garschagen, M., Fernando, N. and J. Kropp. 2010. Extreme events and disasters: A window of opportunity for change? Analysis of organizational, institutional and political changes, formal and informal responses after mega-disasters. Natural Hazards 55: 637-655.

Bohle, H.G., Etzold, B. and M. Keck. 2009. Resilience as agency. https://www.geographie.uni-bonn.de/forschung/wissenschaftliche-bereiche/geographische-entwicklungsforschung/staff/1bohle-etzold-keck-2009-resilience-as-agency-ihdp-update-2009.2.pdf. Accessed 8 March 2017

Drolet, J., Dominelli, L., Alston, M., Ersing, R., Mathbor, G. and H. Wu. 2015. Women rebuilding lives post-disaster: Innovative community practices for building resilience and promoting sustainable development. Gender and Development 23: 433-448,

Eduards, M. L. 1994. Women's agency and collective action. Women's Studies International Forum 17: 181-186

Enarson, E. 2008. Gender mainstreaming in emergency management: Opportunities for building community resilience in Canada. Gender and Disaster Network homepage, http://www.gdnonline.org/http://www.gdnonline.org/resources/Enarson_GenderMainstreamingCanada.pdf. Accessed 12 November 2008.

Enarson, E. and B. H. Morrow 1998. The gendered terrain of disaster: Through women's eyes. Praeger Publishers, California, USA. 275 pp.

Juran, L. 2012. The gendered nature of disasters: Women survivors in post-tsunami Tamil Nadu. Indian Journal of Gender Studies 19: 1-29.

Mercy Corps. 2013. Quick Facts: What you need to know about super typhoon Haiyan. https://www.mercycorps.org/articles/philippines/quick-facts-what-you-need-know-about-super-typhoon-haiyan. Accessed 1 March 2017.

Nowak, B. S. and T. Caulfield. 2008. Women and livelihoods in post-tsunami India and Aceh. Asia Research Institute Working Paper Series No. 104). www.nus.ari.edu.sg/pub/wps.htm. Accessed 28 September 2008

Pincha, C. 2008. Indian Ocean tsunami through the gender lens: Insights from Tamil Nadu, India. Gender and Disaster Network homepage http://www.gdnonline.org/resources/Pincha_IndianOceanTsunamiThroughtheGender%20Lens.pdf. Accessed 12 December 2008.

Rajasingham-Senanayake, D. 2004. Between reality and representation: Women's agency in war and post-conflict Sri Lanka. Cultural Dynamics 16: 141-168.

Weist, R., J. Mocellin and T. Motsisi. 1994. The needs of women in disasters and emergencies. UNDP and Office of United Nations Disaster Relief Coordinator, Winnipeg, http://www.gdnonline.org/resources/women-in-disaster-emergency.pdf. Accessed 11 March 2007.

Gender in Aquaculture andFisheries: Engendering Security in Fisheries and Aquaculture
*Asian Fisheries Science Special Issue **30S** (2017): 313-326*

ISSN 0116-6514
https://doi.org/10.33997/j.afs.2017.30.S1.018

Short Communication

Improving the Livelihood for Marginalized Women's Households in Southwest Bangladesh through Aquaculture

SHAHROZ MAHEAN HAQUE[1*], SATTYANANDA BISWAS SATU[2], MOJIBAR RAHMAN[1], HILLARY EGNA[3], SCOTT SALGER[4] and RUSSELL J. BORSKI[4]

[1]Department of Fisheries Management, Bangladesh Agricultural University, Mymensingh, Bangladesh
[2]Shushilan, Khulna, Bangladesh
[3]AquaFish Innovation Lab, Oregon State University, Corvallis, OR, USA
[4]Department of Biological Sciences, North Carolina State University, Raleigh, NC, USA

Abstract

Mud crab (*Scylla serrata* (Forsskål 1775)) fattening and culture is an emerging industry in Bangladesh that directly benefits households in the coastal region of Bangladesh. Currently, 37.8 % of crab fattening and culturing facilities are owned and operated by women whose households are generally poor. The study was conducted to promote the integration of tilapia (*Oreochromis niloticus* (Linnaeus 1758)) into mud crab culture, thus diversifying the crops and potentially improving household income and nutrition. First, a baseline survey of 150 mud crab farmers in the Satkhira, Khulna, and Bagerhat regions was conducted, focusing on household food consumption, dietary nutrition and earned incomes, plus household demographic and socio-economic information. The survey revealed that the majority of mud crab farmers are poorly educated (5 years average schooling) and consumed low dietary nutrients, particularly from animal protein sources. Second, tilapias were integrated into mud crab culture by 45 farmers, 15 from each surveyed region. 5 farmers from each region continued with the traditional mud crab fattening procedures and 10 were instructed in methods of mud crab and tilapia stocking and culture, using mixed sex tilapia for continuous breeding. 5 of the 10 farmers sold their tilapia to market while the other 5 kept the tilapia for direct household consumption. In both groups small tilapia were fed to mud crabs to reduce reliance on wild-caught trash fish as feed. Including tilapia in mud crab fattening and culture increased growth and production of mud crabs, albeit not to a level that differed significantly from the group

* Corresponding author. Email address: shahrozzm2002@gmail.com

where mud crab alone were produced. Adding tilapia into mud crab culture increased the nutrient-rich foods available for the farmer's households. A follow up survey found that the women and their household members improved their incomes and consumption of high quality protein. Overall, the integration of tilapia provides a more sustainable method for growing mud crab while also enhancing the livelihoods of farmers.

Introduction

The people of coastal (southwest) Bangladesh are highly vulnerable to the impacts of global climate change that include increased seawater incursion into fresh water systems and lands and more frequent and powerful storms. Three districts (Satkhira, Khulna and Bagerhat) that surround the Sundarban mangrove forest are considered the most threatened, suffering repeatedly from the effects of calamitous storms (e.g., cyclone Sidr in 2007 and Aila in 2009). During periods of high flooding, the average consumption of staple rice falls to 33 % of the minimum nutritional requirement, resulting in acute malnutrition and chronic energy deficiency, particularly in women and children (World Food Programme 2011). While men in this region commonly engage in day labor or have migrated to urban areas to obtain low-income work, the majority of women in this population rely directly on subsistence farming of natural wetland resources. The prevalence of impoverished women-led farming households in coastal Bangladesh, traditionally underrepresented in the economic market chain, make this demographic particularly susceptible to exploitation and thus a key target for improving dietary nutrition and earned incomes of the impoverished Southwest. As fish commonly contribute 63 % of dietary animal protein intake for Bangladeshis (Belton et al., 2011), this investigation focused on 2 key aquaculture species, Nile tilapia (*Oreochromis niloticus* (Linnaeus 1758)) and the mud crab (*Scylla serrata* (Forsskål 1775)), the latter primarily cultured alone, but may be integrated with tilapia. Integrative culture of these species could improve the nutritional and economic well-being of female-led households as well as the environmental impact associated with crab-fattening where feed inputs are significant and water exchanges are common. A key component of this study is to promote the culture of both species by women to foster better food security through diversification of dietary resources. A secondary benefit of this strategy is that tilapia can also be used as feeds for mud crab fattening, which are traditionally reliant on fisheries by-catch. The co-production of both species, combined with on-going research into crab hatchery development will go a long way towards

securing an environmentally sustainable industry and promote better food security for impoverished women aquaculturists in coastal Bangladesh.

The large-clawed mud crabs are high-value seafood commodities due to their delicacy, medicinal value and demand in international markets (Ali et al. 2004; Keenan et al. 1997). The culturing or fattening of mud crab is an important industry directly benefiting women-led households in coastal Bangladesh (Azam et al. 1998; Khan et al. 1991; Ferdoushi and Xiang-Guo 2010). Of the 2,428 crab farms in the severely impacted regions (Satkhira, Khulna and Bagerhat), 37.8 % are currently owned and operated by women (26-41 % by region). Even farms not directly owned by women commonly rely on this demographic for stock collection of juveniles from shrimp ponds or other wetlands. While women aqua-farmers likely obtain economic benefits from crab fattening, this is solely marketed as an export crop, and thus may not directly benefit the dietary needs of women and children. To more directly improve the dietary nutrition of women and children, and create a more sustainable method of mud crab fattening, our objective was to promote integration of Nile tilapia into traditional mud crab culture, thus providing greater crop diversification. The live mud crab industry holds promise for improving economic opportunities in regions sensitive to global climate change (e.g., seawater incursion, storms), with current annual production estimates at 10,000-15,000 MT (Zafar and Siddique 2000). Despite economic benefits, the dietary conditions for many women-led households in these regions are extremely poor, and diets may constitute only staple rice, supplemented periodically with local vegetables and fish. As tilapia farming continues to grow in Bangladesh (Ahmed 2007), including in the Southwest region (Hussein 2009), the integration of tilapia into mud crab culture may enhance the incomes of women-led households through sales in domestic markets, and improve their food security by direct household consumption. The growing number of Bangladesh tilapia hatcheries and the availability of seed stock readily allow for integration of tilapia into mud crab farming.

This study was designed to foster greater participation of women in aquaculture in the impoverished coastal regions of Bangladesh. To this end, we determined the present socio-economic and nutrition status of households through surveys to understand the contribution of aquaculture to the livelihood of women-led households. Additionally, the studies were aimed at evaluating

the utility of integrating tilapia into mud crab fattening and culture. These investigations could promote better food security and dietary nutrition for women-led households through greater crop diversification and training in best management practices for tilapia–mud crab culture. Currently, the production systems for mud crab fattening are less advanced relative to other aquaculture sectors (Begum et al. 2009). This study provided on-site training along with current research into mud crab farming (e.g., captive breeding of seed stock, water quality, cage culture), to achieve sustainable development for this industry.

Materials and Method

Baseline surveys were conducted with existing crab farmers to determine their socio-economic and dietary nutrition status. Surveys were conducted in 150 households in total, 50 from the Khulna, Bagerhta, and Satkhira districts of the coast Southwest region of Bangladesh. These surveys were filled out by the head of the household. They included questions relevant to the income and dietary intake of each member of the household. These surveys focused on food consumption (24 h recall) and how low-intensity culture species (including mud crab and tilapia) and other seafoods contribute to the dietary nutrition and earned incomes (both actual and potential) of surveyed families. Household demographic and socio-economic information was also collected. The survey data collected served as baseline indicators for the study. A second follow up survey was performed that included those families who undertook pilot studies on integrative tilapia-mud crab culture to determine if income and nutrient consumption increased within the household. Evaluation of nutritional benefits derived from families that integrated tilapia with mud crab culture/fattening were examined.

A pilot study was conducted to demonstrate the potential benefits of integrated tilapia and mud crab culture to practicing women aquaculturists who utilize mud crab-fattening as a source of income. The benefits of integrating tilapia into mud crab fattening and culture may include: 1) greater supply of nutritious foods for household consumption, 2) improved earnings by the sale of extra tilapia in domestic markets, 3) improved environmental water quality resulting in less stock mortality and environmental impacts, and 4) a decrease in the reliance of fisheries by-catch for use as crab feeds. The latter benefit,

utilized through feeding of extra juvenile tilapia to crabs, may also improve the environmental sustainability of this industry.

All participating households were given a data collection notebook to record farming activities including crab stocking, feeding, tilapia (kg) harvested, proceeds from crab and/or tilapia sales, and input costs associated with crab feeding. Evaluation of nutritional benefits derived from integrating tilapia into mud crab culture was examined through a survey questionnaire described above (24 h recall questionnaire on foods consumed).

Participating members from women-owned farms or from women-led households were included within the sample set identified in the baseline study of 150 households. Sites were selected to have a salinity range (5-20 ppt) tolerant for Nile tilapia (*Oreochromis niloticus* (Linnaeus 1758)) breeding and mud crab fattening (Popma and Masser 1999; Shelly and Lovatelli 2011). An equal number of ponds from all 3 districts (Kulna, Satkhira, and Bagerhat, 15 per district) were used. Ponds were assigned to 1 of 3 treatment groups (N = 45; n = 15): (T1) control – only traditional mud crab fattening or culture practiced, (T2) integrated tilapia-mud crab farming where the tilapia are sold to market, and (T3) tilapia-mud crab farming where the tilapia are directly consumed by the household.

Prior to stocking, a bamboo fence or *Pata* (15 m x 9 m) was put in place in the pond and covered with a net once crabs were stocked. The fence height extended 0.76-0.91 m above the water surface and 0.30 m below the soil. The pond bottom was cleaned and lime (3 kg ha^{-1}) was applied. Fertilizer, urea (18.5 kg ha^{-1}) and triple super phosphate (TSP; 24.7 kg ha^{-1}) was then applied. Ponds for treatment 2 and treatment 3 were stocked with mixed-sex tilapia of breeding size (3 female: 1 male) at a density of 1 fish m^{-2}. The crab stocking density was 3 m^{-2}. At Rampal and Khulna crablet individual stocking weights were 0.60 to 3.2 g and at Syamnagar, juvenile crab individual stocking weights were 18 to 25 g. At stocking, crab biomass was 22 kg and tilapia was 11.2 kg at Munshugonj. At Rampan and Khulna crab biomass averaged 10.4 kg and tilapia biomass 11.2 kg. The tilapia were raised only on secondary pond productivity derived from excess crab feeds and pond fertilization (28 kg N, 7 kg P ha^{-1}) only if productivity was low (> 20 cm Secchi disk depth). Crabs were fed at 10 % body weight daily with trash fish. In the groups incorporating tilapia, around

10 % of small juveniles (~10g, produced by tilapia breeding within the ponds) were harvested weekly for use as supplemental crab feeds. The study was conducted over a single tilapia production phase or for ~ 4 months (2 crab fattening cycles or 1 crab culture).

In Bangladesh, aqua-farmers have been practicing mud crab fattening mainly in earthen ponds; however, escape through burrowing is a common problem. High mortality is another production constraint, likely due in part to turbid waters, fluctuations in salinity and limits on the knowledge of farmers of water quality management. Introduction of cage culture and other innovative enclosures is new in Bangladesh though adopted in many Southeast Asian countries, e.g., bamboo and net cages (Kuntiyo 1992) in the Philippines, bamboo enclosure and cage in river and canals in Myanmar (Felix et al. 1995), and floating cage culture in Vietnam and Malaysia (Sivasubramain and Angel 1992). Training and workshops on best management practices were performed. The workshops were designed to help women aquaculturists improve their farm practices including potential integration of tilapia.

Results and Discussion

The baseline analysis found that 52 % of the crab farmers had more than five years of experience in crab fattening but little experience with crab-tilapia polyculture. About 24 % of the farmers in Khulna have more than 10 years of experience while only 18 % of farmers in Bagerhat had more than ten years of experience in crab fattening. The majority of respondents were involved in crab fattening (66 %). The other respondents were involved in fish culture (22 %), crab trading (5 %), fish trading (2 %), or another type of small business (5 %) (Fig. 1).

About 37 % and 24 % of the ponds were either leased or under a multiple ownership arrangement, respectively, where the ponds were owned by more than one household. About 53 % of the farmers had taken a loan to fund their farming practices. The incomes of the respondents ranged from USD 55 to USD 243 (BDT 4,500 to 20,000). The survey also revealed that more than 78 % of the surveyed farmers did not receive any formal training related to crab farming. As for formal education, the average maximum schooling for the farmers was 5 years after which they started farming to help support the income

of their families. The surveys indicated that 49 % of the respondents had been educated to the primary school level, whereas 40 % had some high school education and 11 % had been educated beyond the high school level.

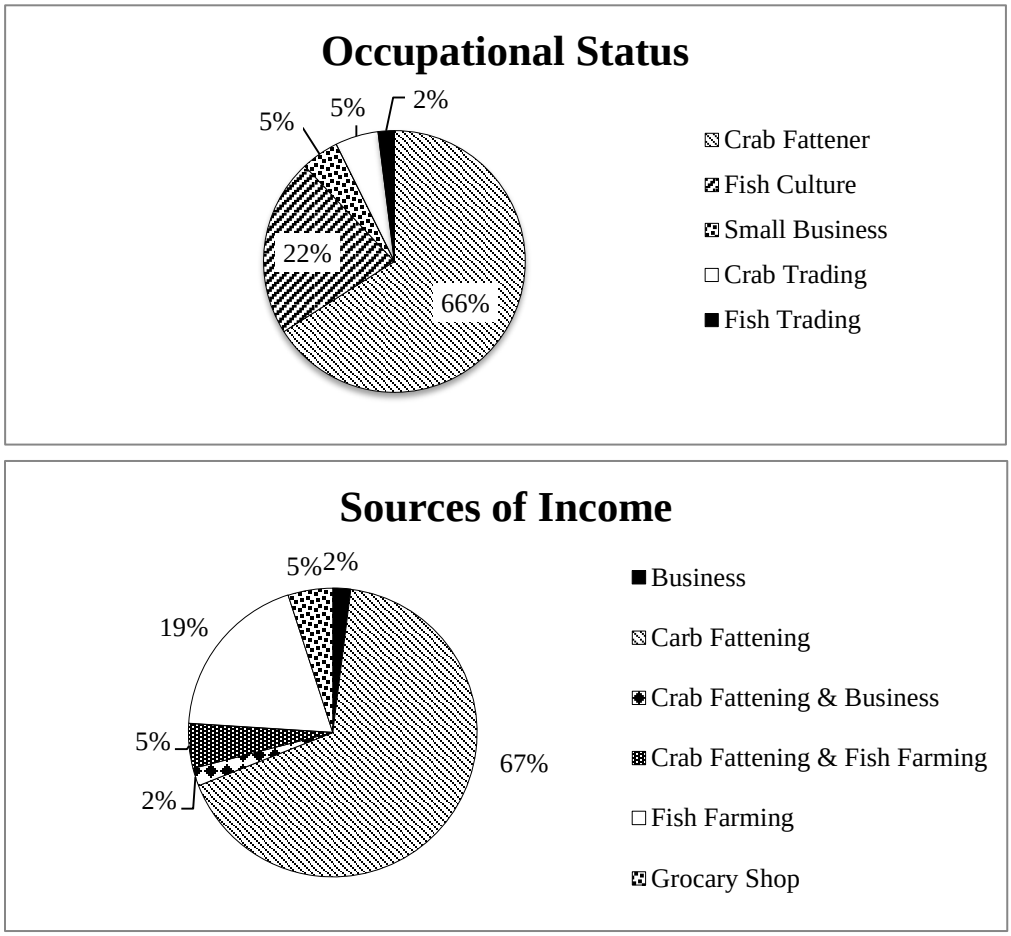


Fig. 1. Occupation status and income source of household members involved in mud crab fattening and culture.

Around 64 % of the crab collectors used filtered pond water, 5 % used pond water directly, and 8 % used rainwater for drinking purpose whereas none of them had their own well. However, 23 % of the crab collectors used well water provided by the local government or those belonging to schools or neighbours.

Integrated tilapia-mud crab culture practices

A pilot study was conducted to determine if introducing tilapia into mud crab culture could increase the well-being of households of women who own

farms. Groups either continued in the traditional mud crab fattening and culture practices (T1, control), cultured tilapia along with the mud crabs and sold the tilapia at market (T2), or cultured tilapia along with the mud crabs but kept the tilapia for consumption by the household members (T3). No additional feed was supplied to the ponds to support the tilapia; tilapia subsisted on biota naturally found in the ponds.

Regardless of the amount of tilapia produced in T2 and T3, mud crab growth tended to be higher in culture with tilapia although the increase did not differ statistically from control (Fig. 2). Crab production increased when grown in the presence of tilapia (Table 1).

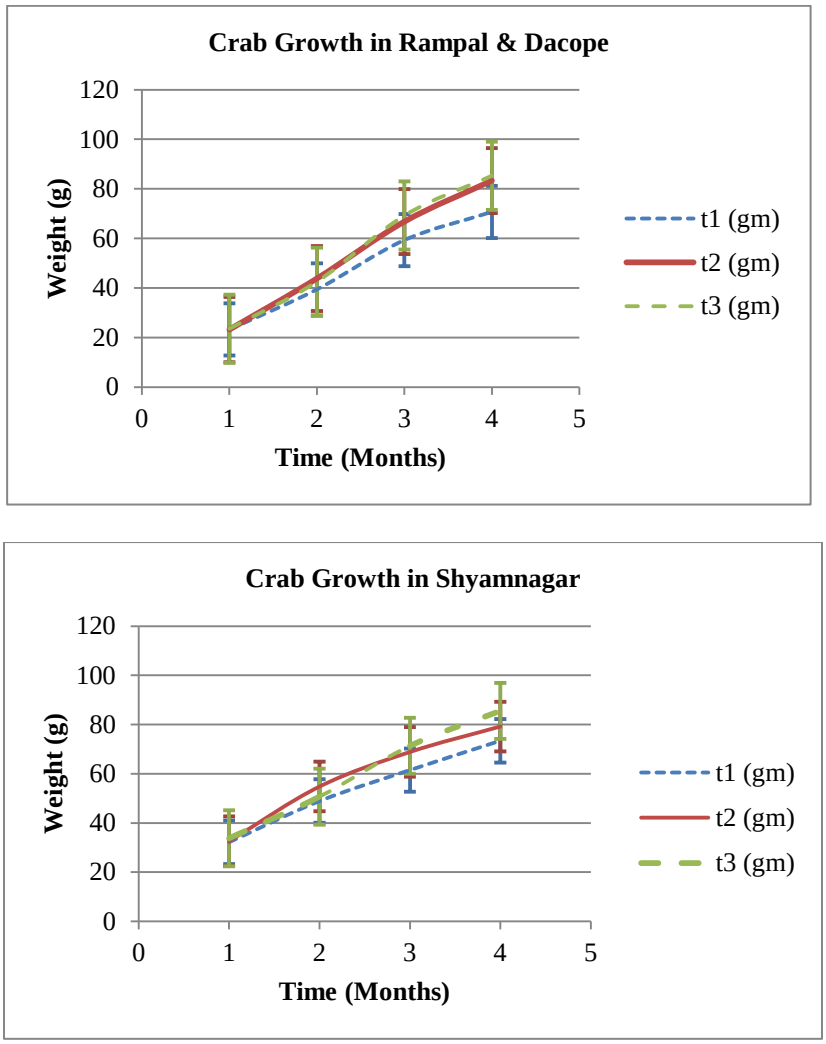


Fig. 2. Growth (weight) of mud crabs on integrated farms (mean ± SD). Mud crab growth was higher when tilapia was included with mud crab.

Table 1. Total production (weight gained) of mud crabs, including of different size classes, in the mud crab/tilapia pilot study.

Production	Gained weight (kg)									Others below the size of male & female	Avg. Weight (kg) /point
			Male			Female					
Grade with Rate	XXL +500	XL +400	L +300	M +250	SM +200	F1 +180	F2 +180	F3 +160	F4 +130		
Production in Shyamnagar, Satkhira (after 3.5 to 4.0 months)											
T-1	1.40	2.80	4.40	5.50	9.20	1.60	2.30	4.35	5.300	24.40	61.25
T-2	2.10	3.30	4.20	6.40	12.30	1.85	2.50	6.23	11.22	29.10	79.20
T-3	1.55	2.20	5.35	7.35	11.80	1.00	2.74	9.35	12.05	32.15	85.54
Production in Rampal, Bagerhat (after 3.5 to 4.0 months)											
T-1	2.05	2.34	5.15	5.50	8.86	1.80	2.50	4.75	8.45	23.75	65.15
T-2	2.21	3.40	4.60	7.10	10.25	2.75	2.30	7.30	12.02	31.20	83.31
T-3	1.61	2.33	5.15	6.05	11.50	2.10	1.94	10.15	11.45	33.01	85.29

The crabs were fed 10 % of the tilapia in the ponds every week. The tilapia could be providing valuable nutrients and feed biomass to the crabs to increase their growth and production. Fig. 3 shows that growth of tilapia was similar between T2 and T3.

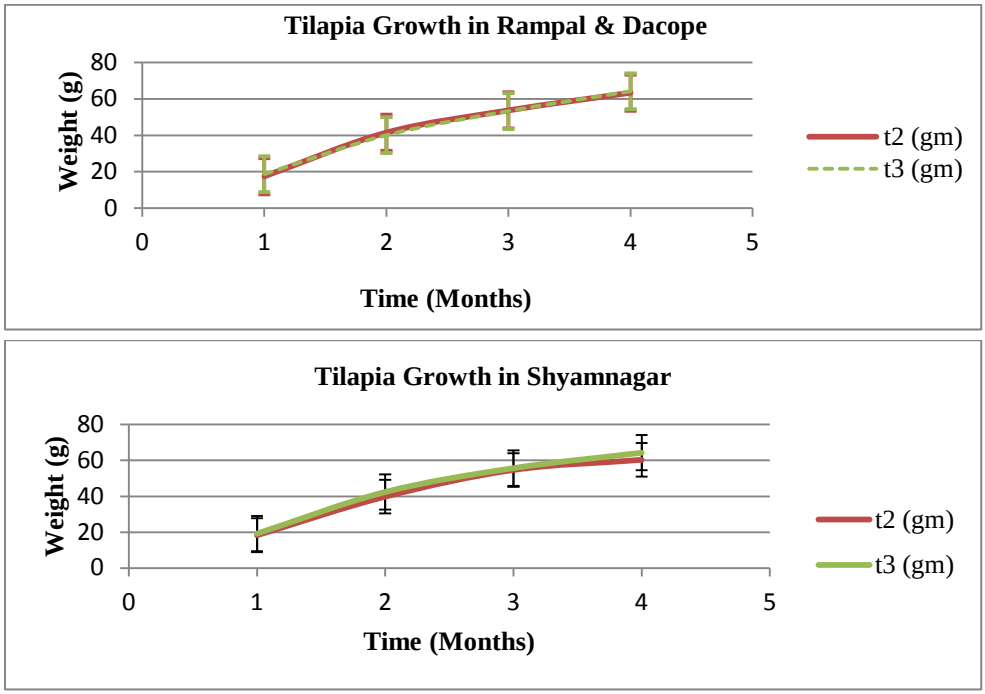


Fig. 3. Tilapia growth (weight) on integrated farms.

The addition of tilapia into mud crab culture also increased protein availability to the farmer's households. The addition of tilapia in crab fattening and culture ponds had benefits in increasing nutrient-rich foods available to the farmer's households. The households consumed protein-rich foods after the study with greater intensity than they did before the study (Fig. 4).

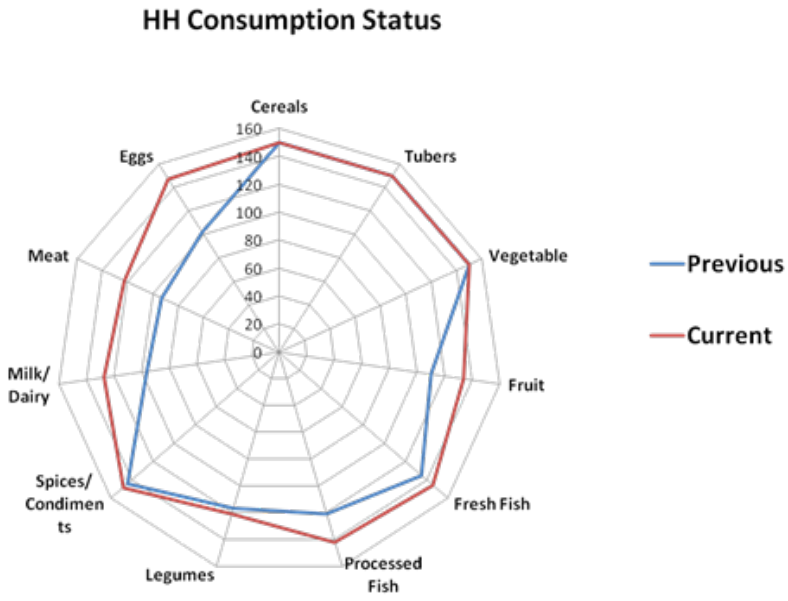
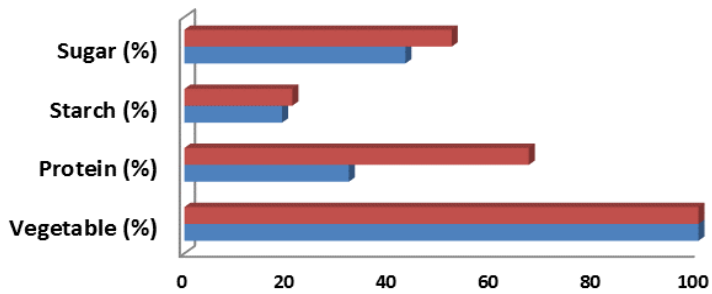


Fig. 4. Household consumption of food groups identified. Consumption of protein-rich foods increased after tilapia were included in mud crab fattening and culture.



	Vegetable (%)	Protein (%)	Starch (%)	Sugar (%)
Recent Study	100	67	21	52
Baseline Study	100	32	19	43

Fig. 5. Proportion of food compositions consumed by study respondents. Respondents consumed more protein and sugar after inclusion of tilapia in mud crab fattening and culture facilities (recent versus baseline).

Respondents who consumed protein increased from 32 % in the baseline study to 67 % in the follow-up survey (Fig. 5). This is a significant increase in protein consumption for households. There was also an increase in the proportion of respondents (52 %) who consumed sugar after the pilot study compared with that observed in the baseline survey (43 %).

The other offshoot of this study was that more women were becoming income earners in each of the households. During the baseline survey farmer's lowest income was only USD 55 (BDT 4,500) and highest income was USD 243 (BDT 20,000) and the average income was USD 150 (BDT 12,250). After the integrated tilapia-crab study the average income was USD 183 (BDT 15,000) with the income pattern and savings improving from the previous baseline period. According to the baseline report only 38 % of respondents were able to maintain their savings for the betterment of the family. Afterwards nearly 48 % of respondents have the capacity to keep savings in banks and other financial institutions (Fig. 6).

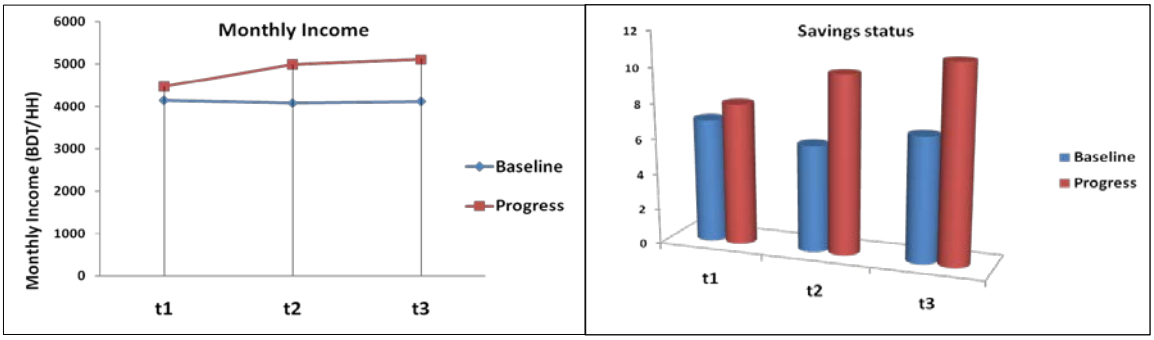


Fig. 6. Comparison of monthly income and savings by study respondents. Income and savings of respondents increased after they incorporated tilapia into mud crab culture (recent versus baseline).

This is important because this leads to a total increase in income for the entire household, income that can be included in purchasing necessary foods for the health and well-being of all members of the household. The inclusion of tilapia in mud crab fattening and culture farms in this pilot study led to greater overall growth and production of mud crabs. This in turn could increase income to the farmers, not only through the greater production of mud crabs but also supplemental sales of tilapia not kept by the farmer's families for consumption.

On-farm training and workshops were provided to describe this new technology to the farmers and for improving mud crab fattening and culture. It mainly targeted women crab farmers in order to give them valuable information on the methods and outcomes of integrating tilapia into their crab fattening and culture operations. Items discussed were methods to include and grow tilapia along with the mud crabs and methods of proper water quality maintenance and pond preparation such as dike construction, water exchange facilities, use of fertilizer and lime, physiochemical parameters, crab and tilapia feed, stocking density, management during stocking, post-stocking management, feed utilization and feed conversion, harvesting and handling of crabs and fish, marketing, grading of crabs, and record keeping. This session also allowed the farmers to ask questions about crab and tilapia farming to members of the research and extension team. Household nutritional sessions were also given to assess and exchange nutrition information to the farmers. Changes in protein and other food nutrient uptake, and issues of malnutrition that may be resolved with these new culture methods were discussed. These sessions educated the farmers in basic concepts of food and nutrition. An extension factsheet was produced which detailed the pilot study and its potential benefits to income, nutrition, and health of the participants. This brochure was given to the participants of the training workshop and to other crab farmers in the region. The brochure included details on the methods and function of crab/tilapia polyculture with information on how these practices could lead to better seafood production and its impacts on the well-being for the women farmers and their families.

Conclusions

45 mud crab farmers were trained in the new technology of integrating tilapia into mud crab fattening and culture. This polyculture system slightly enhanced the production of mud crab, and the smaller tilapia provide a source of feed for mud crab, that can reduce reliance on wild-caught trash fish. Farmers may also consume larger tilapia or sell them. The tilapia-mud crab polyculture system had the added benefits of increasing income status along with consumption of animal proteins by farmers and their families. Through outreach and extensions workshops and sessions, more farmers have been educated on tilapia-mud crab polyculture and it is anticipated as farmers become more successful, the technology will spread, particularly among impoverished women

who rely on mud crab fattening and culture for their livelihood. Accompanying nutritional education for the households could be important.

Acknowledgements

This research was supported by Shushilan NGO and, in part, by the AquaFish Innovation Lab through the U.S. Agency for International Development (USAID EPP-A-00-06-0012-00), and by participating institutions, particularly Bangladesh Agricultural University, North Carolina State University, Shushilan NGO, and Oregon State University. The AquaFish accession number is 1465. The opinions expressed herein are those of the authors and do not necessarily reflect the views of the AquaFish Innovation Lab or USAID.

References

Ahmed, N. 2007. Development of tilapia marketing systems in Bangladesh: Potential for food supply. National Food Policy Capacity Strengthening Programme.Final Report. Bangladesh. 54 pp

Ali, M.Y., D. Kamal, S.M.M. Hossain, M.A. Azam, W. Sabbir, A. Mushida, B. Ahmed and K. Azam. 2004. Biological studies of the mud crab (*Scylla serrata* Forsskål 1775) of the Sundarbans mangrove ecosystem in Khulna region of Bangladesh. Pakistan Journal of Biological Science 1967: 1981-87.

Azam, K., D. Kamal and M. Mostafa. 1998. Status and potential of mud crab (*Scylla serrata* Forsskål 1775) in Khulna Bangladesh. In National Seminar on integrated management ganges floodplains and sundarbans ecosystem in July 16-18, 1994. (eds. M.A. Rahman, M.S Shah, M.G. Murtaza, and M.A. Matin), pp. 150-160. Khulna University, Bangladesh Agricultural Research Council and Department of Agricultural Extension. Khulna University, Bangladesh.

Begum, M., M.M.R. Shah, A. Al Mamun and M.J. Alam. 2009. Comparative study of mud crab (*Scylla serrata* Forsskål, 1775) fattening practices between two different systems in Bangladesh .Journal of the Bangladesh Agrilcultural University 7: 151–156.

Belton, B., M. Karim, S.Thilstead, E. Murshed, E. Jahan, W. Collis and M. Phillips. 2011. Review of aquaculture and fish consumption in Bangladesh. Studies and Reviews 2011-53. The WorldFish Center, Penang, Malaysia. 71pp.

Felix, S, M. Gazendran and S. Subramaniam. 1995. Aquaculture of mud Crab. Seafood Export Journal 26: 5-6.

Ferdoushi, Z. and Z. Xiang-Guo. 2010. Role of women in mud crab (*Scylla serrata* Forsskål 1775) fattening in southwest part of Bangladesh. Marine Resource and Aquaculture 1:5-13.

Hussain, M.G. 2009. A future for the tilapia in Bangladesh. AQUA Culture Asia Pacific Magazine 5: 38-40.

Khan, M.G. and M.F. Alam. 1991. The mud crab (*Scylla serrata* Forsskål 1775) fishery and its bio-economics in Bangladesh. BOBP/REP 51: 29-40.

Keenan, C.P. and A.W. Blackshaw. 1999. Mud crab aquaculture and biology in Darwin, Australia. In International Scientific Forum held in, April 21-24,1997 on Mud crab Aquaculture and Biology. (eds. C.P. Keenan, and A.W. Blackshaw ACIAR proceedings No. 78), pp. 1-98. Watson Ferguson and Company, Brisbane, Australia.

Kuntiyo, A. 1992. Fattening of mud crab(*Scylla serrata* Forsskål 1775) in net cages installed in the drain canal of intensive prawn ponds fed with trash fish and prawn pellate. MS Thesis. University of the Philippines in the Visayas. 60 pp.

Sivasubramain, K and C.A. Angel. 1992. A review of the culture, marketing and resources of the mud crab. In: The mud crab (ed. C.A. Angel), pp. 5-12. Bay of Bengal Program, Madras. India.

World Food Programme. 2011. A rapid food security assessment at satkhira in the context of recent flood and water logging.http://documents.wfp.org/stellent/groups/public/documents/ena/wfp240049.pdf.Accessed August 2011.

Zafar, M. and M.Z.H. Siddiqui. 2000. Occurrence and abundance of four brachyuran crabs in the Chakaraia Sundarban of Bangladesh. The Chittagong University. Journal of Science 24: 105-110.

Gender in Aquaculture and Fisheries: Engendering Security in Fisheries and Aquaculture
*Asian Fisheries Science Special Issue **30S** (2017): 327-332*

ISSN 0116-6514
https://doi.org/10.33997/j.afs.2017.30.S1.019

Short Communication

Women in Riverbed Aquaculture for Livelihoods in Foothills of Nepal

MADHAV K. SHRESTHA[1*], KIRAN K. AMATYA[2] and JAY D. BISTA[1]

[1]Agriculture and Forestry University, Rampur, Chitwan, Nepal
[2]Institute for Sustainable Agriculture Nepal (INSAN), Kathmandu, Nepal

Abstract

Small-scale aquaculture is one of the options for improving household family nutrition and also supplements income for rural poor. Family nutrition depends on women as they prepare, cook and provide food for the family in most of the Nepalese communities. This short communication deals with the use of foothill riverbed for aquaculture involving women in order to improve family nutrition and supplement income of an ethnic community. 90 household ponds were constructed on both sides of river flood plain in foothills of Nepal. Womens' groups participated in monthly technical training sessions along with fish farming activities. Ponds were stocked with grass carp (*Ctenopharyngodon idella* (Valenciennes 1844)), common carp (*Cyprinus carpio* (Linnaeus 1758)) and Nile tilapia (*Oreochromis niloticus* (Linnaeus 1758)). Local river species were allowed to enter and grow in ponds. Pond dikes were used for vegetable farming, grass cultivation, and pig farming. Though pond fish farming added extra work, ethnic women were able to produce significant amounts of fish, fruits and vegetables that supported family nutrition and was also a source of income.

Introduction

Increasing food and nutrition security, cash income for household family expenses and full utilisation of family labour are the major issues for the rural poor. Communities residing in the foothills of Nepal with limited available agriculture land, use public forest land for livestock grazing to support their livelihoods. Poor access to roads and markets further compound the food and livelihoods security issues. Small-scale pond aquaculture for such rural poor

[*] Corresponding author. Email address: madhavshrestha1954@gmail.com

communities is one of the options for improving household family nutrition and to supplement income. The role of small-scale aquaculture in household food and nutrition security, income generation and empowerment of women and marginalised communities has been increasingly appreciated in recent years (Shrestha et al. 2012). However, availability of suitable land for pond construction is a major limitation in most of the cases. Gravel bed flood plains, with frequently changing river courses due to monsoon floods, are available resources in many areas of the foothills of Nepal.

This paper aims to present how floodplain gravel-bed riverbeds can be utilized for pond aquaculture by women to improve the livelihoods of poor and marginalised ethnic community of the foothills in Nepal.

Materials and Methods

The program sites were the Bhundrung and Thado khola flood plain river bed of Jhulyan village, which is in the Hadikhola Village Development Committee of Makawanpur disrtict of Nepal (Fig. 1 and 2). About 99 % of the inhabitants of this area belong to the "Tamang" ethnic group, which is a marginalised community. Agriculture and livestock farming are the major occupations, but these activities support only about 6 to 10 months of the in total household consumption needs. During the remaining months, men from this location temporarily migrate to work as non-skilled labour outside their village. The routine work tasks of women in "Tamang" households are cleaning livestock sheds, fetching drinking water, fodder collection from the forest and farmland for livestock, cooking, livestock grazing and firewood collection along with the other seasonal agriculture work such as rice planting, weeding and harvesting and so on.

Fig. 1. Main river with tributaries and Program site marked

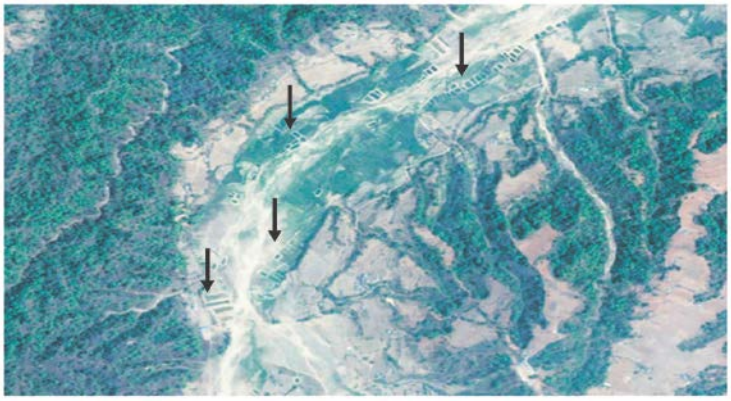


Fig. 2. Ponds at program site marked with arrows

Program activities were carried out from March 2015 to February 2016. An inception workshop with village households was organised, and 2 groups of women were formed from the 53 women. The 2 womens' groups were involved with an existing cooperative of the village. An exposure trip for these groups was organised to visit an established and successful women's aquaculture cooperative in Chitwan district. During the project period, 90 fish ponds for 53 households were constructed with an excavating machine. The ponds ranged from 100-500 m^2 in size with an average area of 170 m^2. Ponds were constructed on both sides of the river flood plain at the foothills, on land covered by small gravel and boulders. For 8 months, the womens' groups received monthly hands on technical training on fish farming in the field. Inputs such as fingerlings, fishing nets, weighing balances, water pumps, fish baskets and vegetable seeds for pond dike farming were supplied. A weekly market in the village was establishment for product sale, and the women's group was linked with the live fish sale market in the nearest city Hetauda.

Fish species used for culture were grass carp (*Ctenopharyngodon idella* (Valenciennes 1844)), common carp (*Cyprinus carpio* (Linnaeus 1758)) and Nile tilapia (*Oreochromis niloticus* (Linnaeus 1758)). Local river species such as dedhuwa (*Esomus danrica* (Hamilton 1822)), pothi (*Puntius sophore* (Hamilton 1822)), faketa (*Barilius barna* (Hamilton 1822)) and gaichi (*Macrognathus aculeatus* (Bloch 1786)) were allowed to enter and grow in ponds. Women were trained to harvest regularly for family consumption. Pond dikes were used for vegetable farming, cultivating pulses, banana and grasses. Some households made pig sheds on the dike and raised pigs. The program was launched for one year and the culture period for the fish was about 6 months.

Results

Formation of household women groups and regular monthly gathering for training allowed the women to interact and share on social events of the village, agricultural activities and problems, besides the fish farming activities. It is observed that in the course of training the period, individual women developed capacity to present what she saw as differences between own pond and others, and could interact with trainers. As of the project rule, pond ownership was with household women and that empowered them for income from the pond.

Total income estimated from the aquaculture and pond dike farming from the communities was about NPR 1,350,000 (USD 13500). Outcome of the one-year program is summarized in Table 1.

Table 1. Items, volume and value of production from pond and pond dike farming during of the project implementation period.

S.N.	Production item	Production (kg)	Value (NPR)
1.	Fish production	2,755	716,300
2.	Local fish production	1,590	477,000
3.	Pulses	600	66,000
4.	Vegetables	173	6,920
5.	Banana	150	9,000
6.	Pig	380	76,000
	Total		1,351,200

Note: NPR. 100 = USD1

Though pond ownership was with the woman of the household, fish farming was supported by all family members. The Cooperative Society managed to buy fish fry from the government hatchery for its members. Feeding and fertilising of the pond was by women. The whole family took part in the harvesting activity. Women and grown up children went to the village weekly market to sell fish and vegetables, however, the men through the Cooperative Society sold live fish in the city market. As a result of the activities undertaken the Cooperative Society managed to get further support for pond construction.

Discussion

Flood plains of small rivers in foothills are mostly composed of gravel, boulders and loam soils with minimum of top soil. Cereal crop cultivation especially rice, maize, wheat and others are difficult in this terrain. Frequent

flash floods during the monsoon are also a problem for the crops. People residing in such areas are resource poor ethnic communities. Utilisation of river bed/flood plains for aquaculture seems possible as pond dikes can provide flood protection. The water table is quite high and water recharge in ponds is good enough even during the dry season. Besides production of cultured species, local indigenous fish species are available in the rivers that can be grown in ponds by allowing it to naturally enter into the constructed ponds. It also helps to conserve indigenous fishes, control use of illegal fishing methods in rivers through educating community womens' groups. Raising of livestock (pigs and goats) that the community has been traditionally doing is also possible utilising pond dikes. Goats are also commonly farmed by allowing them to graze in the foothill forests. The amount of stocked fish produced was about 52 kg and indigenous local river fish produced was about 30 kg per household. Approximately 50 % of fish produced was used for family consumption which rose to 8 kg/caput/year for a family of 5, which is about 3 times higher than the national average of fish availability in Nepal i.e., 2.4 kg/caput/year (Mishra 2015). Assuming 50 % fish were sold, their efforts have added an income of NRs 12,000 for each household. Cultivation of grasses on the pond dike helped to raise goats. Banana, pulses and vegetables helped in family nutrition and for supplementing the family income.

Once the ponds are constructed and fish stocked, the culture activities that need to be carried out are everyday feeding, weekly or fortnightly fertilising/manuring and finally harvesting. Fish fry purchase and stocking is mainly done by men and for harvesting the whole family is involved. Feeding and manuring for one pond does not require much time for the woman if it is nearby the house. All the ponds built in the project were close to their residences at 10 minutes' walking distance from house. Moreover, grass cultivation on the dikes can save time for the women who had to go to the forest for fodder for livestock. Grass collection and fish feeding can be done simultaneously. Thus, it can be argued that adding one household pond does not add much extra work for a woman.

Use of available natural resource of foothill river bed or flood plain by constructing fish ponds with strong dikes could benefit many poor communities residing along rivers and streams. Pond ownership and pond income empowers women. Fish produced from pond owned by women supports family nutrition,

enhances family income, increases food security, and develops saving behavior in the women. This model should be scaled up throughout Nepal and also in other countries with similar resource conditions.

Acknowledgements

Agriculture and Forestry University (AFU) and Institute for Sustainable Agriculture Nepal (INSAN) are acknowledged for facilitating the conduct of the project. This project was supported by WWF Hariyo Ban program, Nepal. AquaFish Innovation Lab supported the attendance and presentation of this work at 11th Asian Fisheries and Aquaculture Forum (AFAF) Bangkok, Thailand.

References

Mishra, R.N. 2015. Status of aquaculture in Nepal. Nepalese Journal of Aquaculture and Fisheries 2: 1-12.

Shrestha, M.K., J. Pant and R.C. Bhujel. 2012. Small-scale development model for rural Nepal. In: Proceedings of the National Symposium on Small-scale aquaculture for increasing resilience of rural livelihoods in Nepal. (eds. M. K. Shrestha and J. Pant), pp. 71-75. Institute of Agriculture and Animal Science, Rampur, Chitwan, Nepal, and The WorldFish Center, Penang, Malaysia.

Gender in Aquaculture and Fisheries: Engendering Security in Fisheries and Aquaculture
*Asian Fisheries Science Special Issue **30S** (2017): 333-342*

ISSN 0116-6514
https://doi.org/10.33997/j.afs.2017.30.S1.020
Short Communication

Gender Roles Analysis of Ornamental Fish Enterprises in Maharashtra State, India

BHARAT YADAV[*] and ARPITA SHARMA

ICAR-Central Institute of Fisheries Education, Versova, Mumbai, Maharashtra, India

Abstract

Ornamental fish breeding, rearing and production is an emerging business in India and has the opportunity for major growth, especially in domestic trade. In Maharashtra State, the Rainbow Revolution scheme was started in 2007. About 305 men and women are beneficiaries of this scheme. Gender role profiles of the ornamental fish producers are used to explore the differences between men and women's access to and control over resources in the ornamental fish enterprises in the northern coastal Maharashtra districts of Thane and Mumbai. Information was collected using semi-structured interviews and stakeholder meetings. Out of 90 farms, people on 30 farms were interviewed. The gender roles profile was studied using the Harvard analytical framework. The participation and time spent by men in the ornamental unit was significantly higher (8 hrs day^{-1} average) than that by the women (4 hrs day^{-1} average). Of the farms sampled, 22 units were owned by men and 8 by women, and men were found to have higher access and control over resources. Community norms, including the prevailing social hierarchy, demographic factors and the access to special training on ornamental fisheries were the major factors influencing people in taking up this venture. The study suggests that the role of women in ornamental fish production can be enhanced through targeted schemes for women with a focus on increasing ownership and training programmes. This will make the business more equitable and sustainable.

Introduction

The demand for ornamental fishes is increasing, especially in the United States of America (USA), Europe and Japan, stimulating many countries in Asia to start capturing and culturing ornamental fishes. Nearly 60 % of the international trade in ornamental fish originates from developing countries, mainly in Asia (FAO 2006). India's share in ornamental fish export is negligible

[*]Corresponding author. Email address: bharat.fex-pa4-04@cife.edu.in

and mainly dominated by wild varieties of fish from north eastern states. The domestic trade of aquarium fish is reported to be growing at 20 % annually (Jain and Jain, 2009). However, only 0.04 % of Indian households keep an aquarium as compared to 10-21 % in Europe and USA, indicating a major opportunity for growth of ornamental enterprise for domestic trade (Jain and Jain 2009). The 'Rainbow Revolution' scheme was initiated by the Marine Product Export Development Authority (MPEDA), Government of India in the year 2007 which aims to encourage breeding and rearing of ornamental fishes for domestic trade and export of fish. The scheme was implemented in 3 stages i.e. Grade I for cluster based rearing, Grade II for breeding and rearing and Grade III for breeding, rearing and export. The MPEDA has provided a 50 % subsidy for establishing ornamental units, along with 3 to 5 days training on ornamental fish breeding and rearing. The scheme was initially implemented in 4 states, i.e. Maharashtra, West Bengal, Tamilnadu and Rajasthan and later extended to other states.The business is being promoted amongst women's groups for livelihood security (Swain et al. 2013; Remeshan and Shaktivel 2014).

In India, approximately 1.8 million people are employed in net mending, marketing fish, peeling, curing, preservation, trading, purchasing, handling, drying, filleting, displaying, and fish-selling activities, with women forming 48 % of this total labour force (FAO 2011; Nag et al. 2012). Income earned by women contributes to the local economy, and in some areas it provides capital to male producers to improve their productive fisheries assets. In ornamental fish production in West Bengal, women do the feeding, collection of live food and selling of ornamental fishes to retailers (Ghosh et al. 2003). In Odisha, ornamental fish breeding and farming as a backyard activity has been taken up, especially in rural areas (Swain et al. 2011).

The success of women's self-help groups in ornamental fish enterprises has been related to the homestead status of the ornamental fish enterprises, and is enhanced through linkages with credit, technology, infrastructure, skill development and trade (Swain et al. 2013). Jayalal et al. (2016) also stressed the importance of finance and technology. Rameshan and Sakthivel (2014) found that ornamental fish enterprises can help women farmers to generate income and employment. The role of women in ornamental fish enterprises in India has been highlighted also by Shaleesha and Stanley (2000) and Dutta et al. (2013).

Men and women's access and control over the resources are essential to ensuring their right to equality and to an adequate standard of living. In many communities, gender disparities with regard to land and other productive resources are linked with assumptions that men, as heads of the households, control and manage productive resources. (UNHR 2013). Unequal access to resources limits women's capacity to ensure agricultural productivity, security of livelihoods and food security and is increasingly linked to poverty, migration and urbanization (United Nations 2011).

The present study had the objectives of understanding the differentiated contribution of women and men to the production and value addition within ornamental fish enterprises as well as how men and women might use and make decisions differently on the natural resources on which they depend for their livelihoods.

Materials and Methods

The study was carried out in the northern coastal districts of Maharashtra, namely, Mumbai and Thane. The primary data were collected through a semi-structured interview schedule and stakeholder meetings. The Marine Product Export Development Authority (MPEDA) records 90 fish producers in Mumbai and Thane. Out of these, 30 fish producers (22 men and 8 women) from all blocks from Mumbai and Thane district were selected randomly for the study.

To achieve the objectives of the study, the Harvard Analytical Framework given by Overhalt et al. (1985) was used. The Harvard Analytical Framework is a grid for collecting data at the micro-level (i.e., at the community and household level). The framework has 3 main components i.e., activity profile, access and control profile and influencing factors.

The non-parametric Mann-Whitney test statistic was used to test the difference between men and women's participation and time spent in various productive, reproductive and social-political activities. This test was used to compare differences between the independent groups when the dependent

variables are either ordinal or continuous but not normally distributed (Snedecor and Cochran 1967).

The null hypothesis was that there is no significant difference between men and women's participation.

Results

The study revealed that the majority of men and women involved in the ornamental fish business were middle-aged, college graduates. Ornamental fish farming was either a primary or a secondary occupation. Most of the units established in Mumbai and Thane have taken up the benefits of the 'Rainbow Revolution Scheme' implemented by MPEDA. Institutions such as the College of Fisheries, ICAR-Central Institute of Fisheries Education (CIFE) and MPEDA had motivated them. Their neighbors, friends and market potential, in order, were the other sources of influence. Almost all were members of a co-operative society and self-help groups.

Participation of men was higher in activities such as observation of fish health, water parameters, live food culture and maintenance, recording of parameters, setting of fish for breeding, preparation of tanks for rearing or breeding, recording of activity, preparation for marketing, packing of marketable fish, preparation and maintenance of filter system activities and marketing (Table 1). For women, participation was higher in activities like feeding, cleaning of tanks and siphoning feed preparation and removal of offspring. In addition, the majority of household work, collecting firewood, collecting water and agriculture and dairy work activities were done by women.

Men spent 8 hrs.day^{-1}on management of the ornamental fish production units, whereas women's involvement was reported to be 4 hours/day. Women spent most of their time, i.e. on average 11.5 hrs.d^{-1}, in household and community works (cooking, cleaning, caring, personal work and community works), whereas men spent 6.5 hours on these activities.

It is clear from table 2 that, there is a significant difference between men and women regarding participation as well as time spent in productive, reproductive and social and community activities.

Table1. Participation and time spent by men and women in different activities of ornamental fish production.

S.No	Activity Profile	Particpation (%)		Time Spent (hrs/ day)	
	Productive activities	***Men (n=30)***	***Women (n=30)***	***Men***	***Women***
	One time activity				
1	Construction of ornamental unit	100	33	-	-
2	Stocking of seed	87	70	-	-
	Daily activities				
1	Feeding	87	50	1.63	0.47
2	Cleaning of tanks and siphoning	73	50	0.77	0.57
3	Observation of fish health	87	33	0.77	0.22
4	Water parameter check	73	33	0.32	0.15
5	Feed preparation	73	60	0.72	0.68
6	Live food culture and maintenance	73	33	0.65	0.07
7	Recording of parameters	87	33	0.33	0.15
8	Setting of fish for breeding	87	53	0.27	0.20
9	Removal of fingerlings	87	50	0.21	0.16
10	Preparation of tanks for rearing or breeding	73	33	0.25	0.14
11	Recording of activity	87	43	0.25	0.14
12	Preparation for marketing	100	43	0.29	0.10
13	Packing of fish	87	43	0.25	0.08
14	Marketing	100	63	0.77	0.63
15	Preparation and maintenance of filter system	100	30	0.11	0.07
	Reproductive/Domestic activities	-	-	2.47	8.33
1	Household work	100	100	1.00	7.33
2	Other activities	90	60	1.47	1.00
	Social and community activities	-	-	4.1	3.1
1	Weddings	100	100	-	-
2	Funerals	100	100	-	-
3	Village meetings	100	40	-	-
4	SHG activities	100	63	-	-

Table2. Comparison between the men and women in participation and time spent for ornamental fish business and household activities. A significance level of 0.05 was selected.

Parameters	Z value	P-value	Decision
Participation	-4.654	0.000	Reject Ho
Time spent	-2.292	0.022	Reject Ho

In the study of access and control of men and women over resources, household, fishery related and financial resources were each examined. Household resource included land, farm, machine and equipment and other household assets. Fishery related resources included the ornamental fish units, breeding and rearing units, management of the units, production, marketing and income resources. Financial resources included income, expenditure, savings and credit.

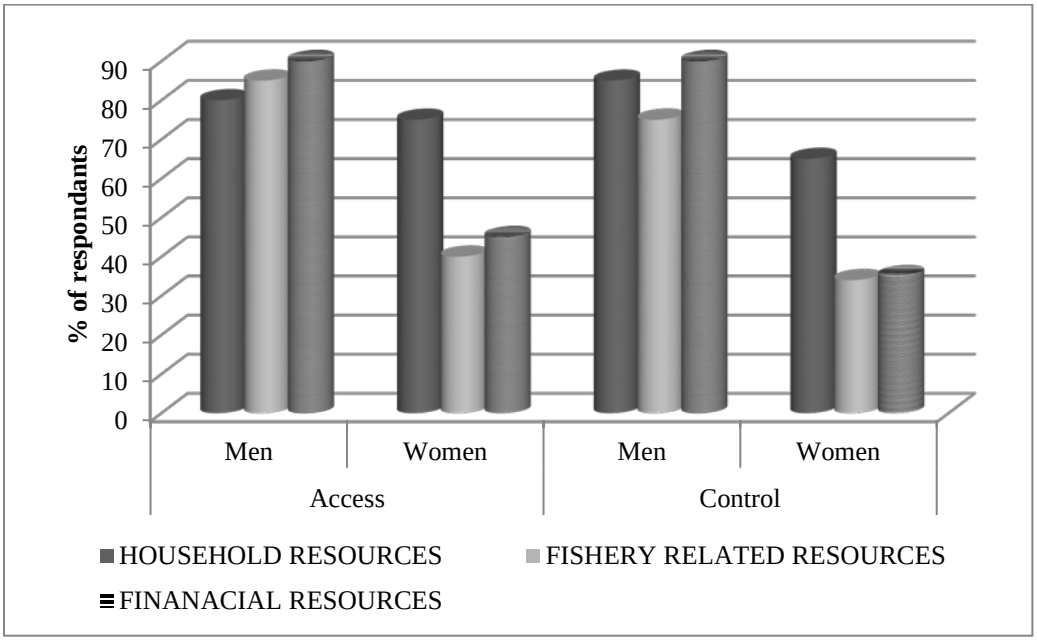


Fig. 1. Access and control over household, fishery related and financial resources between men and women

For all resources, men had greater access and control than women (Fig. 1). The women had considerably higher access to household resources and higher control over household resources than fishery related resources and financial resources.

Table 3. Access and control of men and women over household, fishery related and financial resources

Parameters	Z value	P-value	Decision
Access	-4.675	0.000	Reject Ho
Control	-4.559	0.000	Reject Ho

There is a significant difference between men and women's access and control over resources (Table 3). On an average, men have higher access to resources (87 %) compared to women (52.56 %). Men have higher control on resources (80.89 %) as compared to women (49.89 %).

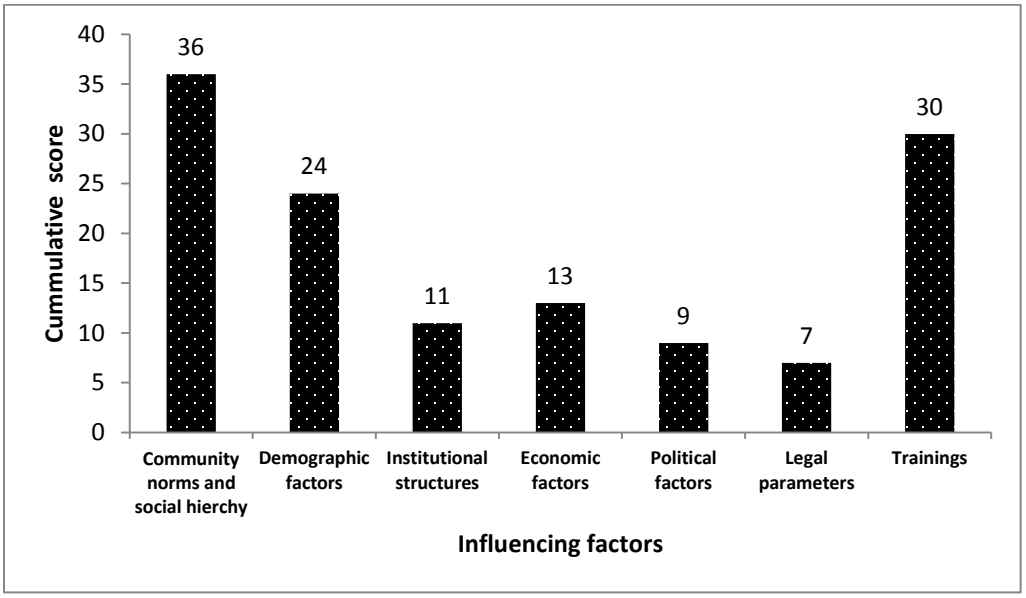


Fig. 2. Influencing factors affecting activity profile and access and control of resources

Among the influencing factors (Fig. 2), community norms and social hierarchy played the main role in deciding division of productive and reproductive roles as well as access and control of resources for men and women followed by training and demographic factors. Institutional structures, economic factors, political factors and legal parameters had relatively less influence.

Discussion and Conclusions

The maximum participation of men is in the construction of the ornamental fish unit, seed stocking, water and health check, live food preparation recording of activity. Women's participation was predominantly observed in feeding, cleaning of tanks and siphoning feed preparation and removal of offspring. There were notable differences between men and women in the access to and control over household, fishery and financial resources. Men had greater access and control over household, fishery and financial

resources when compared to women. Though women participated in fishery activities they had less access to and control over fishery resources when compared to men. The results obtained were similar to other studies which have also stated that men usually have more access and control over resources related to agriculture land, farm assets, inputs such as improved seeds, fertilizers and insecticides, management of labour, management of cash and procuring and repaying loan (Gupta 2011 and Paul 2016).

The main influencing factors were community norms and social hierarchy, training and demographical structures.

There is a vast opportunity for growth of ornamental fish enterprise in domestic trade. The gender role profile of ornamental fish producers reveal that even when the maximum ownership of the ornamental fish enterprise is with men, participation of women in the venture is significant. Women spent about 18 % of a day's time in the activities related to ornamental fisheries. In addition they spend 46 % of a day's time in the household work or reproductive roles. Men on the other hand spend 33 % of their day's time in the activities related to ornamental fish venture. Women are spending half of the time spent in comparison to men in this venture. It would be interesting to know whether the profit earned from the business is shared with women or not. As this study is recent, further results will shed some light on these features. From the initial field work it seems that women's ownership could be increased by having special schemes and training programmes for women in the field of ornamental fisheries. This will make the venture more equitable and sustainable.

Acknowledgements

Authors would like to thank Dr. Gopal Krishna, Director, ICAR-CIFE, Mumbai and Dr. Tapas Bhattacharya, Vice-Chancellor, Dr. Balasaheb Sawant Konkan Agricultural University, Dapoli for providing all support. Thanks are due to all ornamental fish producers who provided information for the study.

References

Dutta, A. L., D. Chakraborty, S. L. Dey, S. Kumar, A. K. Manna and P. K. Manna. 2013. Ornamental fishes of coastal West Bengal, India-Prospects of conservation and involvement of local fishermen. Natural Resources 4: 155-162.

FAO (Food and Agricultural Organization of United Nations). 2006. Fishstat plus: Universal software for fishery statistical time series. Fisheries Department, Food and Agricultural Organization of United Nations, Rome, Italy http://www.fao.org/fishery/statistics/software/fishstat/en. Accessd 03 March 2017.

FAO (Food and Agricultural Organization of United Nations). 2011. State of Food and Agriculture, Women & Agriculture -Closing the gender gap for development. Rome, Italy. 160 pp.

Ghosh, A., B. K. Mahapatra, and N. C. Datta. 2003. Ornamental fish farming-Successful small scale aqua business in India. Aquaculture Asia 8: 14-16.

Gupta, M. and S. Jain. 2011. Access and control of gender of district Ganganagar over agriculture resources. Advance Research Journal of Social science 2: 217-220.

Jain, A. K. and A. Jain. 2009. Domestic aquarium trade is an avenue of immense opportunities and development potential. Souvenir- International Livestock, Dairy Expo (ILDEX) India. 8 pp.

Jayalal L., P. Sruthi and N. Gopal. 2016.Workspace of women in the small-scale ornamental fish value chain in Kerala.Asian Fisheries Science 29S: 213-222.

MPEDA. 2011. Guideline for green certification of freshwater ornamental fishes. Marine Product Export Development Authority (MPEDA), Kochi, Kerala. 122 pp.

Nag, A., H.Vyas, P.Shah and P.K. Nag. 2012. Risk factors and musculoskeletal disorders among women workers performing fish processing. American Journal of Industrial Medicine 55: 833–843.

Overholt, C., M.B. Anderson, K. Cloud and J.E. Austin. 1985.Gender roles in development projects-A Case Book. Kumarian Press, West Hartford, USA. 326 pp.

Paul, M. and R. Rani. 2016.Gender differences in access to and control over farm resources. International Journal of Home Science 2: 301-302.

Rameshan, B. and R.Sakthivel. 2014. The role of women in the popularization of ornamental fish culture in Kerala. Intercontinental journal of marketing research review 2: 54-70.

Shaleesha A. and V. A. Stanley. 2000. Involvement of rural women in aquaculture: An innovative approach. The ICLARM Quarterly 23: 1-5.

United Nations. 2011. International migration report 2009: A global assessment. United Nations, Department of Economic and Social Affairs, Population Division (2011). (United Nations, ST/ESA/SER.A/316). 334 pp.

Snedecor, G. W. and W. G. Cochran. 1967. Statistical methods. Sixth Edition, Oxford and IBH Publishing Co., New Delhi. 593 pp.

Swain, S.K., S.S. Ikmal, S.Parida, B.Patro, S.K.Sahoo, N.Rajesh, P. K.Meher, J.K.Jena, and P. Jayasankar. 2011. Success story of Barakhandapat ornamental fish breeding unit at Patna cluster of Keonjhar, Odisha, India. Aquaculture Asia 16:11-13.

Swain, S.K., B.K. Baliarsingh, S.K.Sahoo, P.K.Meher, B.Patro, N.Rajesh, P. C.Dash, P.Jayasankar and J. K. Jena. 2013. A success story of MaaTarini self help group ornamental fish unit, Purunia Village, Keonjhar District, Odisha, India. Aquaculture Asia 18:21-24.

UNHR. 2013. Realizing women's rights to land and other productive resources. Office of the United Nations High Commissioner for Human Rights. 68 pp.

Gender in Aquaculture and Fisheries: Engendering Security in Fisheries and Aquaculture
*Asian Fisheries Science Special Issue **30S** (2017): 343-353*

ISSN 0116-6514
https://doi.org/10.33997/j.afs.2017.30.S1.021

Short Communication

Gender and Poverty Dimensions in a Value Chain Analysis of Milkfish Mariculture in Misamis Oriental, Philippines

ALITA T. ROXAS[1]*, SHEEVUN DI O. GULIMAN[1], MARIPAZ L. PEREZ[2] and PAUL JOSEPH B. RAMIREZ[2]

[1]MSU-Iligan Institute of Technology
[2]WorldFish Philippine Office

Abstract

This paper aims to describe the role of key players in the value chain for milkfish *Chanos chanos* (Forsskål, 1775) in a mariculture Park in Balingasag, Misamis Oriental in the Philippines with an emphasis on gender dimensions. It also estimates the value additions done by the key players and assesses implications on income distribution. Mapping the chain involved primary data collection through observations, key informant interviews, and focus group discussions. The big, medium and small-scale fish cage operators – 90 % men – are the key players in production. Along the chain are men and women milkfish brokers/traders, wholesalers, and retailers. Largely men created value additions; nonetheless, women's involvement in the different nodes of the chain and their leadership in wholesale and retail trade are evident. While women's labor is unpaid in small-scale operations, women's contribution to the household economy convey to them empowerment in household relations and in community affairs. Findings also reveal that large and medium players are able to obtain higher income from mariculture operations. The perpetuation of poverty among small players that results from capital accumulation among big players is revealed when value additions along the chain are analysed "by what function" or "by whom" and "by how much".

Introduction

Milkfish, (*Chanos chanos* (Forsskål 1775)), is the primary fish species in the Philippine aquaculture industry, contributing 398,088 metric tonnes to

*Corresponding author. Email address: alita.roxas@g.msuiit.edu.ph

Philippine aquaculture production in the year 2016 (Philippine Statistics Authority (PSA) 2016). The present study addressed the value chain for milkfish that is harvested from the Balingasag Mariculture Park in Misamis Oriental, Philippines and distributed in the Cagayan de Oro and Iligan markets within Region 10 of the Philippines. The Philippine Statistics Authority (PSA) 2006-2015 figures indicate that the farmed average production rate of milkfish in the Philippines and in Northern Mindanao stood at 98.33 % and 99.63 %, respectively, indicating that milkfish is almost entirely raised through aquaculture; the average production rate of milkfish as part of capture fisheries therefore comprised a negligible proportion of the entire production. Production in marine cages in Region 10 in 2007 increased 3.2 times (from 12.64 metric tonne to 53.37 metric tonne) over the 2006 level and rose 7.6 times (from 53.37 metric tonne to 456.76 metric tonne) from 2007 to 2008 due to the establishment of the Balingasag Mariculture Park in March 2007. The launching of the Mariculture Park Development Program nationwide aimed to provide an alternative and sustainable livelihood among fishers, for food security, and for stimulating investment in fisheries in the face of dwindling fishery resources and climate change (Salayo et al. 2012).

The value chain concept was introduced by Porter in 1985 (Porter 2008); he defined it as activities within an organization that adds value to the services and products the organization produces. Activities include product designing, production, marketing, distribution and after-sales services to the final consumer. Kaplinsky and Morris (2001) saw the value chain as a tool in understanding income distribution, its functional decomposition or the share going to or withheld from men and women players. Value-added is the difference between the sales of a commodity and the cost of inputs (factors of production); value is created by form through transformation activities like processing, by time through storage so the product is available at various times, and by place through movement from production to consumption (Brown, Perez et al. 2010). In the locale of the study milkfish is sold fresh to traders up to the consumers, except for a very minimal processing done by women.

The objectives of the study are two-fold: (1) to describe the role of key players in the milkfish value chain with an emphasis on gender dimensions; and (2) to estimate the value addition done by the key players and the implications on income distribution.

Methods

This value chain analysis (VCA) employed a triangulation of primary and secondary data sources. Primary data gathering involved actual observation, key informant interviews (KIIs), and focus group discussions (FGDs). Three private fish cage investors, 10 fish cage supervisors, 10 small-scale operators, five brokers/traders, seven wholesalers and 14 retailers, two officers of the Balingasag Women's Federation, and the Municipal Agricultural Technologist in Fisheries served as KIs. FGDs with wives of marginal operators/fish cage workers and with fish cage workers were conducted. Secondary data came from the Bureau of Fisheries and Aquatic Resources (BFAR) and Philippines Statistics Authority (PSA) websites, research articles, and from the Balingasag Mariculture Park records. Value addition from each of the key players in the chain were estimated using a cost and returns analysis and were then compared. The study was conducted in January to June, 2014.

Results

The mariculture park covers 195 ha but only 10 % of this is used for culturing milkfish: 11.5 ha for the 56 fish cages of 11 big fish cage operators; 6 ha for 100 fish cages of 24 medium operators, and 2 ha for 9 fish cages shared by 34 small-scale operators; the last group comprises mariculture park livelihood beneficiaries (DA-BFAR Balingasag Mariculture Park brochure, 2009). Table 1 details the number and sizes of fish cages owned by different types of operators, the stocking density and yield.

Table 1. Fish cages - characteristics, stocking density and yield

	Big Operators	Medium Operators	Small-scale Operators
No. of fish cages operated	7–14	2–6	¼ a fish cage
Materials used	High density poly-ethelyne, galvanized iron pipes, bamboo	Galvanized iron pipes bamboo	Bamboo
Size	Circular: 10 m, 15 m, 20 m diameter Square: 10 m x10 m x 5 m	Square: 10 m x 10 m x 5 m	Square: 5 m x 5 m x 5 m
Fingerlings stocked/fish cage	15,000 – 60,000	15,000	5,000
Yield/fish cage(MT)	7.50–30.0	7.5–8.0	≈ 2.0

Source: Balingasag Municipal Agriculture Office 2014.

Gender and Poverty in the Milkfish Value Chain

Inputs and Services

This node of the chain is the pre-stocking stage where repairs and maintenance of fish cages and the sourcing of fingerlings are done in preparation for production. Male fish cage caretakers hired by private investors perform the former but women were also hired to mend or fabricate fishnets. The small-scale operator does these tasks, assisted by men and women (specifically for net repairs) next-of-kin whose labor is unpaid. Procurement of fingerlings (PhP 8 each) was also done at this stage. As indicated in Table 1 above, the minimum stocking density for private investors is 15,000 fingerlings, but only 5,000 for small operators.

Production

This is the milkfish grow-out period and covers 4 months of feeding milkfish juveniles till they are harvested. To allow time between crops for repairs and maintenance, there are only two grow-out periods, but grow-out is spread throughout the year in different fish cages so harvesting can be year-round. The fish cage operators are the key players in this node. Men comprised 80 % of the 35 private (big and medium) operators and women composed the remaining 20 %. They had college education and access to investment capital. Similar to other mariculture parks (Aquapark Final Project eReport 2014), the small-scale operators are the fish cage livelihood beneficiaries, totalling 34. Only men and local residents can become beneficiaries. They are provided with fish cages and working capital. Four beneficiaries share a 10 m x 10 m x 5 m fish cage. Working capital is lent to a group of at least three, but the insufficient amount compels the beneficiaries to take turns in operating a fish cage. The pooled operating capital covers the cost of fingerlings, repairs and maintenance of fish cages and only 60 % of the feed required such that additional feed needs to be purchased on credit. For private investors, fingerlings and feed account for 20.4 % and 70.9 % of costs, respectively; labor and overhead costs acount for the remaining. Private fish cage operators manage their fish cages through their hired fish cage supervisors who manage the fish cage caretakers in feeding the juveniles. Fish cage operations are done by men but women are hired to count the fingerlings for stocking in fish cages.

Hired watchers, sometimes armed, are all men and they secure the fish cages day and night from poaching.

Small-scale operators alternate with their respective wives and/or male children (13–15 years old), during school holidays in meeting the requirements of the grow-out period. The wives feed the juvenile milkfish when the operators engage in fishing, find an extra job, or get ill. It is not unusual to find the small operator and his wife safeguarding the fish near harvest time. Fish harvesting is done by fish cage workers, augmented by hired menfolk from their families. Women prepare the food for the harvesters. Fish brokers/traders shoulder labor and food expenses. Fish is sold fresh so no form value is created.

Trading

The brokers/traders of milkfish are those contacted by fish cage operators during harvest time to buy the fish for distribution to wholesalers. Our informants estimate that 75 % of the brokers/traders are men. The brokers/traders pay using cheques post-dated three to four days from the purchase date or give a promissory note to pay in 3–7 days. Traders generate place value as they move the fish through fish cars from the mariculture park to the fish landing area or "bagsakan" where they sell the fish to wholesalers. Wholesalers, whom we observed to be generally women, sell the fish to retailers, most of whom are also women, who go to the "bagsakan" to buy fish. Apart from recording sales and collecting payments from retailers, wholesalers have minimal activities and incur mainly labor expenses. Some of them also defer their payment for the fish for three days as they allow a two-day credit term to retailers who are their regular buyers. Retailers similarly generate place value as they transport the fish to the final consumers at the public markets. Few men join their wives in fish retail, but we learned that most wives partner with their retailer-husbands in selling the fish. Big and medium fish cage operators, fish brokers and wholesalers, both men and women, reported getting a personal share of profits. Small-scale fish cage operators and milkfish retailers revealed that profits become part of total family income.

It can be seen that from the pre-stocking of fish cages up to retailing, women played important roles. However, in small-scale operations women generally form part of unpaid family labor. Nonetheless, whether in focus group

discussions or in individual interviews, the women, particularly the wives of fish cage operators and the retailers, claimed feeling empowered as a result of working in tandem with their spouses in nurturing their livelihoods. The women said that by helping in fish cage operations, their spouses can engage in additional jobs, e.g., as caretakers of other fish cage operators, as carpenters, or an substitute tricycle drivers, and earn extra income. As milkfish retailers or as partners in their spouses' retail activities, the women are also able to contribute to household income. The respect that the women's economic activities engender allows them participation in major household decision-making, such as allowing both a son and a daughter to finish high school and accepting official functions in community organizations, e.g., secretary, thereby getting involved also in community affairs.

Value Additions along the Chain

Taking the yield of 7.5 metric tonne of a single 10 m x 10 m x 5 m fish cage, the cage size common to all players except the small-scale operators who only operate a quarter of this size, as the basis for determining value additions, Table 2 shows the value-added by key players in the different nodes of the chain per kilogram. Value-added is the difference between gross value received and the cost of inputs (Brown et al. 2010). Gross value received for the fish cage operator is the farm gate price.kg^{-1} of milkfish. Other inputs that he pays for include management expenses, labor cost, cost of fingerlings and feeds, and depreciation costs. Cost of inputs by the other players refers to their buying price.kg^{-1} of milkfish. Value received for a kg by other players down the chain refers to the selling price.kg^{-1} of milkfish while their major input cost is the buying price.kg^{-1}. Other input costs for the brokers/traders refer to the cost of bringing the milkfish from the mariculture park to the "bagsakan", which includes labor cost, gasoline expense, and depreciation of the Asian utility vehicle or light truck, popularly called "fish car" used to transport fish. For the wholesaler, other input costs are nil as he/she only transfers the fish to the retailers at PhP 5.00 commission/kg from the broker; other input costs for the retailer include labor and transportation expenses in bringing the fish from the "bagsakan" to the wet market for final distribution to the consumers.

Using a cost and return analysis, private fish cage operators are able to create a value-added per kilogram estimated at PhP 11.11/kg, which was

realized only after four months of production or during harvest time. The brokers/traders' value added is estimated at PhP 12.05/kg and generated only in a day's time. Wholesalers are able to add only a value of PhP 5/kg in a day. The retailers are able to create the highest value added estimated at PhP 12.46/kg; however, they are able to sell only about 400 kg of milkfish in 1-2 days (Table 2).

Table 2. Value-added per kilogram by key players for a 7.5 metric tonne harvest (in PhP)

Particulars	Private (big and medium) fish cage operators (80 % men)	Brokers/Traders (75 % men)	Wholesalers (Mostly women)	Retailers (Mostly women)
Gross value received (Selling price/kg)	92.00	105.00	110.00	125.00
Cost of milkfish/kg	74.07	92.00	105.00	110.00
Cost of other inputs	6.82	0.95	-	2.54
Total cost of inputs	80.89	92.95	105.00	112.54
Value Added (Gross Value-total cost)	11.11[1]	12.05	5.00	12.46

Table 3. Percentage of value-added to gross value-added by key players per kg of milkfish sold for 7.5 MT harvest and factors of production used

Key players	Value-added (PhPp)	% Value-added of Key Players	Inputs
Private [big and medium] fish cage operators (80 % men)	11.11[1]	27.35	Management, labor, financial capital, depreciation cost of fish cages
Brokers/Traders (75 % men)	12.05	29.67	Management, labour, financial capital, depreciation cost of fish car
Wholesalers (mostly women)	5.00	12.31	Management, labor
Retailers (mostly women)	12.46[2]	30.67	Labor, financial capital
Gross Value-added (Total wealth created)	40.62	100.00	

[1]Realised after 4 months of production
[2]Retailers are able to sell only 400 kgs

Table 3 shows the percentage of value added by the key players in the different nodes of the chain. Gross value added per kg is PhP 40.62. Value additions are largely generated by men owing to their more active involvement in fish cage operations, which generates 27.4 % of value added, and in brokering/trading, which generates 29.7 % of value added. This suggests a bigger income acccruing to men from milkfish mariculture in Balingasag. Women are more involved in wholesaling and retailing; the former creates only a minimal percentage share of the gross value added (12.3 %), and while the latter generates the highest value addition in the chain (30.7 %), the retailer reported being able to absorb only 400 kgs of milkfish a day for distrbution to final consumers.

Private investors can sell more than 7.5 metric tonnes of milkfish per harvest as they operate several fish cages (Table 1). Traders are also able to buy and sell bigger quantities given their access to capital, capacity to pay for labor and credit arrangements with operators. Wholesalers may similarly be able to absorb and sell more fish to retailers. Income accruing to these groups of players therefore multiplies with the volume sold. As profit margins from mariculture take four months to be realized, the attractive layers of profit margins in trading, earned only in a day, serve as incentives to some private operators to also engage in fish trade, thereby allowing them to create value up to the wholesale node of the chain.

The small-scale operators are able to create value estimated at PhP 7.38/kg in four months as they only have approximately 2,000 kgs of harvest and do not benefit from economies of scale, e.g., small volume of purchases of feed. Moreover, they earn only twice in two years as fish cage operators, because of their alternating production arrangements with other beneficiaries.

Increasing women's participation in the mariculture park through fish processing

In 2011, a 500 m^2 Milkfish Processing Plant was built by BFAR in Balingasag to increase women's participation in fish cage operations. 30 women were organized and trained to produce frozen and deboned milkfish for supermarkets and other institutional buyers. However, there are certification

requirements, such as for Good Manufacturing Practices (GMP) and Hazard Analysis and Critical Control Points (HACCP) for these lucrative markets to ensure that products are of high quality and pose no risk to consumers. Documents on food safety and maintenance of facility, among others, are required. The women were provided training for certification, but due to the very minimal volume of processing (<100 kgs.month^{-1}) regular expert supervision and monitoring are absent thereby impeding the women's compliance as most of them did not even finish high school. The women more often rely on walk-in customers and earn only less than PhP 400 per month.

Discussion

Income status and work requirements shape gender roles in the milkfish value chain in Misamis Oriental, Northern Mindanao. Where the fish cage operators can afford to hire workers, women's participation is peripheral; in small-scale operations, it is prominent yet forms part of unpaid (family) labor. This is consistent with the findings of Ferrer et al. (2014) and Sumagaysay (2014) among others, in their studies on small-scale fisheries. Consistent likewise with these studies are the involvement of men in activities requiring strength and the engagement of women in work needing patience and meticulous attention. However, cross overs are sometimes necessary as when women paddle a wooden fishing boat or "banca" to feed juvenile fish or men count fingerlings.

Findings also lend support to assertions by Silvander (2013) that households use various strategies to cope with poverty. A common strategy is to transform family members (usually wives and children) into unpaid workers, resulting in lower operational expenses and additional income. Diversifying livelihoods is another coping mechanism and manifested by small-scale operators working as caretakers of big fish cages or taking extra jobs. Livelihood diversification was also observed by Ellis (2000) in his studies on rural livelihoods.

Women's ability to provide/augment household income by serving as unpaid/substitute workers in fish cage operations, or by engaging or assisting in fish trade not only improve power relationships in the household but also afford women participation in community affairs. In an interview with the Agricultural

Technologist in Fishery of the Balingasag Municipal Agricultural Office (Karen May Sabugaa, personal communication) it was learned that gender considerations in the pursuit of inclusive and sustainable development in small scale fisheries as espoused by FAO (2015) have prompted BFAR to mitigate male dominance in fish cage operations by establishing an onsite milkfish processing facility. However, weaknesses earlier mentioned in meeting certification requirements for food safety render precarious the women's livelihood in fish processing.

Meanwhile, the distribution of benefits over time along the milkfish value chain (Table 2), as indicated by the value added by key players in the various nodes, provide insights on the percentage of value creation by men and women. It similarly provides insights for the persistence of poverty among small-scale players and capital accumulation among big and medium ones over time as the latter are able to exploit economies of scale.

Conclusions

Evaluations of gender and poverty issues through VCA are gaining ground. This VCA for milkfish set in the context of the Balingasag MP opens a social window that allows a closer look at how access to factors of production shapes the roles of men and women in a value chain. It shows how value created in the chain and its distribution transform the way men and women relate to each other and how it expands women's participation in decision makingin the household and in the community. As well, the VCA provides a better understanding of how value creation and subsequent income distribution lead to the perpetuation of poverty among small players and to the accumulation of wealth among big players.

Acknowledgments

Gratitude and appreciation go to WorldFish, Philippine Office for generously funding the study, to all who formed part of the study, and to the MSU-Iligan Institute of Technology for its commitment to research and development.

References

Aquapark Final Project eReport. 2014. Planning and management of aquaculture parks for sustainable development of cage farms in the Philippines (AQUAPARK) https://www.academia.edu/7666623/Planning_and_management_of_aquaculture_parks_for_sustainable_development_of_cage_farms_in_the_Philippines. Accessed 05 December 2016.

Brown, E.O., M.L. Perez, L.R. Garces, R.J. Ragaza, R. A. Bassig and E. C. Zaragoza. 2010. Value chain analysis of sea cucumber in the Philippines. Studies and Reviews 2120. The WorldFish Center, Penang, Malaysia. 44pp.

Ellis, F. 2000. The determinants of rural livelihood diversification in developing countries. Journal of Agricultural Economics 51:289-302.

FAO. 2015. Voluntary guidelines for securing sustainable small-scale fisheries in the context of food security and poverty eradication. https://www.google.com.ph/?gfe_rd=cr&ei=HsVSWMXsCsrU8AeEwYCIAg#q=Voluntary+International+Guidelines+on+Securing+Sustainable+Small-Scale+Fisheries+in+the+Context+of+Food+Security+and+Poverty+Eradication+. Accessed 12 December 2016.

Ferrer, A.J.G., M.L. Perez, A.T. Roxas and E.M. Avila. 2014. Expanding roles of men and women in aquatic agricultural systems in the Philippines. Asian Fisheries Science 27S: 185-194.

Kaplinsky, R. and M. Morris. 2001. A handbook for value chain research. 113 pp. https://www.google.com.ph/?gfe_rd=cr&ei=HMtSWPeLO9TU8AeBgJOYBw#q=kaplinsky+and+morris+value+chain. Accessed 26 June 2012.

PSA (Philippine Statistics Authority). 2016. Country STAT Philippines. World Wide Web: http://countrystat.psa.gov.ph. Accessed 30 July 2017.

Porter, M. E. 2008. Competitive advantage: Creating and sustaining superior performance. Simon and Schuster, New York. 691pp.

Salayo, N.D., M.L. Perez, L.R. Garces and M.D. Pido. 2012. Mariculture development and livelihood diversification in the Philippines. Marine Policy 36: 867-881.

Silvander, J.K. 2013. Gender equality in value chains and the role of aid for trade in promoting gender equality and women's employment in developing countries. Ministry for Foreign Affairs of Finland. 60 pp. https://www.google.com.ph/?gfe_rd=cr&ei=e8lSWLnkDc_U8Aevp5HQBg#q=Silvander%2C+J.K.+2013. Accessed 11 September 2016.

Sumagaysay, M.B. 2014. Workspaces for women in the mussel industry Jiabong, Samar in the Philippines: Promoting small-scale entrepreneurship. Asian Fisheries Science 27S: 175-184.

EXTENDED ABSTRACTS

Gender in Aquaculture and Fisheries: Engendering Security in Fisheries and Aquaculture
*Asian Fisheries Science Special Issue **30S** (2017): 357-361*

ISSN 0116-6514
https://doi.org/10.33997/j.afs.2017.30.S1.022

Extended Abstract

Gender and Emotions in the Appraisal and Management of Climate-Related Risks in Inland Aquaculture

LOUIS LEBEL[*] and PHIMPHAKAN LEBEL

Unit for Social and Environmental Research, School of Public Policy, Chiang Mai University, Chiang Mai 50200, Thailand

Abstract

Fish farmers in Northern Thailand who rear Tilapias (*Oreochromis niloticus* (Linnaeus 1758)) and (*Oreochromis mossambicus* (Peters 1852)) x (*Oreochromis niloticus* (Linnaeus 1758)) in floating cages in rivers face significant climate-related risks, in particular from droughts and floods. Women play significant roles in taking care of the fish, raising the question of whether their experience of risks and how they manage risks differ from that of men. This paper is a review of the gender-related findings from a series of studies in Northern Thailand. Gender differences found in perception and management of risks could not be explained by gender differences in attitudes to risk as measured on risk aversion scales. Investigation of feelings around risk-taking suggest that appraisal of risks involves both analysis and emotions, and is not identical for women and men. Overall, the studies found that modest gender differences and emotions both influenced risk-taking and decision-making, and thus are significant factors in how climate-related risks are managed.

Introduction

Although it is common to assume women are more vulnerable than men to climate change and cast them as victims (Cornwall et al. 2007), empirical evidence in many livelihood and geographical areas is lacking (Jost et al. 2016). Moreover, there are concerns that intervention programs may multiply burdens for women, leading to calls for more critical research on how gender actually influences the experience and management of climate-related risks (Lebel et al.

[*]Corresponding author. Email address: llebel@loxinfo.co.th

2017). This short paper reviews the findings related to gender of a set of recently published studies by the authors. It is a summary of the paper presented at the 6th Global Symposium on Gender in Aquaculture and Fisheries.

In Northern Thailand, Tilapia and a few other species are reared in earthen ponds as well as floating cages in rivers and reservoirs. Extreme weather events and climate have significant impacts on farm profits, in particular, floods and droughts. Climate risk management and investment decisions are important to farm profitability (Lebel et al. 2016a). Women often play a major role in taking care of fish and in rearing decisions (Lebel et al. 2009), although this varies with gender relations within households (Kusakabe 2003). Studies of risk aversion of salmon farmers in Norway (Bergfjord 2009) and reservoir culture in Northern Vietnam (Petersen and Schilizzi 2010) suggest fish farmers are risk averse; whereas a study of channel catfish culture in the USA found levels of risk aversion varied widely among individuals and was associated with practices such as stocking densities (Dasgupta and Engle 2007). Little is known however, about how gender and emotions influence risk appraisal and management decisions.

Materials and Methods

These studies used mixed methods: in-depth interviews, direct observations, a role-playing game (Lebel et al. 2016b), and quantitative surveys (Lebel et al. 2015b) to assess how gender and emotions influence the management of climate-related risks (Lebel and Lebel 2016c). The main studies were done with river cage fish farmers in four regions in Northern Thailand with different climates and river flows; with some additional observations and comparisons with cage culture in reservoirs (Lebel et al. 2016a), culture in ponds and crop agriculture (Lebel et al. 2017).

Results

Women consistently expressed slightly greater concern than men for most climate-related risks (Lebel et al. 2015d). Women were also more likely than men to perceive that droughts had become more severe and to be ‘very concerned’ with future climate change (Lebel et al. 2015c).

In line with these differences in risk perception at the farm level, women placed greater importance than men on monitoring, reducing costs, preparing equipment, and diversifying income sources as climate risk management strategies (Lebel et al. 2015b). At the river level, women placed greater importance than men on the operation of water infrastructure and watershed management, but did not attach more importance to participation in water governance where they felt they had little influence. Differences in climate-related risk management practices could not be explained by attitudes towards risk: women and men showed similar levels of risk aversion on two standard scales (Lebel and Lebel 2016c).

Some additional insights, however, were gained from considering emotional responses to risk and decisions (Lebel and Lebel 2016c). Women and men expressed similar emotions when discussing fish farming risks, except for pride and frustration, which men expressed significantly more frequently. Feeling worried, concerned, anxious or stressed, were the most common negative emotions referred to in interviews. Fear was a reason for not-taking risks. Anxiety in the period prior to harvest helps motivate risk management practices, such as close monitoring and aeration. Men who expressed pride performed better in the role-playing simulation game than those who had not, but for women there was no difference. Men who expressed feeling excited or thrilled chose riskier options than women.

Discussion and Conclusions

Gender differences and emotions both influence risk-taking and decision-making, and thus are significant factors in how climate-related risks are managed. This study adds an example, from a novel aquaculture context, to the body of knowledge that shows risk decisions are not just analytical considerations, but also influenced by emotions (Breakwell 2010; Loewenstein et al. 2001).

Although significant, the gender differences in behavior at the farm level found in this study were not very large. One reason is that commercial cage culture is already a relatively standardized set of practices, as a consequence of a history of contract farming arrangements and extension support. Gender differences are greater for cage culture in reservoirs, as this activity takes place

further away from home (Lebel et al. 2016a) than river cage culture which is often undertaken close to home (Lebel et al. 2014). Overall, most farm-level risk management options were equally accessible to both men and women, and in many households, decisions and actions were taken jointly.

At the collective level, participation in risk management, or governance, by women is much less than that of men. In this region men dominate water user groups, and play a much more prominent role in conflicts over water shortages and decisions on water allocation (Lebel et al. 2015a). Research on the roles of women in community-level water management, and gendered social norms in Northern Thailand (Lebel et al. 2017) suggest that it will be difficult for women to reduce risks to their farms at the larger, collective scales than it is for men. Further work is needed on how gender relations influence the management of water uses by aquaculture, as this is another area critical to the management of climate-related risks.

Acknowledgements

The work was carried out with the aid of a grant from the International Development Research Centre, Ottawa, Canada, as a contribution to the AQUADAPT project.

References

Bergfjord, O. J. 2009. Risk perception and risk management in Norwegian aquaculture. Journal of Risk Research 12: 91-104.

Breakwell, G. M. 2010. Models of risk construction: Some applications to climate change. Wiley Interdisciplinary Reviews: Climate Change 1: 857-870.

Cornwall, A., E. Harrison and A. Whitehead. 2007. Gender myths and feminist fables: The struggle for interpretive power in gender and development. Development and Change 38: 1-20.

Dasgupta, S. and C. Engle. 2007. Impact of low catfish prices on economically efficient feeding and optimal stocking densities of channel catfish, *Ictalurus punctatus*, in multi-batch production in the U.S. south. Journal of Applied Aquaculture 19: 67-82.

Jost, C., F. Kyazze, J. Naab, S. Neelormi, J. Kinyangi, R. Zougmore, P. Aggarwal, G. Bhatta, M. Chaudhury, M. L. Tapio-Bistrom, S. Nelson, S. and P. Kristjanson. 2016. Understanding gender dimensions of agriculture and climate change in smallholder farming communities. Climate and Development 8: 133-144.

Kusakabe, K. 2003. Women's involvement in small-scale aquaculture in Northeast Thailand. Development in Practice 13: 333-345.

Lebel, P., P. Chaibu and L. Lebel. 2009. Women farm fish: Gender and commercial fish cage culture on the Upper Ping River, northern Thailand. Gender, Technology and Development 13: 199-224.

Lebel, P., N. Whangchai, C. Chitmanat, J. Promya and L. Lebel. 2014. Access to fish cage aquaculture in the Ping River, northern Thailand. Journal of Applied Aquaculture 26: 32-48.

Lebel, L., P. Lebel, P. Sriyasak, S. Rattanawilailak, R.C. Bastakoti and G.B. Bastakoti. 2015a. Gender relations and water management in different eco-cultural contexts in Northern Thailand . International Journal of Agricultural Resources, Governance and Ecology 11: 228-246.

Lebel, P., N. Whangchai, C. Chitmanat and L. Lebel. 2015b. Climate risk management in river-based Tilapia cage culture in northern Thailand. International Journal of Climate Change Strategies and Management 7: 476-498.

Lebel, P., N. Whangchai, C. Chitmanat and L. Lebel. 2015c. Risk of impacts from extreme weather and climate in river-based Tilapia cage culture in Northern Thailand. International Journal of Global Warming 8: 534-554.

Lebel, P., N. Whangchai, C. Chitmanat, J. Promya and L. Lebel. 2015d. Perceptions of climate-related risks and awareness of climate change of fish cage farmers in northern Thailand. Risk Management 17: 1-22.

Lebel, L., P. Lebel and B. Lebel. 2016a. Impacts, perception and management of climate-related risks to cage aquaculture in the reservoirs of northern Thailand. Environmental Management 58: 931-945.

Lebel, P., P. Sriyasak, C. Kallayanamitra, C. Duangsuwan and L. Lebel. 2016b. Learning about climate-related risks: Decisions of Northern Thailand fish farmers in a role-playing simulation game. Regional Environmental Change 16: 1481-1494.

Lebel, L. and P. Lebel. 2016c. Emotions, attitudes, and appraisal in the management of climate-related risks by fish farmers in Northern Thailand. Journal of Risk Research Issue: 1-19.

Lebel, L., P. Lebel and B. Lebel. 2017. Gender and the management of climate-related risks in northern Thailand. International Social Science Journal, 147-158. DOI: 10.1111/issj.12090

Loewenstein, G., E. U. Weber, C. Hsee and N. Welch. 2001. Risk as feelings. Psychological Bulletin 127: 267-286.

Petersen, E. and S. Schilizzi. 2010. The impact of price and yield risk on the bioeconomics of reservoir aquaculture in Northern Vietnam. Aquaculture Economics and Management 14: 185-201.

Gender in Aquaculture and Fisheries: Engendering Security in Fisheries and Aquaculture
*Asian Fisheries Science Special Issue **30S** (2017): 363-366*

ISSN 0116-6514
https://doi.org/10.33997/j.afs.2017.30.S1.023

Extended Abstract

Women in the Seafood Industry: Different Countries, Diverse Level of Knowledge and Awareness

MARIE CHRISTINE MONFORT *

Marketing Seafood, Co-founder of WSI, The International Association for Women in the Seafood Industry, 19 rue Martel 75010 Paris, France.

Introduction

On a global scale, quantitative and qualitative data on the participation of women in the seafood industry is sparse and when it exists it may be of poor quality and only cover some segments of the industry. Thus, the knowledge and understanding of the very complex distribution of roles, power, access to resources and profits between genders are incomplete and vary greatly between regions and industry sectors. This presentation draws on a study (Monfort 2015) that, among other themes, illustrates the level of knowledge, the level of awareness and the understanding of the distribution of roles by gender through case studies in 6 different countries, Croatia, Egypt, France, Iceland, India and Senegal.

The case studies, carried out in early 2015 for Globefish the unit in the FAO Fisheries Department responsible for information on international fish trade, summarize the knowledge on "the role of women in the seafood industry". What is known, documented? Does sex disaggregated data over the full employment spectrum in the seafood industry exist? Do sociological, anthropological and economic studies shed a light on the role and power distribution between sexes?

* Corresponding author. Email address: marie.monfort@marketing-seafood.com

Methods

In each country, we measured the level of knowledge and the level of awareness of women's situation in the seafood industry, not the actual level of disparity or discrimination. We have used an assessment grid made of 3 successive steps as described in Table 1. Note that this simple tool is not meant to run comparisons between countries

Step one. What is the state of knowledge on potential gender-bias in the seafood industry? To answer this question, we looked for sex disaggregated data in the different segments of the industry (fishing, fish processing, aquaculture, fish trading), and for qualitative social studies carried out by sociologists, anthropologists or economists about gender-based distribution of roles and power in the industry and all along the value chain (access to education, capital, network, visibility, power). Are women recorded in official statistics? What do we know about their contribution to the seafood value chain?

Table 1. The 3 step assessment grid for gender analysis (source: Table 9, Monfort 2015)

Step 1. Knowledge of women's participation, gender-based roles and power distribution in the seafood industry	
Gender-based role distribution: quantitative data in the industry	Does sex disaggregated data exist? Is there a systematic collection organised? Who provides labour force/ capital; who owns resource; who makes decisions?
Knowledge and understanding of gender relationships in the industry	Social research work on the issue? Gender surveys?
Step 2. Awareness of inequalities and barriers against women in the society in general and in the industry	
Inequalities identified in the society	Have inequalities affecting women been identified/published/publicised and recognised?
Inequalities identified and addressed by seafood stakeholders	Have this issues been addressed by stakeholders: NGOs, associations, public authorities, private businesses?
Step 3. Correctives measures and initiatives in the seafood industry	
Taken by the public sector, NGOs and aid agencies	Specific provisions, dedicated projects?
Taken by private businesses	Have private companies developed specific gender related programmes?

Step two. What is the level of knowledge of the status of men and women in the society and the existence or otherwise of gender inequality (access to education, capital, network, visibility, power). If/when there is evidence of gender-bias in the industry, has this bias been publicised to raise people's awareness. Has any gender imbalance been addressed by public authorities, trade unions, NGOs, by industry stakeholders in the society and in the seafood industry?

Step three. What is done in practical terms to correct the imbalance? What initiatives have been taken in the seafood industry, by the public sector and/ or by private companies?

Results and Conclusion

Globally, quantitative and qualitative data on the participation of women in the seafood industry is sparse and when it exists it may be of poor quality and only cover some segments of the industry. Thus, the knowledge and understanding of the very complex distribution of roles, power, access to resources and profits between genders are incomplete and vary greatly between regions and industry sectors.

Table 2. Knowledge of the situation of women in the seafood industry, based on surveys of experts in each country, each of the dimensions of knowledge was rated on a scale from 0 to 6.

	Egypt	France	Iceland	India	Senegal	Croatia
Knowledge of women's participation, gender-based roles and power distribution in the seafood industry	0	2	4	3	3	2
Awareness of inequalities and barriers against women	1	2	4	3	3	1
Correctives measures and initiatives in the seafood industry	1	1	1	1	2	0

Of the 6 countries (Republic of Croatia, the Arab Republic of Egypt, the French Republic, the Republic of Iceland, the Republic of India and the Republic of Senegal) studied in this report, only 1 collects sex disaggregated data over the full employment spectrum in the seafood industry, namely Iceland. Sociological, anthropological and economic studies on the role and distribution of power between sexes are still rare.

The knowledge and understanding of the very complex distribution of roles, power, access to resources and profits between genders are incomplete and vary greatly between regions and industry sectors. This report provides evidence that the quality of data is not linked to a country's level of economic development. Developing countries such as India and Senegal, for instance, offer rather good records because these important fishing and aquaculture nations have received the attention of gender sensitive development aid agencies. By contrast, the knowledge of the participation of women in the seafood industry in a developed country such as France is dramatically poor.

Reference

Monfort, M.C. 2015. The role of women in the seafood industry. GLOBEFISH Research Programme, 119, 67 pp. http://www.fao.org/3/a-bc014e.pdf. Accessed 30 April 2016.

Gender in Aquaculture and Fisheries: Engendering Security in Fisheries and Aquaculture
*Asian Fisheries Science Special Issue **30S** (2017): 367-373*

ISSN 0116-6514
https://doi.org/10.33997/j.afs.2017.30.S1.024

Extended Abstract

Food Security Practices of 4Ps Women in Urban Coastal Areas in Iloilo City, Philippines

FELJEAN C. CAGAPE*, RHODELLA A. IBABAO, MARIA THERESA B. VARGAS, NICANOR L ESCALERA, MARK REY NEIL C. SOLIVA and LAWRENCE A. LORENZO

College of Management, University of the Philippines visayas, Gen. Luna st., Iloilo city 5000 Philippines

Introduction

Household food security has become a serious concern in the Philippines. Approximately 17.5 million Filipinos are still undernourished and 33.6 % of children are stunted (FAO 2015). Meanwhile, 19 % of the whole population live with a daily budget of less than Php 50.00 or USD $1.25 (FAO 2015). Poor nutritional status is partly caused by food insecurity - a situation that exists when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development and an active and healthy life (FAO 2016). Food insecurity is influenced by the unavailability of food, insufficient purchasing power, and inappropriate distribution or inadequate use of food at the household level (FAO 2016).

Household food security, when viewed through an urban lens, is a key developmental challenge because low-income groups who rely heavily on market purchases for consumption spend the largest share of their income on procuring food (Battersby 2012; Floro and Swain 2009). Moreover, urban food security is viewed as secondary to rural food security and analysis has been largely framed as an issue of production so that solutions and frameworks adopted are designed for the rural challenge with urban agriculture as the main response (Battersby 2012). However, food insecurity in urban areas is not triggered by absolute food shortages but by failures of households to be able to

access food (Battersby 2012). In addition, spatial dimensions have been neglected in the analysis in terms of how people actually navigate their foodscapes (e.g. where they work and reside and where they buy food) and the availability of space for food production.

Equally important are gender dimensions in the way households respond to food insecurity. Women are key players in overcoming urban household food insecurity (Floro and Swain 2012). They also play predominant roles in food trading but also act as food producers, food preparers, and in-charge of income budgeting as primary caregivers in homes (Karl 2009; IIED 2013). They also grow traditional varieties of vegetables, herbs and spices in their home gardens.

Yet, there are socio-cultural, institutional, and behavioural factors which limit women's capability to access food for their families. These include the perceptions of both men and women (and women significantly more than men) that husbands should receive priority treatment in the family. As part of their reproductive role, women are held responsible for properly feeding their children and the household work force. However, they often do not have sufficient decision-making power and access to productive resources to increase own food production or buy food, unless new opportunities are created (Battersby 2012).

This paper investigates the experiential measures of food security by 30 women in 3 coastal villages (Calaparan, Sto. Nino Norte and Sto. Nino Sur) in the highly urbanized Iloilo City that has almost 500,000 residents. Between March-April 2016, ten females were selected from each village. These women were from among the 928 families under the 4Ps (Pantawid Pamilyang Pilipino Program or Bridging Program for the Filipino Family) in the 3 coastal villages. The 4Ps is a human development measure of the national government that provides conditional cash grants to the poorest of the poor, to improve the health, nutrition, and the education of children aged 0-18.

Methods

In Iloilo City, Philippines, the main land uses are residential, institutional and commercial uses. Light industries are allowed and only 4 % of land is utilized for agriculture. Study sites were the 3 coastal villages of Arevalo district, namely, Sto. Nino Sur, Sto. Nino Norte and Calaparan. The villages are the largest coastal urban barangays in terms of population and land area. The type of soil is sandy loam which is not ideal for growing crops. The 3 villages are vulnerable to typhoons, storm surge, water level rise, flood, salt intrusions, earthquakes, and fire. The latest profiles of the 3 coastal areas indicate the main sources of livelihood as: fish vending, and selling of other marine products such as shells and shrimps. Other sources of livelihood are food vending, manual labor, sari-sari (local variety) store owner, jeepney and pedicab drivers, government and private employees, and overseas Filipino workers. The 3 villages abound with eateries or 'carinderias' and water refilling stations. The local water district provides the source for drinking and other domestic uses.

The questionnaire included the respondents' personal information, their access to physical, human, economic and social assets, and their perception of food security. Supplementary methods were the 24 hour profile with 2 respondents representing the lives of working and non-working 4Ps women. A focus group discussion (FGD) was conducted with 5 representatives to validate the results.

Results

Profile of Survey Respondents

The average age of respondents is 31 years old, with majority having 3 children (50 %) in each family. All were informal settlers and had resided in the city since birth. Most women respondents had reached high school level (33 %) but failed to complete schooling. Women respondents had limited access to social, physical, infrastructure and economic assets. They had below the household income poverty threshold. Only some of the women had part-time jobs with no permanent income. Adult men in respondents' households drove jeeps or pedicabs and engaged in carpentry jobs. They were the main income earners. Most children were engaged in paid manual work as helpers and salesgirls.

While the respondents and their husbands reside near the sea, the quality of natural resources is not anymore suitable for fishing. But since many of the residents used to engage in fishing before the water quality started to deteriorate in the 1980s, most of them are now engaged in fish vending. They purchase the fish (wholesale) at Iloilo Fishing Port and sell them by kilos or retail in fish stands that they have built in front of their houses.

With everyone having an informal settler status and limited space, very few own a home garden. The majority have access to credit or loans. Almost everyone reported that they did not have contact with officers of livelihood and health agencies. There were still a few respondents that did not have health coverage while an overwhelming number reported not having government or private insurance from illness, disability, death, and old age.

Respondents reported that they, the women, were mainly in-charge of buying food for their families, doing the budgeting, and preparing the food for the family. They also planned the food to eat when they had to cook. For the few who had a home garden, women took care of the vegetables/crops that were grown.

None of the participants reported that there was insufficient and limited access to food supply. The foods they ate at least 3 times a day were reported as: vegetables, fish, pork, beef and rice. However, the sources of these foods were not easily accessible within or near their homes. In preparation for calamities, the majority of the respondents stored food such as salted fish, meat, eggs, canned food, noodles and bottled water.

The abundance of carinderias or eateries in the neighborhood served as the main source of everyday food (FGD April 2016). Most houses had eateries within walking distance from their homes. These carinderias had fixed menus which were cheap but also contained quantities of monosodium glutamate (MSG) to give flavor to the food. Women mentioned that the fresh and safe food sources were available in commercial grocery stores and public markets, the locations of which were far from the respondents' residences.

Women and their husbands usually bought food in the morning and at lunch time. They only cooked fresh food at night time when all members of the family were already at home. Women believed they were able to save time and

money when they bought food in eateries rather than cooked it for every meal. By not cooking their own food, however, the food they bought from eateries contained MSG.

The women reported a number of coping strategies that they used to ensure access to food supplies and access to food. This included sharing meals and reducing meal size, income augmentation (part-time jobs, manicurists, laundrywomen, and massage therapist), children engaging in fish vending, sending adult children to work as housemaid/houseboy, hence decreasing household members to feed.

There were no reports of household members resorting to giving a child up for adoption to reduce household size, or joining religious organizations in order to eat meals, or selling their body parts to earn money. None intended to move out of Iloilo City and go to the countryside.

Discussion and Conclusions

Women in this study of food security in coastal barangays were basically food consumers and bought food in eateries for their daily food needs thus running the risk of consuming food with high amounts of MSG. This research showed that women played very limited roles in food security, and were relegated mainly to food buying, budgeting, and cooking once a day.

Given the limited space for gardening and the seeming abundance of eateries or carinderias, the following recommendations are made:

Enhancing fish-related activities

A common market place should be set-up where fish vending and other related activities can be undertaken. At present, the people individually set up their tables along the streets to display and sell fish and other products. Related to the earlier recommendation is the creation of an organization among fish vendors for better regulation of prices and other activities. Moreover, improving access to financial assistance with simplified process and requirements by the local government or other credit institutions can be made to augment the capitalization of qualified people.

At the household level

A simple practice like planning meals in advance helps to lessen reliance on expensive and unhealthy food. Listing of the required ingredients included in the menu ahead of time help in lowering food cost and ensures value of money. Families should buy groceries in volume as one way of saving money.

At the village level

4Ps women should establish a cooperative movement purposely for livelihood programs to be funded by the government agencies and to have access in credit from government banks and institutions, and access to training in the livelihood programs from the Cooperative Development Authority (CDA). Barangay Officials should provide the community an open space for communal gardens. This is another way of acquiring fresh food in a cost effective and enjoyable way. Householders could adopt the vertical garden in their backyards to address the issues of limited space. Each family should consider potted vegetable garden in their houses.

At the city level

Open spaces should be included in the land use planning of Iloilo City for the communal gardens. Both men and women should be given training, seminars and workshops particularly on food storing, preparation, production, budgeting and marketing. Authorities could provide list of local markets or lower cost retail options for food purchasing to enable families get better food value from their budget.

References

Battersby, J. 2012. Beyond the food desert: Finding ways to speak about urban food security in South Africa, Geografiska Annaler: Series B, Human Geography http://www.afsun.org/wp-content/uploads/2013/09/Beyond-the-Food-Desert.pdfon. Accessed 13 December 2016.

FAO (Food and Agriculture Organization of the United Nations). 2015. Regional overview of food insecurity Asia and the Pacific: Towards a food secure Asia and the Pacific. http://www.fao.org/3/a-i4624e.pdf. Accessed 22 August 2016.

FAO (Food and Agriculture Organization of the United Nations). 2016. Glossary of selected terms: The State of food insecurity in the World 2015. http://www.fao.org/hunger/glossary/en/ Accessed 13 December 2016.

Floro, M. and R. Swain. 2009. Food security, gender and occupational choice among urban low-income households. https://www.american.edu/cas/economics/pdf/upload/2010-6.pdf. Accessed 13 December 2016.

Floro, M. and R. Swain. 2012. Assessing the effect of microfinance on vulnerability and poverty among low income households. http://www.tandfonline.com/doi/abs/10.1080/00220388.2011.615917. Accessed 13 December 2016.

IIED (International Institute for Environment and Development). 2013. Urban poverty, food security and climate change: Human settlements working paper No. 37. Rural-urban interactions and livelihood strategies. http://pubs.iied.org/pdfs/10623IIED.pdf. Accessed 22 August 2016.

Karl, M. 2009. Inseparable: The crucial role of women in food security revisited. http://www.isiswomen.org/downloads/wia/wia-2009-1/1wia09_00aFeatures_Karl.pdf. Accessed 21 July 2017.

Gender in Aquaculture and Fisheries: Engendering Security in Fisheries and Aquaculture
Asian Fisheries Science Special Issue 30S (2017): 375-381

ISSN 0116-6514
https://doi.org/10.33997/j.afs.2017.30.S1.025

Extended Abstract

Women's Participation in Aquaculture in Southwest Bangladesh

AYESHA SIDDIQA[1*], SHAHROZ MAHEAN HAQUE[2] and BENOY KUMAR BARMAN[3]

[1]Department of Fisheries, Bangladesh.
[2]Bangladesh Agricultural University. Mymensingh, Bangladesh
[3]WorldFish, Bangladesh and South Asia, Dhaka, Bangladesh.

Abstract

Aquaculture plays an important role in income generation, poverty alleviation and household nutrition in Bangladesh. In aquaculture, women in rural households have important roles that are often ignored. The current study, carried out in the districts of Khulna, Sathkhira and Bagerhat under a USAID supported AIN (Aquaculture for Income and Nutrition) Project of WorldFish, assessed women's participation in different aquaculture systems. A total of 450 households, 50 % of which were assisted under the project, were selected. Women in 74 % of the households participated in aquaculture. In homestead-based aquaculture women's participation was higher (89 %) than the corresponding rates for commercial fish culture (69 %) and commercial shrimp culture (36 %). Increased awareness and better capacity building initiatives have played a part in increasing women's participation in aquaculture activities.

Introduction

In Bangladesh aquaculture has grown rapidly due to recent technological advancements in production of fish seed, feed and improved knowledge about the technologies, resulting in higher levels of income, household nutrition and employment. Like other agricultural activities, women are involved in aquaculture activities (Samina et al. 2010) although lack of education, engagement in domestic tasks and household care, restricted mobility and socio-cultural barriers have hampered their active participation (FAO 2013; De and Pandey 2014). The present study attempted to understand women's

* Corresponding author. Email address: asiddiqa16@yahoo.com

contributions in aquaculture activities promoted under the AIN (Aquaculture for Income and Nutrition) project in three districts Khulna, Bagerhat and Satkhira in southern Bangladesh.

Materials and Methods

The AIN project was implemented from 2010 to 2015 in three districts, Khulna, Bagerhat and Satkhira, in southern Bangladesh. It aimed at promoting homestead aquaculture which included: polyculture of carps and 'mola' (*Amblypharyngodon mola* (Hamilton 1822)) with dike crops; commercial fish culture; and shrimp culture. Polyculture of carps and "golda" (*Macrobrachium rosenbergii* (de Man 1879)) in freshwater ponds; and monoculture and polyculture of "bagda" (*Penaeus monodon* (Fabricius 1798)) with some brackishwater species of fish in 'gher' in rice fields were already practiced in this region. Under the project, a total of 64,638 households were trained in homestead-based fish culture, 50,510 in commercial shrimp farming and 14,531 in commercial fish culture (USAID-AIN 2014). The training was held at the community level targeting households in which both men and women members of the households participated.

For the present study a total of 450 randomly selected households involved in aquaculture production were selected, of which 225 households were covered under the project. As a comparison, 225 households were selected as controls. The controls were engaged in homestead-based fish culture, commercial fish culture and commercial shrimp culture. A combination of participatory, qualitative and quantitative methods was used for collection of data (Williams 2007).

Results

The level of women's participation in aquaculture activities was defined under three categories: 'active participation' (four or more of the 8 major tasks); 'less active participation' (3 or fewer tasks); and 'no participation'.

Table 1. Number of women who participated in different types of aquaculture (the figures in the parenthesis are percentages)

Types of aquaculture	Number of household	Active participation	Less active participation	No participation
1. Commercial fish culture	**150**	**75 (50)**	**28 (19)**	**47 (31)**
Project-intervention	75	46 (61)	14 (19)	15(20)
Non-intervention	75	29 (39)	14 (19)	32 (43)
2. Commercial shrimp culture	**150**	**48 (32)**	**6 (4)**	**96 (64)**
Project-intervention	75	34 (45)	6 (8)	35 (47)
Non-intervention	75	14 (19)	-	61 (81)
3. Homestead aquaculture	**150**	**93 (62)**	**41 (27)**	**16 (11)**
Project-intervention	75	68 (90)	7 (10)	-
Non-intervention	75	25 (33)	34 (45)	16 (21)
Total	**450**	**256 (57)**	**76 (17)**	**159 (36)**
Project Intervention	**225**	**148 (66)**	**27 (12)**	**50 (22)**
Non-Intervention	**225**	**68 (30)**	**48 (21)**	**109 (48)**

It was observed that in households where there was project intervention, the participation of women in aquaculture activities was higher, with women in 78 % of the households participating. The percentage of participation in households without intervention was 51 %. Participation was highest for homestead-based aquaculture with 89 % (100 % in project intervention households and 78 % in the control group). For commercial fish culture, in 69 % of households women participated; the participation for commercial shrimp culture 36 % (Table 1). Where women were actively involved in stocking and post-stocking management, they undertook the activities along with the male family members (Table 2).

Time spent for aquaculture activities varied from 1-3.5 h woman^{-1}day^{-1}. For 83 % of women, the range was 1-3 h day^{-1}, for 8 % of women the time spent was shorter than 1 h day^{-1} but for10 % of women the time spent was more than 3 h day^{-1}.

Table 2. Participation of women in aquaculture activities (n=216)

Name of activity	Percentage participation of women and men in aquaculture activities		
	Men and Women	Only women	Men only
1. Drying of pond	19	3	78
2. Removal of mud	27	2	70
3. Poisoning	12	7	81
4. Liming	25	3	72
5. Fertilization	25	4	71
6. Fish species selection	60	5	35
7. Fingerling stocking	73	8	19
8. Application of feed	78	21	1
9. Pond monitoring	82	11	7
10. Partial harvesting	67	15	18
11. Final harvesting	57	-	43

The women who actively participated were 20-50 years old, with a family size of 4-5 members. For the majority of the households, women practiced aquaculture in ponds (58 %) that had a pond area of 0.1-0.5 ha. Of women actively engaged in aquaculture, 64 % had ponds located within the proximity of the homestead (<0.25 km). About 37 %, 27 % and 12 % of women, respectively, had primary, secondary and higher secondary level education. About 49 % of the women felt that their domestic household tasks were their primary occupations.

Discussion and Conclusions

Commercial shrimp and fish culture and homestead aquaculture were the major activities practiced by farmers in the southern region of Bangladesh. Ponds in homestead areas were important resources for fish culture both in freshwater and coastal areas in the southern region of Bangladesh and had a high potential for successful participation by women (Kabir et al. 2015).

More households are involved in homestead aquaculture than commercial shrimp or fish culture. Comparatively easier technologies, low levels of investment, the location of the ponds close to homesteads and lower

levels of production risk were factors in favour of women adopting homestead aquaculture. Small-scale aquaculture in the homestead areas integrated well with prevailing cultural norms for women and therefore achieved higher levels of participation (Jahan et al. 2010; Apu 2014). Although lowest in proportion, in one-third of the households doing commercial shrimp culture, women participated and in commercial fish culture, in two-third of the households, largely with their male household members and, in a few cases, alone. Increased participation of women in recent years in aquaculture related activities may be because of the support provided by projects and programs, capacity building initiatives, and access to extension services. (Ahmed et al. 2012*)*.

In many households women were involved in selection of fish species, stocking and harvesting of fish along with men, though earlier studies observed limited participation (Samina et al. 2010; Barman 2001 and Asian Development Bank 2004). Women are also more aware than men of the benefits of regular harvest of small fish from homestead ponds for household consumption.

Women can be burdened with additional work from being involved in aquaculture (Samina et al. 2010). It is important to look at how such use of time burdens them or undermines their other household activities, while developing strategies for greater inclusion in income generation.

Aquaculture is considered as an important income generating activity for rural people in Bangladesh and therefore, an important option for women to participate with men or alone. As demonstrated in the project, projects supporting women influence the uptake, but research also needs to focus on how aquaculture benefits them and what type of aquaculture is appropriate from the point of view of income, nutrition, social and gender relations.

Acknowledgements

The authors are indebted to USAID-AIN project of WorldFish, Bangladesh and South Asia, Dhaka for funding the research. Special thanks to Dr. Syed Arif Azad, Director General, Department of Fisheries, Bangladesh for his administrative support and encouragement throughout the study periods; Dr. Md. Abdul Wahab, Professor, Department of Fisheries Management, Bangladesh Agricultural University (BAU) and Dr. Mohammad Mahfujul

Haque, Professor, Department of Aquaculture, BAU for their guidance; Dr. Craig A Meisner, Former Director, WorldFish, Bangladesh and South Asia Office, Dhaka, Mr. Hendrik Jan Keus, Chief of Party, AIN Project, Dr. Manjurul Karim, Deputy Chief of Party, AIN Project, for their logistic support to conduct the research. Thanks to Quazi A.Z.M. Kudrat-E-Kabir, Project Manager, AIN Project for organizing the focus group discussion and all AIN staff for their co-operation during the fieldwork. Finally, we express our sincere gratitude to both men and women members of the surveyed households for their generosity during interviews.

References

Ahmed, M.K., S. Halim and S. Sultana. 2012. Participation of women in aquaculture in three coastal Districts of Bangladesh: Approaches toward sustainable livelihood. World Journal of Agricultural Sciences 8: 253-268.

Apu, A.N. 2014. Bangladesh small and medium-scale aquaculture value chain development: Past trends, current status and likely future directions. International Livestock Research Institute, Nairobi, Kenya. 117 pp.

Asian Development Bank. 2004. An evaluation of small-scale freshwater rural aquaculture development for poverty reduction. ADB, Manila. 163 pp.

Barman, B.K. 2001.Women in small-scale aquaculture in North-West Bangladesh. Gender, technology and development 5: 267-287.

De, H.K. and D.K. Pandey. 2014. Constraints to women's involvement in small scale aquaculture: An exploratory study. International Journal of Agricultural Extension 02: 81-88.

FAO. 2013. Mainstreaming gender in fisheries and aquaculture: A stock taking and planning exercise. Final report. Rome. 55 pp.

Jahan, K.M., M. Ahmed and B. Belton. 2010. The impacts of aquaculture development on food security: Lessons from Bangladesh. Aquaculture Research 41:481-495.

Kabir, K. A., G. Faruque, R. Sarwar, B. Barman, A. Choudhury, M. Hossain, E. Hossain, N. A. Aleem, M. Karim, K. Kamp and M. Philips. 2015. Producing fish in small shaded homestead ponds: Finding solutions with rural women. In Conference on Revitalizing the Ganges Coastal Zone: Turning Science into Policy and Practices. (eds. Humphreys, E, T.P. Toung, M. C. Buisson, I. Pukinskis and M. Phillips), pp. 265-277. CGIAR Challenge Program on Water and Food (CPWF), Colombo, Sri Lanka.

Samina Shirajee, S., M.M. Salehin and N. Ahmed. 2010. The changing face of women for small-scale aquaculture development in rural Bangladesh. Aquaculture Asia Magazine 15: 9-16.

USAID-AIN. 2014. Annual report of Aquaculture for Income and Nutrition (AIN) and Cereal Systems Initiative for South Asia in Bangladesh (CSISA-BD) Project. http://pubs.iclarm.net/resource_centre/WF-2015-Annual-Report.pdf. Accessed 18 April 2016.

Williams, C. 2007. Research methods. Journal of Business and Economic Research 5: 65-72.

Gender in Aquaculture and Fisheries: Engendering Security in Fisheries and Aquaculture
*Asian Fisheries Science Special Issue **30S** (2017): 383-387*

ISSN 0116-6514
https://doi.org/10.33997/j.afs.2017.30.S1.026

Extended Abstract

Cage Farming Headed For Equal Opportunity In Aquaculture Development In Kerala, India

IMELDA JOSEPH* and A. GOPALAKRISHNAN

ICAR- Central Marine Fisheries Research Institute
Post Box No.1603, Ernakulam North P.O., Kochi- 682 018, Kerala, India

Introduction and Rationale

Kerala, on the southwest coast of peninsular India, has a long coastline, interconnected to backwaters and brackishwater resources with extensive areas available for farming but only moderate current use for cultivation. Pizhala is an island near Kochi, the largest city of Kerala, surrounded by the Periyar River. Pizhalais is in the central part of the Kadamakkudy Grama Panchayat (village council) of Ernakulam District. Here, pokkali (salt-tolerant) rice cultivation in water-logged fields and shrimp farming are the major activities. Kudumba Shree self-help groups of women actively participate in these economic activities. Of the 20,000 total population of the Panchayat, women constitute 51 % and have a literacy rate of 81 %. Women's involvement in the fisheries value chain is minimal and mostly concentrated in fresh and dried fish trading.

With the objectives of ensuring equal opportunity in aquaculture and providing supplementary income to families, the present activity of cage culture of finfishes was established by the Indian Council of Agricultural Research (ICAR)-Central Marine Fisheries Research Institute (CMFRI) at Pizhala. The activity was conducted in a participatory mode and involved only women.

*Corresponding author. Email address: imeldajoseph@gmail.com

Materials and Methods

The study was conducted in the Pizhala area of Kadamakudy Panchayat in Ernakulam district, Kerala, India. ICAR-CMFRI, Krishi Vigyan Kendra (Ernakulam) and the Kerala State Fisheries Department disseminated several technologies in the village, which is predominantly an area where the activities of capture fishermen dominate. Before any farming intervention in the village, the women were trained in cage farming, along with men and youth of the village, through an awareness-raising programme carried out in the village itself.

For the present study, women were selected based on their proximity to the farming site, and the fishery related activities in which they were involved. Women fish traders, Anitha and Latha, were chosen for cage farming demonstrations in a participatory mode, wherein, inputs like net or cages were provided by CMFRI and other inputs like seed, feed etc were met by the farmers. Though the women were chosen at random, both were very receptive and ready to adopt cage farming by following the strict technical advice of the research team. This also was a reason in choosing them for the study. Both women were older than fifty, belonged to the fishing community and had been trading dry fish for the past decade with financial assistance from local government organizations/societies. Both of them had two college-going children. Even though both were married, the income of their husbands, who were daily wage earners, could not meet the entire family expenses. However, the women's income from fish trading, when added to the men's income, was only just sufficient to meet the daily needs of the family. The education of children and additional expenses were met by procuring loans from local agents. The two women were provided with cage nets to start cage farming. They met all other expenditures. All technical inputs were provided by CMFRI in the course of regular visits and sample collections from the farms.

The farming was carried out during 2015-16 for a period of 6 months. Two galvanized iron (GI) cages were used, each measuring 4 x 4 m and net depth of 2.5 m with 19 mm mesh HDPE net. Each cage had two nets, an inner and an outer. Each cage was suspended 50 cm off the bottom of the river. The cages were provided with a 60 mm cover net to prevent bird predation. Within the cages, a 30 cm high fine mesh polyethylene net was fixed to retain floating

pellets while feeding. A wooden walkway that connected the cage to the shore made feeding and monitoring simple. Each cage was stocked with 2,000 pearl spot (*Etroplus suratensis*) at 50 fish.$m^{3.}$ The fish were fed using commercial floating pellets (32 % crude protein, Godrej Co., Ltd.).

Since women from two families were only involved in the farming, a structured questionnaire was not used, but phased information was collected by interviews. The measures of women's empowerment used for the study were: the women's decision making ability within the family, spending ability, social participation, access to assets, and access to resources. For measuring the women's decision-making ability within a family and spending ability, the women were asked about the education of children, family health issues, giving loans to others, homestead repairs, purchase of new electronic gadgets, mobile phones, furniture, daily family household expenditure and festival and entertainment expenditure. Social participation included social and community activities, participation in social functions such as marriage, helping neighbors in need, working with people in any situation, participation in panchayat programs pertaining to the village, attitude towards societal activities, and casting votes in local and national elections. Access to assets and resources included access to a bank (own bank account), access to institutional credit, ability to contact public services (health, nutrition, farming etc.), access to national and state fisheries departments and access to farm management and budgeting etc.

Results

Gross yield of pearl spot was 280 kg $cage^{-1,}$ which was very encouraging. The economics was also feasible for social acceptance. The farm gate price received was Rs. 500 kg^{-1}. The total revenue obtained was about Rs. 1,80,000/-.

As well as production and income, this study has shown that women gained knowledge in the management of cage farms, e.g., for seed procurement, nursery rearing of fish seed, feed scheduling, feeding, cage maintenance, and marketing. Women became directly involved in the fabrication of cages and their maintenance, procuring good quality fish seed, and stocking. They also sold the fish on their own, achieving a profit in terms of money, and due to the

quality of the product. The women sold their produce directly at the farm-gate and in local markets to eliminate the middlemen. All these factors were attributed to the women, although having little education, being empowered in a rural society typically dominated by men. The women with their long years of experience in fish trading were able to sell their produce at a premium price in local markets due to the high quality of the product. Anitha went directly to the market to sell her produce, while Latha was supported by her husband in selling her fish. However, both women received physical and moral support from their family members, especially their husbands. The present results are based on a single crop only, but the women are continuing cage farming with more financial investments in the next cycle. New cages were also installed by both women.

The five empowerment variables had significant positive relationships with the women's sense of empowerment through participation in the cage culture program of CMFRI. Furthermore, apparently important variables such as education, family size, previous experience in aquaculture and family annual income did not show any significant relationship with these women's empowerment.

Discussion and Conclusions

With the involvement of women in cage farming activities, the village may have opened up a better avenue for the development of aquaculture as well as social upliftment and equal opportunity. In nearby areas to this activity, empowerment of women through cage culture with pearl spot, GIFT tilapia (*Oreochromis niloticus* (Linnaeus, 1758)) and red snapper (*Lutjanus argentimaculatus* (Forsskål 1775)) was earlier reported by Joseph et al. (2016), and for pearl spot cage culture by Kappen et al. (2016).

Other activities involving women in cage culture in Kerala (Kappen et al. 2016; Joseph et al. 2016) showed that, once involved in cage farming, women were ready to expand cage farming further with their own efforts and expenditure (personal experience). In addition, it has been observed in this study that the decision making power of the women was remarkably improved because of the enhanced income the families could achieve through cage farming. In this study it was observed that, the education of the children of the

women farmers has been aimed at higher levels. The elder son of Anitha was pursing an engineering degree while living in a hostel near the college, and younger children were sent for extra tuition in difficult subjects. Also, house repairs were taken care, such as repairing leaking walls after years of neglect, and renewing electric wiring.

Acknowledgements

The authors acknowledge all staff members of Mariculture Division of CMFRI at Kochi, especially Mr. M. D. Suresh and Mr. K.G. Jeyaprasad, Skilled Support Staff for their dedicated support to all activities in the cage culture studies. We also acknowledge the women farmers and their family memebers for their active role in completing the study.

References

Joseph, S., Imelda-Joseph and B. Ignatius. 2016. Cage culture:A new avocation for women empowerment.In Proceedings of the Fifth International Symposium on Cage Aquaculture in Asia. 326p. (Gopalakrishnan, A ., J. Imelda, B. Ignatius, S. Kuriakose, G. George , R.J. Nair, A. Kathirvelpandian and M.M. Joseph),pp.267-282.Asian Fisheries Society, Malaysia and ICAR-Central Marine Fisheries Research Institute, Kochi,India.

Kappen, D.C., Kurup, B.M., Nair, M.C., Raju, M.S., Dinesh, K., Salin, K.R., and N.S. Saneer. 2016. Cage aquaculture of pearl spot *Etroplus suratensis* (Bloch 1790) for livelihood enhancement of the fisherwomen of central Kerala. In Proceedings of the Fifth International Symposium on Cage Aquaculture in Asia.(Gopalakrishnan, A ., J. Imelda, B. Ignatius, S. Kuriakose, G. George , R.J. Nair, A. Kathirvelpandian and M.M. Joseph),pp.177-183.Asian Fisheries Society, Malaysia and ICAR-Central Marine Fisheries Research Institute, Kochi,India.

ANNEXES

Asian Fisheries Science Special Issue **30S** (2017)

Annex I

GAF6: List of Reviewers

1. Alice Ferrer
2. Angela Lentisco
3. Apurba Krishna Deb
4. Arathy Ashok
5. Arlene Nietes Satapornvanit,
6. Aswathy N
7. Benoy Kumar Barman
8. Chuthatip Maneepong
9. Cindy Frantz
10. Cornelie Quist
11. Danika Kleiber
12. Derun Yuan
13. Elizabeth Liz Matthews
14. Harikrishnan M
15. Indah Susilowati
16. Janet momsen
17. Jayasankar
18. Katia Frangoudes
19. Kyoko Kusakabe
20. Marieta Sumagasay
21. Mariette Correa
22. Mary Barby P. Badayos-Jover
23. Mary Christine Monfort
24. Meryl J Williams

25. Michael J. Akester
26. Narayana Kumar
27. Nerissa Salayo
28. Nhuong Tran
29. Nial Moores
30. Nightingale Devi B
31. Nikita Gopal
32. Oswaldo Huchim
33. Patrick McConney
34. Poh Sze choo
35. Prabhakaran M P
36. Prabhati Barat Sahoo
37. Pradeep B.
38. Ramachandran C
39. Rashidah Shuib
40. Rebecca Metzner
41. Roehlano Briones
42. Sajesh V K
43. Salin Krishna
44. Stefania Vannuccini
45. Sun- Ae Ii
46. Swathi Lakshmi
47. Vijay Gupta M.
48. Vijaya Khader

Annex II

Gender in aquaculture and Fisheries: Engendering Security in Fisheries and Aquaculture

Report on the 6th Global Symposium on Gender in Aquaculture and Fisheries (GAF6), Bangkok, Thailand 3-7 August 2016[1]

GAF6 – Engendering Security in Fisheries and Aquaculture – focused on multiple facets in fish value chains and society that matter in realising the security of women, in particular, but also men and communities. These facets include food security and nutrition, legal rights, access to resources and industry opportunities, fair livelihoods, dignified work, safety within the household, and resilience in the face of natural and climate change related disasters. GAF6 built on the overarching theme of food security of the 11th Asian Fisheries and Aquaculture Forum (11AFAF), the host of GAF6, and linked to the theme of the Conference on Climate Change Adaptation for Fisheries & Aquaculture (FishAdapt) (8-10 August 2016, Bangkok).

GAF6 learned that, while women have become more visible in fisheries policies such as the Small-Scale Fisheries Guidelines, in other policy arenas, such as climate change adaptation and fish trade certification, more needs to be done for gender equality. Much needs to be done to remove structural barriers, and change social and fish sector norms that render women especially insecure in fisheries and aquaculture. Gender equality champions should be supported and women encouraged to speak up and act on their own behalf. Clichéd explanations for gender differences should be rejected as excuses for restricting people to lesser work, e.g., women should work near their homes so that they can also look after their families, and that women are better at menial post-harvest processing because they have more nimble fingers.

[1] Parts of this are taken and adapted from the articles published in *Yemaya 52*, "*Gender inequality: GAF6 asks 'WHY?'*," and "*The climate for change*." http://www.icsf.net/en/yemaya/article/EN/52.html?limitstart=0

GAF6 began with a lively half day Training Workshop – GAF-101: Theorizing Gender in Aquaculture and Fisheries Research – in which more than 50 new and experienced gender researchers participated. Workshop leaders Marilyn Porter, Holly Hapke, Kyoko Kusakabe and Susana Siar set out to demystify theory. "Theory," they said, "encourages us to ask, and keep asking, the question 'WHY'?" The Training Workshop introduced how gender can be theorized in fisheries and aquaculture to provide frameworks for understanding cases, based on feminist research concepts of empowering everyone in society, and specifically creating more equal relations between women and men. Participants were urged to focus on gender relationships, not simply roles, and on intersectionality, as women's and men's lives were interconnected and gender interacted with other systems in society, e.g., cultural, political and economic structures. Groups presented and discussed the sample cases they had developed.

> "*Participants were urged to focus on gender relationships, not simply roles, and on intersectionality, as women's and men's lives were interconnected and gender interacted with other systems in society, e.g., cultural, political and economic structures.*"

The present report on GAF6 responds to this injunction. We share the outputs under five lines of inquiry, each concerned with different aspects of realising security. The first asks whether current policies and practices are engendering security. The second questions why women are not better positioned in the burgeoning aquaculture sub-sector. In the third we explore the challenges for securing fair livelihoods in fish value chains. The fourth concerns climate change and the forces of change in coastal communities; and finally, we explore why realising security means transforming social and fish sector norms, especially gender norms.

M.C. NANDEESHA PRESENTATION AWARDS

Best Presentation

- AFRINA CHOUDHURY: *Women's empowerment in aquaculture: Case studies from Bangladesh.* Presentation prepared by: Afrina Choudhury and Cynthia McDougall

Highly Commended

- ALEXANDER KAMINSKI: *A gendered value chain analysis of post-harvest losses in Barotse Floodplain, Zambia.* Presentation prepared by: Alexander Kaminski, Alexander Kefi, Steven M Cole, Kate Longley, Chifuniro Somanje, Pamela Marinda, Ansen Ward, Alexander Chilala and Gethings Chisule

- MARY BARBY P. BADAYOS-JOVER: *Security in adversity: coastal women's agency in the aftermath of Haiyan.*

Best Student Presentations

- KHAMNUAN KHEUNTHA: *The adaptability to shock in small-scale fishing community: case studies Bang Ya Preok sub-district, Samut Sakorn Province.*

- ANINDYA INDIRA PUTRI: *The survival story of wife in securing household's economy in fishing community of Pemalang Regency – Indonesia.* Presentation prepared by: Indah Susilowati, Mayanggita Kirana and Anindya Indira Putri

11 AFAF Best Student Poster (GENDER**)**

- BENEDICT MARK CARMELITA: *Attitude Towards Mariculture Among Men and Women in Mariculture Areas in the Philippines.* Oral summary presented by Benedict Mark Carmelita, Poster prepared by: Alice Joan G. Ferrer, Herminia A. Francisco, Benedict Mark Carmelita, and Jinky Hopanda

Youth Art Awards

- First Prize Senior High School: *Ms. Thummachat Thianpattanagul and Mr. Pichaiyut Puntasen*, Surasakmontree School (Teacher: Ms. Tavarat Suthapoj)

- First Prize Junior High School**:** Ms. Matuda Pasukee and Ms. Thanyalak Pensri, Satrisisuriyothai School (Teacher: Mr. Suthat Thanghun)

Are current policies and practices engendering security?

The 2014 Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines) hold prospects for greater security for small-scale fishers and women in fish value chains. Debates at GAF6 concluded that as policy space for gender equality opens up, the opportunities nevertheless come with implementation challenges that require concerted action. In all cases, presenters observed that women were deterred from participating in decision-making. Women were invisible in most fisheries statistics and thus national policy makers did not include them and paid no heed to their interests, unless non-

government organisations (NGO) and active women's groups agitated to join the consultations. Even when policies and projects recognized women's needs, however, governments and project managers often did not allocate money and expertise to back up their gender equality aspirations. Hopefully signalling a new trend, some recent projects were keeping their commitment to gender equality action.

> "*The SSF Guidelines are opening up new policy space on gender equality. Yet, in implementing the Guidelines, women have been deterred from taking part in decision-making, are invisible in most fisheries statistics and their interests excluded from national policies – unless NGOs and women's groups have advocated for inclusion. Even when women's needs are recognized, money and expertise may not have been allocated. In a hopeful sign, some recent projects are committed to gender equality*."

Xiangjun Yao, FAO Regional Strategic Programme Coordinator, welcomed GAF6 participants and highlighted the new normative instruments in fisheries and rural development that provide guidance on gender equality, especially the SSF Guidelines. The GAF6 Special Session on implementing the gender elements of the Guidelines had two objectives: to examine the SSF Guidelines through a feminist lens; and to use case studies to identify the main barriers, challenges and the best approaches for achieving gender equity and equality.

Since the 2014 SSF Guidelines included gender, Katia Frangoudes stressed that the next critical step is implementing the gender equality provisions. Examples from different regions are important because they reveal information on critical implementation barriers, opportunities, challenges to gender equality, including norms and values that may prevent gender equality. The ensuing presentations provided such information from different geographical areas.

In all the cases presented, women faced difficulty participating in the fisheries decision-making processes. In Japan, Kumi Soejima reported that women have their own sections within Fisheries Cooperative Associations

(FCAs). The FCAs deal with all social matters related to the community and the fishery sector but women are not allowed to become full members of the sections that are empowered to discuss fishery management and the future of the community, and that run the banking system. Fishermen claim that women cannot become members of the FCAs because "they are not participating in harvesting activities." Logically speaking, one might expect women divers (*ama*) who harvest abalone and other high value shellfish would qualify for full membership of the FCAs. But this is not the case because their right of access to the fisheries is granted by their husbands as members of the FCAs. This status quo however is being challenged by fisherwomen who have benefited from national schemes to develop their business capacities by establishing private or collective units to process fish products, and who demand to be completely involved in the fisheries organizations. For the time being, fishermen have not fully opened the door, and only some women struggling against male power have been successful. Women generally need support from scientists, prefectural and national fisheries authorities to force their way into the FCAs.

Lack of statistics was identified as one of the reasons for the absence of gender-sensitive policies. In addition to statistics, Nadine Nembhard, from the Caribbean, identified the lack of gender mainstreaming in several Caribbean national fisheries and aquaculture policies, as well as the limited capacity of the national gender agencies to monitor, report on, and implement strategies in all sectors. Now, however, several regional agencies believe that implementing the SSF Guidelines will lead to women's empowerment and capacity building. Nadine reported that within the Caribbean Network of Fisherfolk Organisations (CNFO), a "fisherwomen" section has been created and, together, CNFO, the Caribbean Regional Fisheries Mechanism (CRFM) and the Caribbean Community (CARICOM) aim to get a protocol on the SSF Guidelines, including gender, into fisheries policy. The regional and national efforts are being supported by the Gender in Fisheries Team (GIFT) hosted at the University of the West Indies Center for Resource Management and Environmental Studies (UWI-CERMES). GIFT research delves into the different roles and needs of rural and urban women and men in specific supply chains, such as the Barbados flying fish fishery, and in fisheries institutions where women are now more numerous than in the past.

Ravadee Prasertcharoensuk explained that, in Thailand, women are participating actively in small-scale fisheries, but national statistics are not sex-disaggregated and the needs of women are therefore not taken into account during policy formulation. NGOs that work for the recognition of small-scale fisheries communities and gender equality, promoting and supporting the active involvement of women fishers in national policy development and concrete local initiatives, view the SSF Guidelines as an important tool. They have used the Guidelines framework to conduct a national consultation forum in collaboration with the Department of Fisheries and representatives of provincial level small-scale fishing communities. A national implementation plan for securing sustainable small-scale fisheries has been drafted and is expected to direct the future actions of NGOs and civil society organizations.

Integrating women into decision-making also faces very fundamental policy challenges. In Kiribati, fisheries governance faced hurdles, according to Aurelie Delisle, when the country tried to implement a new mode of co-governance which called for equal participation by all user groups. Although paying particular attention to women's involvement, participation had not materialized because cultural norms, traditional governance structures and the gender-blindness of fisheries authorities impeded the desired change.

Why does this failure occur? In spite of what is proclaimed in government gender policy, frequently gender equality strategies are not implemented. In 2003, the Government of Lao PDR promoted gender equity as a priority and established the National Commission for Advancement of Women (NCAW). Dongdavanh Sibounthong examined how national gender equity policy was being implemented locally in fisheries and aquaculture in Pakse and Phonthong districts, where district plans promote gender equality and the inclusion of women in decision-making. At the grassroots, however, Dongdavanh found traditional gender divisions of labour in fish value chains. Further, the district Agriculture and Forestry Offices had few women staff, few prospects of promotions for women, and no funds to advance gender plans. NCAW also lacked the funding and human resources capacity to provide assistance to sector ministries and district level offices. Another example comes from Vietnam where Roel Bosma found that sectoral Gender Action Plans (GAP) had not reduced gender inequality in aquaculture and fisheries. These

plans did not address the constraints to gender equality, including the attitudes of men and families. Roel concluded that "the struggle for gender equality will be a continuous struggle."

Natasha Stacey and colleagues reviewed livelihood projects from the last two decades in Indonesia. The projects were supported by development assistance, and government and NGO resources. Most projects performed little gender analysis, did not follow through on planned gender activities and did not measure gendered impacts. As a result, no strategies yet exist to support women, who, as Anindya Indira Putri found, were suffering greater burdens in their triple roles (productive, reproductive and community), especially if men migrated to work elsewhere because resources and coastal environments had been degraded from exploitation, climate change and other factors.

Some new projects are taking gender equality more seriously than these past efforts. One is the USAID Oceans and Fisheries Partnership which, according to Arlene Satapornvanit, embeds gender policy and strategies in its work. For example, as part of its Asia-Pacific work to combat illegal, unreported, and unregulated (IUU) fishing and seafood fraud, the Partnership is strengthening the human well-being component by including gender tools and case studies in its Catch Documentation and Traceability system. The International Pole and Line Foundation, Peter Wessels reported, is also starting to work on the contributions of women in the tuna fishery supply chain in the Maldives, taking a complete value chain approach. The research, the first of its kind in the Maldives, is designed to feed into assessing how management measures may impact access to assets and the capabilities of women in the Maldives tuna fisheries.

Fisheries agencies are struggling to incorporate gender elements and provide support to women, but how is aquaculture, which is not specifically included in the SSF Guideline, coping? The next topic addresses aquaculture and gender in more depth but we conclude this topic on fisheries and aquaculture policy with Henk Peters' evidence based on Oxfam's GRAISEA (Gender Transformative and Responsible Agribusiness Investments in South East Asia) program. GRAISEA is piloting gender transformative approaches in shrimp value chains in Indonesia and Vietnam through the use of participatory

social impact assessment. This tool is used in Aquaculture Stewardship Council (ASC) certification procedures. Oxfam felt that this participatory tool was underdeveloped with respect to gender and gender action learning was added to augment the tool. As almost all aquaculture policies lack gender equality provisions, an important part of the GRAISEA program is advocacy to influence sector wide sustainability initiatives with industry, certification bodies and NGOs. The work done by Oxfam in Indonesia and Vietnam provides initial recommendations for how to improve attention to gender equality: the participatory social impact assessment tool needs to be more gender specific and subsequent action planning should contain gender transformative activities.

Why are women not better positioned in aquaculture?

Women's progress in securing places in the fast growing aquaculture industry has received far less attention than has the positioning of women in fisheries. Often observers assume that women will naturally prosper in aquaculture because the modern industry is not burdened with the historical constrictions on gender roles found in fisheries. In fact, the evidence is that gender roles and relationships in aquaculture follow social patterns of ownership, rights and power typical of similar economic sectors. Unless they break out as entrepreneurs under their own volition or with help, women tend to be positioned in small-scale, near-home, and low technology aquaculture enterprises, or as low-paid labour in medium and industrial scale operations. However, small-scale household aquaculture can fulfil important subsistence roles and be tweaked, with expert help, to better satisfy multiple security needs, especially food security and nutrition. Women's places are often accepted by society, including by many women, as suitable or normal and not explored further.

"Aquaculture is gendered," said Surendran Rajaratnam, in introducing a preliminary report on a literature review of gender and aquaculture in the 7 focal countries of WorldFish programmes in Asia (Bangladesh, Cambodia and Myanmar) and Africa (Egypt, Nigeria, Zambia, and Tanzania). Of the 90 papers fulfilling the review selection criteria, almost half were on Bangladesh, while the number of papers on other countries ranged from 0 to 15. Patterns emerged out of the review: divisions of labour were gendered, with men dominating production while women tended to process and market the produce. Women

were found to face challenges in accessing resources because of similar constraining factors such as household responsibilities. Studies integrating gender in aquaculture were limited while available papers tended to speak of gender as representing men and women and their roles and responsibilities. Only a few studies went further to discuss the underlying reasons for these gendered differences and/or use theories to explain their findings.

> ”*Aquaculture is gendered. Gender roles and relationships in aquaculture follow typical social patterns of ownership, rights and power. Unless they break out as entrepreneurs, women are positioned in small-scale, near-home, and low technology aquaculture, or as low-paid labour in medium and industrial scale operations. Nevertheless, small-scale household aquaculture can fulfill important subsistence roles and be improved to better satisfy food security and nutrition*.”

Several presentations confirmed that women tend to be found in small-scale aquaculture enterprises located close to where they live. Irna Sari reported on case studies in Indonesia, one on shrimp farming in extensive and intensive systems in Barru District, Sulawesi, and the other on homestead milkfish (*Chanos chanos* Forsskål 1775) processing in Sidoarjo District, East Java. The cases were meant to contribute knowledge and good practices to the FAO initiative Asia-Pacific Blue Growth Initiative. Homestead milkfish processing industries appeared to provide good opportunities for poor and unskilled women and full-time mothers but shrimp farming had low women’s participation, and most of this was concentrated in lowly or unpaid labour. The study found that both tangible and intangible benefits and outcomes needed to be carefully addressed, and care taken to incorporate the respondents own definitions of “success” and empowerment in aquaculture.

In many locations, aquaculture is being used as a new activity for improving women’s livelihoods. One of these, as Madhav Shrestha reported, was on the Bhundrung and Thado khola flood plain river bed of Jhulyan village in Makawanpur district of Nepal, where researchers from the University of Nepal and NGO partners helped women, mainly from the Tamang ethnic community, to develop integrated farming systems and link to city markets. In Khulna, Satkhira and Bagerhat districts of southwest Bangladesh, Shahroz

Mahean Haque and colleagues found that 65 % of women in aquaculture households played a role in the activity, with women in nearly half the households being very active. Women's engagement did vary with type of aquaculture. Homestead aquaculture accounted for 30 % of the women, commercial fish farming 23 %, and only 12 % were involved in shrimp culture.

Seaweed farming is a major aquatic farming endeavour and is often carried out by people living in remote coastal villages, including in Indonesia. Ria Fitriana found that the farming of *Kappaphycus alvarezii* ((Doty) Doty ex P.C.Silva 1996) and *Eucheuma* spp in Nusa Tenggara Timur Province (10 villages spread out over Kupang, Roe Ndao and Alor districts) was comprised of family businesses in which women and men each had their own roles. In some islands of Rote district, however, women had their own farm sites, distinct from those of the men, in keeping with the more individualistic nature of the enterprises in these islands. Overall, however, women were generally more active in work close to their homes, a theme that recurs in many forms of women's fish work. This pervasive theme has been examined in the literature on gender, economy and development. Research on gender in aquaculture and fisheries needs to draw on this literature more thoroughly to understand why it occurs and its many ramifications.

The majority (60 %) of Indian ornamental fish come from capture from the wild. To promote the industry for export, the Marine Products Export Development Authority (MPEDA) created the Rainbow Revolution assistance scheme to provide subsidies and support group efforts at scales from small to large through ornamental fish aquaculture. Bharat Yadav's studies in Maharashtra State incorporated gendered analyses into a study on the Rainbow Revolution beneficiaries, looking at the access and control of household, fishery and financial resources. For household, fisheries and financial resources, he found that women rated their access and control at near medium (50 %), and never high; men's ratings were high in all areas. Community norms, including the prevailing social hierarchy, demographic factors and special training on ornamental fisheries seemed to influence women's positions.

Aquaculture, a form of farming, is often integrated into existing terrestrial farming systems. So how does it compare with other farming

activities in terms of labour and time requirements? On small-scale farms (0.25-1.5 ha) in Soc Trang province, Vietnam, FAO compared women and men's labour and their use of time in rice and rice-shrimp farming. Clara Park reported how the farmers in these diversified farms experienced seasonal differences in labour in which women tended to do more time-consuming tasks, and were more involved in rice production, whereas men were focused more on cash crops such as shrimp. Rice-shrimp farming was three times more time consuming than rice alone. During the shrimp season, women and men slept less and had less time for personal care. Due to these labour differences, shrimp farming was only marginally more profitable than rice and depended on the family labour. New technologies may have had different impacts on the labour of women and men, and often inventions were made by the gender most affected, e.g., the rice replanting tool was invented by a woman.

Small-scale fish farming was often suggested as a solution for improving family nutrition. Three presentations, all supported by the AquaFish Innovation Lab, demonstrated that positive results are possible. In the first, in southwest Bangladesh, Shahroz Haque found that nearly 40 % of mud crab (*Scylla serrata* Forskål 1775) fattening operations were run by women. Despite the lucrative export markets for the mud crabs, however, the majority of the mud crab farmers were poorly educated, had poor diets, and many were malnourished. By including tilapia into the mud crab fattening and culture farming, households on the pilot farms experienced greater overall growth and production of mud crabs and their members were better nourished from eating the tilapia.

The second concerned successful women from Mishrit and Sundardeep cooperatives who had adopted polyculture of carp and small indigenous species (SIS) in Chitwan and Nawalparasi Districts of Nepal. To further improve the productivity of polyculture under reduced feeding, Sunila Rai reported that 28 women and 7 men from Chitwan District were given a day's training in how to enhance periphyton using locally available bamboo as the substrate. The experimental treatment produced more fish, including more SIS compared to the full feed baseline and more high-nutrient SIS were eaten by the families.

A poster, the third presentation, by Jenna Borberg and colleagues explained the multi-faceted approach that AquaFish Innovation Lab developed

and applied in closing the gender gap in aquaculture for improved nutrition. Four strategies were at the core of the approach. First, all AquaFish training activities had a 50 % benchmark for women and men participants. Second, women scientists and administrators were given project leadership roles in research and mentoring. Third, program research focused on women's roles, barriers to their participation, and their roles in household nutrition. Finally, gender inclusion was monitored and evaluated by collecting disaggregated gender data and performing gender analyses.

Consumer behaviour also has a role in nutrition. Milkfish or *bangus* (*Chanos chanos* (Forsskål 1775)) is the most important Philippine cultured fish, more so in Iloilo Province which is an important centre of production and which has nearly twice the national per capita consumption rate. Iloilo production is declining according to Reynold Tan, whose presentation explored consumer awareness and behaviours towards milkfish in relation to eight factors covering production and food quality. Women and men differed in their awareness of food safety of milkfish, and were similar in all other factors. However, on all factors, the differences in awareness did not translate into action in that men's consumption patterns were strong regardless of awareness to various factors and men consumed more than women.

In the coastal zone, aquaculture interacts with existing uses, especially fishing, and its advent may clash or agree with prevailing ideas of best uses. Often women and men react differently. Jee Grace Suyo asked if gender mattered in a multi-agency project introducing sea ranching for sea cucumber in Pandaraonan, Guimaras, Philippines. Sandfish collection and trade were dominated by women but the project only examined social aspects after the biological stages of the project were underway. The social analysis revealed a plethora of important elements in which women and men responded differently, starting with where people gleaned, fished, farmed and made charcoal, through to income levels, membership of and trust in local organisations, and the types of incentives that attracted people to take part in the project. Women were more likely than men to respond to initiatives that informed and educated them, such as attending project meetings, but less willing than men to be hired as project labourers or to take responsibility. Men tended also to seek technical knowledge.

Benedict Carmelita examined women and men's attitudes towards new government-promoted mariculture parks in Misamis Oriental, Misamis Occidental, Bohol, La Union and Pangasinan Provinces, Philippines. In most, but not all areas, proportionally more men than women liked having mariculture operations nearby but non-fishing households tended to be more favourably disposed towards having mariculture operations nearby than did fishing households. After mariculture was established, fishing, gleaning and leisure activities, including swimming and strolling decreased. Local employment was perceived to have improved with the introduction of mariculture.

Women are often spoken of as potential aquaculture entrepreneurs. The possibilities can sometimes surprise, given the traditional image of women as minor participants or participants in small-scale enterprises.

The good news story of Thailand's Siamese fighting fish industry was presented by Amonrat Sermwatanakul who had experienced it first-hand and been instrumental in creating it. After 30 years of traditional extension experience in Thailand, Amonrat discovered the power of branding and social media to help the second generation of growers of these ornamental and sporting fish lift their trade to a new level. Many growers are women: for example, in Nakhon Pathom Province near Bangkok half the growers are women. Using Facebook and group training, Amonrat helped connect producers with each other and thousands of buyers, and provided training to women farmer groups in branding, product photography, as well as in online marketing to local and global aquarium fish markets through such sites as AquaBid.

In another breakthrough, Imelda-Joseph reported how, in Ernakulam district of Kerala state, India, women were headed for equality in fish cage aquaculture. Although the area studied was close to a city, its previous level of economic development was low. Initially, when cage farming started as an R&D project in 2007, women were not on the scene. However, in 2015, a women fish seller had noted the men making the cages and she started to follow their procedures. Now, 6-7 women have joined in and the number of women seems to be increasing due to the demonstration effect of the pioneer women.

In a poor farming area of Yangon region, Myanmar, Asian Institute of Technology aquaculture experts, foreign donors and the Yangon government worked with groups of women in 11 villages to improve their integrated agribusiness operations. Ram Bhujel reported how the women became good detailed record-keepers in their thriving small-scale businesses such as prawn, pig and goat farming. More than two years after the formal project ended, the group efforts were still sustained. The groups helped to solve farm problems in a collective manner, such as how to treat animal health issues that could spread among their village enterprises.

Securing fair livelihoods in fish value chains

Throughout, GAF6 participants emphasized that fisheries and aquaculture should be defined by reference to the whole of the value chain, and not simply to production, which is the current emphasis. Considering the entire value chain rather than just production reveals a greater number of women and a greater diversity of people who depend on fish, often in ways that were not envisaged by planners. Securing fair livelihoods raises a wide range of issues, especially: fundamental definitions of value chain occupations and the filters that may exclude or render many people, especially women, invisible; post-harvest matters that affect fair livelihoods; and the nexus of trade, labour and legality. Again, a persistent thread was that gender equality and equity must be fought for, and protected by active measures, rather than expecting it to happen through a sense of natural justice.

> "*A persistent thread was that gender equality and equity must be fought for, and protected by active measures, rather than expecting it to happen through a sense of natural justice*."

Individuals and groups may be deliberately or incidentally excluded when their informal and invisible work is not counted in national statistics and when fishing is too narrowly defined, for example, when practices such as gathering and gleaning are not considered to constitute "fishing." Jennifer Gee of the Food and Agriculture Organization (FAO) reported how statistical exclusion, including that based on gender, was being addressed. FAO now reports the limited sex-disaggregated national data available and recently published new guidelines on census and sample survey methods for collecting

socio-economic data. Efforts were underway to find ways to integrate project-based data, often the only data available, into national data.

In the production nodes of the value chain, narrow definitions of fishing exclude many small-scale operators. Susana Siar reported that inshore gathering, mainly of invertebrates, is most commonly excluded. In Costa Rica, both women and men fishers felt that though they work with dignity, their labour, primarily due to the particular conditions of the work and the associated lack of resources, went unrecognized, keeping them in poverty. Along the Pacific coast, 7,000 mollusc gatherers, mainly women and families working in the mangroves, had been trapped by laws that prohibited official recognition of their work unless the status of the fished stocks was known. This seemingly hopeless situation has started to turn around. One group began to organise themselves and managed to meet with the President of Costa Rica. With the help of the local NGO, CoopeSoliDar R.L, and the FAO, they started to work with the government to resolve the dilemma, using a human rights approach and participatory stock assessments, leading to sustainable use of the resource. Under the umbrella of the SSF Guidelines, this action is aimed at creating decent work with dignity, as defined by the SSF Guidelines.

In another illustration of how the *status quo* may be challenged, Ray Pavo's study showed how formal and official conceptions of gender and place in fish value chains that seem to be exclusionary may be circumvented. Using a framework that distinguished the overlapping concepts of lived, conceived, and perceived space, Ray studied why some women managed to work successfully in the major and overtly masculine tuna port in General Santos City, Philippines. He found that a small number of women prospered in their own business spaces, which they perceived quite differently from the way these spaces were conceived and managed by planners of the value chain, itself a conceived space. Some women's spaces did not even intersect with the conceived value chain, such as the collection and use of fish entrails. The women did not perceive of their spaces as marginal, but rather as ones in which they had good livelihoods.

Also in the Philippines, in Davao Oriental, Jecelyn Pastor interviewed women who had been fishing offshore for many years, some of whom were involved in barter trade for fish products from the deep sea vessels, despite

taboos about women bringing bad luck to deep sea fishing. She found that, due to such prejudices, women were invariably excluded when officials, researchers and other fishers considered deep-sea fishing policies, even though, through their own agency, they may have been active fishers and traders.

Horacio Gervásio asked why substantial subsistence fishing by women and men in Mozambique was not better integrated into local food systems. Under the new 2013 fisheries law, such fishing was defined as non-commercial and secondary, even though it contributed to the fishers' incomes and supplied local hotels and elites. Intertidal fishing should be formalised, he contended, and women encouraged to apply the everyday business skills they used routinely to balance their portfolios of livelihood strategies.

Hilsha (*Tenualosa ilisha* Hamilton 1822) is considered the national fish of Bangladesh but women barely participate in the fishery and its massive supply chains. Safina Naznin is the gender specialist in the ECOFISHBD project that set out to give women more visibility and power in the hilsha fishery. She worked with women in all stages of the project cycle and was testing the hypothesis that greater women's empowerment would lead to better hilsha conservation. Women within the project became more visible in the 80 fishing communities, made progress with their savings and alternative livelihood enterprises, and began promoting conservation by motivating their husband to comply with the regulations. Although the prevailing gender norms limited women's mobility and freedom to act, their involvement in the incipient co-management system was important because men participated very little in the hilsa conservation initiatives.

Turning to factors in post-harvest value chain activities that could affect fair livelihoods, GAF6 presenters introduced gendered investigations into food waste in Zambia fisheries, a wide range of post-harvest processing cases from fish filleting in Mexico as well as many traditional and evolving Philippine value chains including some where women are gaining ground and others which employ disabled people for their special skills.

In recent years, the theme of food loss and waste reduction had become prominent but, despite the gender divisions of work in fish supply chains, women or gender considerations have not featured in analysis and strategy.

Alexander Kaminski examined the effects of gender on value chain losses in the Barotse Floodplain, Zambia and found that women experienced greater losses (biophysical, economic and nutrient) than men during fishing, processing and trading. As a result, the women's gross margins were lower than those of men, except during trading. Using the Women's Empowerment in Agriculture Index, the study highlighted the harmful norms and behaviour that probably led to the women's greater losses, and used drama as a gender transformative communication tool to find ways of addressing these normative factors.

Petatán is a fishing village on Lake Chapala, Mexico's largest lake. The Lake is subject to climate change and pollution, affecting incomes from fishing and the quality of fish products. In numerous establishments in the village, women process the fish from the Lake and from nearby water bodies, turning the fish into a product that is marketable in major Mexican markets. Carmen Pedroza found that the women's work provided them with income that partially satisfied their needs for secure and fair livelihoods. The filleting work stabilised their household incomes against the vagaries of fishing income from the lake, but did not supply them with social security and health benefits.

In the coastal provinces in the Philippines, the status of the fisheries resource often dictates the social and economic conditions and opportunities of communities. Recognizing this, the national Bureau of Fisheries and Aquatic Resources (BFAR) engaged the University of the Philippines in the Visayas to come up with a holistic livelihoods program – from "source to plate" – for gender-based post-harvest technology transfer. Emilia Yap reported on the rapid appraisal and training approach the University applied and tested in Carles, Iloilo. Men as well as women took part in the training for diversified and carefully chosen post-harvest enterprises. The project revealed that women and men's work is becoming less strongly differentiated.

In the Balingasag Mariculture Park, in northern Mindanao (Region X), Philippines, milkfish (bangus, *Chanos chanos* Forsskål 1775) cage culture is a major activity, carried out in 28 small family, 24 medium and 11 large-scale enterprises. Alita Roxas reported how value chain mapping revealed that women do not work in the large-scale operations but tended instead to work in pre-stocking, and in processing plants and retailing. The value chain was

oligopolistic: large wholesalers and retailers, some of whom also owned cages, captured most of the added value, followed by brokers and traders. Despite receiving government assistance, the small-scale cage operating families faced many barriers such as high unit costs of feed and fingerlings purchased at retail prices because the purchases were small. They often operated at only about a quarter of their capacity and families ended up mainly providing cheap labour to the main enterprises.

Many areas in the Philippines have their own unique resources, such as Oton and Tigbauan, Iloilo Province, Philippines, where the catching, processing and trading of the iconic sergestid shrimp (*Acetes* spp.) was segregated by gender according to typical patterns. Myra Iguban described the women's work as mainly involved in trading, although a few were engaged in the hard physical work of harvesting. Both women and men did the processing. As the small shrimp were harvested in large quantities, this involved large-scale operations for which men undertook most of the production. Women processors tended to work in groups to improve their profits, which were already greater than those of the male processors. Generally, women were becoming more important in the sergestid shrimp value chain.

The value chain for the blue swimming crab (*Portunus (Portunus) pelagicus* Linnaeus 1758*)* in the Philippines is increasingly important as a source of employment and income. A study of people in different nodes of the value chain in 30 sites throughout the Philippines found that women were actively engaged in occupations from fishing preparation and operation to marketing and processing. Emilia Yap reported that, in some of the study sites, women were also involved in the top level management of crab processing plants and in managing crab fisheries resources. Women, however, were most prominent in marketing, processing and supply chain information. In one large processing plant, most of the factory floor workers were deaf and mute, hired for their careful work and heightened sense of smell in quality control.

The nexus of fish trade, labour and legality occurs where fish trade is under pressure to minimise costs even at the expense of exploiting workers and operating outside the law. The labour conditions under which women in the fish sector work have received little public attention and have been barely visible in

NGO exposures of other more publicly highlighted labour issues such as human trafficking and migrant labour exploitation. The GAF6 Special Session on the seafood industry, gender and social development encouraged participants to share experiences and perceptions of how women were affected. A broad-based panel discussed practices and experiences (or the lack thereof) linked with social responsibility and development in the seafood industry. Marie Christine Monfort, a seafood marketing consultant based in Europe and one of the panel convenors, noted the absence of women in the majority of high level decision-making positions in seafood companies, as well as in conferences and meetings. Thai business development worker, Supaporn Anuchiracheeva, shared her experiences on how participatory interventions empowered the women in a fishing community in southern Thailand to improve fishing practices, post-harvest, marketing, and business negotiations. The women's status had been elevated and they were now supplying seafood with international certification to 5-Star hotels in Bangkok. Based on her experience in the International Labour Organization, Anna Olsen recommended that gender and intersectional analyses were essential in activities to create decent work in fishing and seafood processing.

Mohammad Nuruzzaman described the factory provisions for occupational safety and health among female shrimp factory workers in Bangladesh. The push to do more on worker conditions was generated from two fronts. The first driver was the horrific collapse in 2013 of the Rana Plaza garment factory complex in Dhaka which brought recognition that shrimp factory and workers risk assessments were lacking but badly needed. The second driver was the pressure from international buyers and consumers who were worried about the shrimp workers. Bangladesh shrimp have become less competitive, having slipped to seventh position in exports from being second in 2009. Nuruzzaman stressed that the safety and health risk assessments are not the final point. Factory owners, managers and government agencies must remain committed to implementing the safety and health provisions, including training workers, recommended from the risk assessment.

This industry session and its panel stressed that concerted work with the seafood industry and development agencies is needed to raise awareness and build up capacity to achieve gender equality, as this is not yet on the agenda.

In the discussion, participants pointed out that, as women were prevalent in most fish value chains, their typical inequality could not be simply due to rarity. Gender is an economic, political and power issue, and inequality is a case of power asymmetries. The feminist perspective on gender issues in fisheries is needed now more than ever. Many participants felt that the political edge of working on gender has been lost. Many studies take the safe route of focusing on technical studies and tools. Furthermore, explanations for gender differences often resorted to cliché, such as "women's hands are more nimble" in fish processing and other low-paying work, ignoring the counter examples, such as that most specialist surgeons were men. New political frameworks are needed to support women on the ground. Knowledge and skills are not enough, but rather changes are needed in behaviours. Will the Small-Scale Fisheries Guidelines be able to play a role and what more is needed?

The international media has reported on importing states and regional bodies such as the European Union cracking down on illegal fishing, but few stories carried the voices of those affected. Since 2015, Thai fishers, their households, communities and life options have been roiled by new trade threats from importing regions, especially the European Union's "Yellow Card" on illegal, underreported and unregulated fishing, and the consequent national 2015 Thailand Royal Enactment on Fishing. Khamnuan Kheuntha examined why the fishers were experiencing seemingly constant and multiplying stress as new regulations placed more and complex demands on the fishers and their households. Khamnuan asked "was this stress due to more than the new regulations?" To answer this question, researchers needed to probe further. What was happening to male fishers' identity, young people's lack of interest in becoming fishers and learning from their elders, and the need to circumvent some new fishing regulations to survive? Additional burdens seemed to be placed on women to fish as well as process and sell fish, and gender relations may have shifted as the men's concepts of their own masculinity were challenged.

Chalermwan Wichakoon, a young woman CEO of a Thai fishing company shared her perceptions on the current situation facing the fishing industry in the fight against IUU fishing. The voices of the fishing company owners were not heard and their opinions were not asked regarding media

reports. This affected their businesses to the extent that the younger generation who inherited the businesses from their parents and grandparents, and especially women, were now thinking of giving up the fishing business.

Negatively and positively, fish trade and its growth impacts women. In coastal areas of India, Nikita Gopal described how women in fish marketing are being pushed out by resource rich traders who have entered the scene in many states. NGOs are helping the affected women to organise and raise awareness of their situation but, at the same time, state led interventions and schemes are also being initiated to explore livelihoods within and outside fisheries. The efficacy of these strategies was yet to be explored.

Climate change and the forces of change in coastal communities

Communities along coasts, rivers and lakes are buffeted by many changes, including climate change. Planning based on, for example, climate adaptation vulnerability assessments, must be improved by including the gender metrics they currently lack. Coping mechanisms that allow people greater control over their lives may include migration, working with government, non-government and academic partners to take control, nurturing gender champions and bringing women to the decision-making table, and, after disasters, "building back better." Agencies seeking to help communities need to take more nuanced views on what might work with appropriate needs assessment across all the players involved in the value chains, e.g., not supplying boats just to the men after a disaster, but also to women and focusing on the needs of women and men. Helping women does not mean working only with women in adaptation and recovery, as often the out-migration of men for work places additional burdens on women left behind.

Climate change is already affecting people in many environments, as reported at GAF6 and in the FAO FishAdapt: Global Conference on Climate Change Adaptation for Fisheries and Aquaculture. The GAF6 session on climate change and disaster preparedness, and previous GAF findings, were communicated at FishAdapt and built on by additional presentations and discussions in a Special Session.

Beginning in 2007, the Global Symposia on Gender in Aquaculture and Fisheries (GAF) began to focus on climate change, disaster recovery and relief as a theme, publishing a modest but important set of studies. The results of these studies showed that a gender lens brings deeper understanding of climate and disaster adaptation; that flexibility, versatility and agency are keys to resilience; and that gender-blind responses should always be challenged.

> "*Using a gender lens brings deeper understanding of climate and disaster adaptation. Flexibility, versatility and agency are keys to people's resilience. Gender-blind efforts to help people adapt should always be challenged*."

Gender-blind approaches were a particular problem in climate change vulnerability assessments for fisheries. These assessments lack gender measures, as do climate change National Adaptation Plans (NAPs). Speakers at FishAdapt explained that vulnerability assessments are used to examine the vulnerability of people, human activities, and places, and to determine the ranking of countries and priorities for action. Methodological choices have a large impact on country rankings. GAF experts and climate change adaption experts need to work together to include the gender dimension as an integral part of the vulnerability assessments and of the NAPs.

Presentations and discussions stressed that climate change adaptation is deeply interconnected with many women's issues: for example, when women are expected to engage in sex with fishers or fish traders to secure scarce fish for sale or processing; the spread of HIV; or the issue of rights and social protection for women and men along the value chain. Despite these linkages, the research on women in fisheries and aquaculture vis-à-vis climate change is very limited.

Marieta Bañez Sumagaysay described how women in Leyte, Philippines, asserted their agency through embracing the fish value chain in post-disaster livelihood intervention following the devastating 2013 Typhoon Haiyan. Women's groups, once formed, were able to "build back better," bringing all parties together, including donors. They created new, value added soft bone milkfish products with longer shell life and lower labour costs.

Following disasters, flexibility in income options for women and men seemed to improve household and community resilience. A study led by B. Shanthi and colleagues in Tamil Nadu, India, and presented by Angela Lentisco, found that, after losing their fishing livelihoods in the 2004 tsunami, many men migrated for work, leaving women to head the households. Researchers, NGOs and others successfully introduced brackish water aquaculture to the women to diversify their livelihoods. It was noted that in some aquaculture enterprises men seemed to facilitate and support women in their aquaculture activities.

Even without a disaster, migrations have become a fact of life and often disrupt fishing communities. Kyoko Kusakabe explored why migration is a pervasive feature of Cambodian coastal and inland fisheries. She found that migration patterns are not simple but were shaped by complex interactions of many factors, including gender, age, identity, resource depletion and alternative opportunities.

Flexibility and agency rely on perceptions, attitudes and emotions. At GAF6, Louis Lebel reported that the attitudes of Thai inland fish farmers towards climate risk were not strongly gendered, but their emotions were. Farmers' decisions were not made just on analytical logic but emotions were also brought to bear.

From a study of perceptions of climate change by women and men engaged in reservoir fisheries in Karnataka State, India, at FishAdapt, Arpita Sharma presented a gender analysis of the potential effects of climate change on livelihood of fishers. For women and men, composite livelihood vulnerability indices with exposure, sensitivity and adaptive capacity as parameters were computed. She reported that women and men experienced climate change vulnerability differently. Women had higher vulnerability scores and perceived that climate change would have more effect on most livelihood capitals (human, physical, natural, financial) than did men; both women and men perceived that their financial capital would be the most affected of all capitals. Thus the study suggested the need to integrate gender perspectives into mitigation and adaptation initiatives.

Standard gender-blind responses to climate emergencies should always be challenged. Mary Barby Badayos-Jover interviewed women who told her that "every time people come here to give aid, they give boats! What about aid specifically for women?" Her presentation and those of others at GAF6 which covered events in the aftermath of Typhoon Haiyan in the Philippines, painted a more complex picture than most relief agencies might provide. Following Typhoon Haiyan, also known as Super-Typhoon Yolanda, which struck the Philippines in 2013, women in Bayas village, Visayas, formed a women's association and were able to secure a boat to use in transport and also to rent out. Donations of boats to fishermen after a coastal disaster are often formulaic and not guided by needs analyses, but this action by the women is viewed as having greater legitimacy as it was based on their expressed needs. Hanny Mediodia's studies showed that households lost proportionately more income from fisheries than from other household activities, providing some *post hoc* justification for the focus on donating boats.

In their poster, Morgan Chow and Hillary Egna reported on a follow-up study to an Asia-Pacific Economic Cooperation 2009 study on gender integration in disaster responses in the Philippines, using the cases of Typhoon Haiyan (Yolanda) 2013 and Typhoon Hagupit (Ruby) 2014. They examined municipal, provincial and national level views. Immediate concerns were focused on narrow gender issues such as the adequacy of evacuation centres and short-term livelihood options. More comprehensive areas for improvement were also identified, potentially leading to stronger gender and fish sector benefits, such as a shift in focus toward rehabilitation and future risk reduction.

Using the fish drying chain in Barangay Duljugan in Palompon, Leyte, Philippines as a case study, Marieta Bañez Sumagaysay explored the nexus between food, water and energy. Women fish dryers provided detailed data on water and energy needs and the pressures to provide the dried fish for food, income, gifts and export. As climate variability, already being experienced, increased, so too did demand for water from the well and the pump, demand for energy, and for food. Women fish driers needed to start developing a "nexus lens" for their businesses. Or, as the study concluded in verse: For every drop, a clean fish to dry. For every ray, a dried fish. For every dried fish, a plateful and a penny. For every plate and penny, more fish to dry…

The lively FishAdapt Special Session titled "Integrating Gender Considerations into Climate Change and Disaster Risk Reduction for Fishing Communities" stressed that the gender lens should be used at all stages of the National Adaptation Plans and climate change projects, from design, to implementation, and impact assessment. The "Too Big To Ignore" Special Session linked this to the need for gender training modules to enhance the ability of decision-makers to identify the specific needs of women. To move forward, gender champions must be identified, developed and capacitated. The fisher should also be brought to the table for others to hear her voice.

But climate change is not the only serious coastal change facing communities. What does a coastal city do when it wakes up to the parlous state of the resources and environment on which it has relied? Roxas City, Capiz Province in central Philippines found itself in this position in the early 2000s. It suffered from a litany of environmental problems due to fishing, illegal aquaculture structures, pollution and habitat destruction. Belinda Garrido pointed out that women bore much of the brunt in having to support their families in the face of such challenges. Consequently, 500 fishers, researchers, government and non-government workers came together to create and implement a comprehensive eco-tourism program that put people back into the ecosystem in more productive ways, starting with five chosen sites. Underpinned by diverse training courses from foot massage to vermiculture and resource interpretation for tour guides, women were half of the participants and managers. The ventures became a meeting points for schools, businesses, civic and religious organisations in efforts from clearing rubbish to replanting mangroves. Although parts of the sites were destroyed by Typhoon Yolanda in 2013, the community organisations proved their resilience and quickly rebuilt the assets. All enterprises have grown financially since the start in 2009, and women have proved to be the backbone. Community-based ecotourism became a strategy to sustain resource rehabilitation efforts.

Even in an equal opportunity country like Norway where fish production is an important economic sector, fisheries management changes have disrupted fishing communities in gendered ways. Siri Gerrard explained how, in 1990, women's many fisheries contributions were not valued and thus were not

considered in the privatisation of the fisheries. Women ended up owning little of the capital that was created by way of quotas, and although they continued to contribute, they did so in invisible ways and by bringing in household income from their work in other sectors.

Setting up protected areas to promote resource recovery also needs community adaptation. Liberty Espectato tested stakeholder values and beliefs in three Marine protected areas (MPAs) in the Municipality of San Joaquin, Panay Island, Philippines, in the Coral Triangle. Although female and male respondents valued the marine resources for food and livelihood and felt ownership of the MPA rules and regulations, a greater percentage of women believed in the need to manage the marine resources sustainably for the future generations. The MPAs succeeded in building the biomass of fish by one to five times and the positive community views on the MPAs supported high rates of compliance with the rules and regulations. Women had more complete formal knowledge of the MPAs than men because they had attended awareness-building activities. This could make women effective in social marketing of MPAs.

Why realising security will mean transforming social and fish sector norms?

Social and fish sector norms present major constraints to secure rights and lives in fish value chains, often despite interventions to empower women. Several presentations pointed out why real progress in securing gender equality will not be achieved unless social norms are transformed. Preliminary results even suggest that women researchers in aquaculture may be experiencing greater difficulty in securing career progression because they may be at a disadvantage in publishing.

> "*Real progress in securing gender equality will not be achieved unless social norms are transformed*."

In Bangladesh, Afrina Choudhury examined whether women in homestead pond aquaculture and shrimp processing factories were empowered by their engagement in aquaculture. Both activities attracted many poor women, and they reported modest improvements in their empowerment, measured at multiple scales. The FAO-WorldFish study concluded, however, that we cannot assume that inclusion leads to empowerment, especially because household and

factory attitudes and strictures on women constrained them to conform to their existing gender roles. She asked whether empowerment would be sustainable or even possible without normative change.

For Solomon Islands, Helen Teioli made a strong case that, to succeed, gender transformative processes needed to engage men as well as women. Ignoring men and regional differences in the transformative processes overlooked gender differences such as that Western Province women tended to lead changes and innovative activities more so than men, whilst Malaita men tended to innovate more than women.

Long-term changes in perceptions will be helped if gender awareness starts early. In schools, art is one medium that might help. At GAF6, a "Youth and Fish" painting competition was held. In opening the event, Arlene Satapornvanit said "we should start our advocacy about gender awareness and sensitivity at a young age, so that these concepts will be incorporated into youth mindsets and be carried into adulthood as a lifestyle." The Youth and Fish Session was a pilot activity involving students from senior and junior Bangkok high schools working in pairs. The art works revealed the students' concern for the environment and people.

Mst. Kaniz Fatema provided an overview of women's roles in the many components of the massive Bangladesh aquatic resource systems in closed and open water bodies, including aquaculture and fisheries. In a special wetlands case study on villages in Kawadighi and Hail Haor, Moulvibazar district in northeast Bangladesh, she found that men dominated the fishery sector. Women's work on fish, in the household and in external engagement depends on permissions from men, even to the extent as to whether women could be interviewed for the study.

In 3 coastal barangays of Panay Island, Philippines, Feljean Cagape and colleagues studied the outcomes of the Pantawid Pamilyang Pilipino Program (4P's) program, a human development effort by the Philippine Government that provided conditional cash grants to the very poor to improve their health, nutrition and the education of children. Women-headed households lacked access to physical assets such as land on which to grow crops and vegetables for the household. Marginalised women producers and providers of food needed to be promoted for household food security.

Vladimir Figueroa reported he had just started a new project to study how gender and development communications could help improve women's empowerment in women organizations in fisheries in the Philippines. Can women's organisations, properly supported, challenge and transform the prevailing power dynamics?

Meryl Williams discussed a recent paper by Elisabeth Pruegl ("Neoliberalism with a feminist face: Crafting a new hegemony at the World Bank," Feminist Economics, 2016) on the World Bank's approaches to gender equality. Starting in 2001, empirical attempts to establish that economic growth and gender equality (and poverty reduction) were positively correlated produced mixed results: some studies supported the correlation, others contradicted it or gave ambivalent answers. The Bank then turned to micro-level studies, e.g., of institutions such as markets that had failed women. Should women be changed or markets and other social institutions be changed? The presentations at GAF6 reflected some of the possible answers to these questions. If women are considered unequal because of their different endowments, overcoming the gender gap with interventions to help women to compete can help, as illustrated by the participatory projects described by Supaporn Anuchiracheeva in the Earth Net Foundation, Thailand, and the Myanmar agribusiness skills training described by Ram Bhujel. Many presentations also addressed giving women greater voice, rights and negotiating power. Roel Bosma concluded that mass media communication needs to be used to enhance profound changes in norms, values and attitudes of men, before gender equality can be reached. Conversely, GAF6 participants often talked about markets and the economy as absolutes, e.g., lamenting but not challenging the low prices women receive in wages, and accepting the fish price as a financial fact, rather than as a constructed negotiable factor. Pruegl concluded that the World Bank's emerging "modified kind of neoliberalism produces substantial openings" because it starts to address also the "coercively gendered institutions" previously treated as private, such as the family and care giving. In the new approach, the actors may become more embodied, less abstract. Susana Siar's presentations on Costa Rica cockle harvesters and Amonrat Sermwatanakul's social media marketing of Siamese fighting fish both revealed the embodied power of women's agency. As fisheries and aquaculture are certainly about markets, and many at GAF6 stressed the need for a fish value chain approach, making markets for fish, for

labor, enterprises, etc., work for women appear as worthwhile spaces for research and action in achieving gender equality.

A key element in gender equality is within the professional spheres of gender and fisheries. For researchers and other experts, academic publishing is a critical determinant of career progression, recognition and rewards. Hillary Egna reported preliminary results from a major study she and colleagues are undertaking on authorship in the academic aquaculture literature, focusing on rates by gender for total authorship, first, last and single paper authors. Author order was selected as a focus because authorship order is important for recruitment, promotions and funding. It is also determined by social processes, can be politically motivated, and is culturally embedded within the research and publishing system. From several large databases analysed, women comprised 15-16 % of all aquaculture authors. First and last author positions were taken by women 13-15 % of the time in aquaculture, lower than the overall science average of about 19 %. Trends since 1982, when the AquaFish series of projects commenced, showed similar female and male changes, including the decline in recent years of single authored papers as research becomes an increasingly collaborative activity.

CONCLUSIONS

Women are gradually becoming more visible in some fisheries policies such as the SSF Guidelines, offering hope for more attention to gender equality in fish value chains. In other policy arenas, such as climate change adaptation vulnerability assessments and National Adaptation Plans, and fish certification systems, women are ignored. The SSF Guidelines have created space for national and international level action on securing greater gender equality. Much more needs to be done, however, to remove barriers that exclude women from the decision-making tables and to fulfil plans for inclusion. These actions could start with registering and counting women and their activities, planning and allocating funds for gender action and ensuring that expertise is available for implementing the plans. Gender champions should be nurtured and conditions fostered in which women can speak up and act on their own behalf. Perceived or culturally conditioned gender differences should not be accepted as reasons for excluding women or restricting them to lesser work.

In aquaculture, unless women make their way as entrepreneurs or receive help to develop their businesses and skills, they may be restricted to small-scale, near-home, and low technology enterprises, or as poorly paid labour in medium and industrial scale operations. Yet, when women are given or take initiative, their success can be remarkable. In coastal communities coping with change, even after disasters, success may come from "building back better" and taking a more nuanced view on which interventions might work, such as giving boats to women to help them in disaster recovery, rather than just to men. Conversely, often women will be helped when men also are helped rather than having men migrate for work, thus placing extra burdens on the women who remain.

The ultimate conclusion of GAF6, however, is that social and fish sector norms will have to be transformed to engender security, as they currently may stand in the way of gender equality and equity. Women will need new political organisation to galvanize the transformation.

GAF6 BACKGROUND INFORMATION

GAF6 gratefully acknowledges the support of the following agencies: Platinum Sponsor – AquaFish Innovation Lab; Gold Sponsors – Thailand Department of Fisheries, Asian Development Bank; Silver Sponsors – USAID, Network of Aquaculture Centres in Asia Pacific; Partners – Asian Fisheries Society, 11 Asian Fisheries and Aquaculture Forum, University of the Philippines Visayas, Asian Institute of Technology, SEAFDEC, Aquaculture without Frontiers, Marketing Seafood. We also gratefully acknowledge the technical support of the Food and Agriculture Organization of the United Nations, and support towards the fish Industry, Gender and Social Development Panel from the French Agency for Development (Agence Française de Développement). The views expressed in this report are our own.

GAF6 was held as part of the 11th Asian Fisheries and Aquaculture Forum hosted by the AFS, Thailand Department of Fisheries and the Network of Aquaculture Centres in Asia-Pacific in Bangkok, Thailand, from 3 to 7 August 2016. FishAdapt: Global Conference on climate Change Adaptation for Fisheries and Aquaculture was held in Bangkok, Thailand from 8-10 August 2016.

GAF6 was the 8th women/gender in fisheries/aquaculture symposium in the series hosted by the Asian Fisheries Society (AFS, http://www.asianfisheriessociety.org) over the past 18 years. Founded in 1984, AFS is a non-profit scientific society that promotes networking and co-operation between scientists, technicians and all stakeholders involved in fisheries (including aquaculture) production, research and development in Asia. Its ultimate objective is to enhance food security and income-generating opportunities for fisheries workers via sound management practices, environmentally sustainable development and efficient utilisation of the aquatic resources.

GAF6 consisted of: the GAF-101 Training Workshop; 68 presentations – 47 oral presentations, 19 oral summaries of posters and 2 posters, organised in Special Sessions, some with panels, and Regular Sessions; 2 Special Sessions with panels; 3 Special Sessions, 5 themed Regular Sessions; a "Youth and Fish" painting competition for students; the GAF Networks Meeting, and an overview presentation at the closing Plenary of 11AFAF. See https://genderaquafish.org/events/2016-gaf6-august-bangkok-thailand/gaf6-reports-and-publications/celebrating-gaf6-announcing-the-prize-winners/ and https://genderaquafish.org/events/2016-gaf6-august-bangkok-thailand/gaf6-program-abstracts-and-ppts/.

Website https://genderaquafish.org/ |
Facebook http://www.facebook.com/pages/AFS-Gender-in-Aquaculture-and-Fisheries/181176555231544| Twitter **@Genderaquafish** |
Flickr http://www.flickr.com/groups/genderaquafish/