THE CONTRIBUTIONS BY WOMEN TO FISHERIES ECONOMIES WORLDWIDE

by

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Abstract

Women make important but often undervalued contributions to fisheries economies globally. Missing these contributions has direct consequences for the sustainability of fisheries and for the millions who depend on fisheries resources worldwide. This work draws on the principles of economics and on other theoretical frameworks and knowledge systems to highlight the contributions by women to fisheries economies around the world. From interviews with Indigenous community members to online databases and national censes, I explore the range of data sources needed for a comprehensive picture of the fisheries economy. This investigation reveals that much needs to be done to improve the quality and scope of gender-disaggregated fisheries data if fisheries policies are to align with international guidelines for small-scale fisheries and goals related to sustainable development.

The global synthesis of participation by women in fisheries, presented here, indicates that women represent approximately 11% of participants in small-scale fishing activities (2.1 million women), catch roughly 2.9 million (± 520,000) tonnes per year of marine fish and invertebrates, with a landed value of 5.6 billion (± 952 million) USD, and an economic impact of 14.8 billion USD per year (equivalent to 25.6 billion real dollars). These contributions are often missing from fisheries statistics and national accounts yet are fundamental to food and livelihood security. In the five major fishing countries (Mexico, Peru, Senegal, South Africa, and Vietnam) investigated in greater depth here, the limited available data indicate that women participate throughout the fish value chain but are under-represented in fisheries decision-making. At the community level, an investigation of the contributions by women to the fisheries-related economy in the

Traditional Territory of the Heiltsuk Nation on Canada's Pacific coast reveals important gender dimensions of linked human-herring systems and highlights the role of Indigenous women in fisheries leadership and governance.

The chapters herein bring attention to women not only as important stakeholders in the fisheries sector but also as powerful agents of change in their communities and major contributors to food and livelihood security. These findings add to an evolving discourse around human dimensions of fisheries that calls for specific attention to women and gender.

Lay Summary

The contributions by women in fisheries economies around the world are often overlooked, in part, because ‘fishing’ is narrowly defined as catching fish at sea, from a boat, using specialized gears. Both men and women are involved in fisheries, but often in different roles and activities. Fisheries research, management, and policy have traditionally focused on direct, formal, and paid fishing activities—that are often dominated by men, ignoring those that are indirect, informal and/or unpaid—where women are more concentrated. This dissertation brings together research at the intersection of gender, fisheries, and economics to highlight how feminist perspectives can improve our understanding of fisheries economies, with implications for improving fisheries accounting, management, and policy, while also advancing gender equality in the fisheries sector and beyond.

Preface

I designed, carried out, and analyzed the research presented here under the guidance of my supervisor and committee members, and am responsible for the writing of this dissertation. I am the lead author on all the chapters. A version of the chapters listed below have been prepared for submission to or published in peer-review journals and include co-authors, as follows:

A version of Chapter 2 has been prepared for submission to a peer-review journal. I researched and developed this chapter with guidance from U.R. Sumaila, who is a co-author on the manuscript based on this chapter.

A version of Chapter 3 is published as Harper, S., Grubb, C., Stiles, M., and U.R. Sumaila (2017) Contributions by women to fisheries economies: Insights from five maritime fishing countries. Coastal Management 45 (2): 91-106. The complete manuscript was researched and written by me with support and insights from C. Grubb, M. Stiles, and U.R. Sumaila.

Chapter 4 includes research conducted under the approval of the University of British Columbia's Office of Research Services, Behavioral Ethics Board for consulting fisheries experts on the role and participation by women in fisheries around the world (H14-01334).

A version of chapter 5 is published as Harper, S., Salomon, A.K., Newell, D., Waterfall, P.H., Brown, K., Harris, L.M. and Sumaila, U.R. (2018) Indigenous women respond to fisheries conflict and catalyze change in governance on Canada's Pacific Coast. Maritime Studies

(MAST) 17, 189–198. I led this project from inception through to the analysis and writing of the manuscript. A.K. Salomon and D. Newell provided key guidance on developing this project and contributed to the manuscript text, while P.H. Waterfall, K. Brown, and L.M. Harris made substantive intellectual contributions, and U.R. Sumaila provided analytic support and project oversight. The research for this chapter was conducted with approval from the Behavioural Ethics Boards at the University of British Columbia and Simon Fraser University as a harmonized review project (H15-01079). This research project was also registered with the Heiltsuk Integrated Management Department in Bella Bella and followed ethical protocols established by the Heiltsuk Nation.

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List of Abbreviations

APRAPAM – Association for the Promotion and Responsibility of Actors of Artisanal Fishing in Mbour (Senegal)

EC – European Commission

EU – European Union

FAO – Food and Agriculture Organization of the United Nations

GDP – Gross Domestic Product

HLPE – High level panel of experts

ICSF – International Collective in Support of Fishworkers

IHH – Illuminating Hidden Harvests

INEGI – National Institute of Statistics and Geography (Mexico)

LV – Landed Value

PPP – Purchasing Power Parity

SDG – Sustainable Development Goal

SPC – Pacific Community (formerly South Pacific Commission)

STECF – The Scientific, Technical, and Economic Committee for Fisheries (European Union)

USAID – United States Agency for International Development

USD – United States Dollars

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I am incredibly grateful for having had the opportunity to conduct research with the Heiltsuk Nation and for the insights and knowledge shared by Heiltsuk leaders, Elders and community members that informed my work and expanded my understanding of Indigenous world views. The Heiltsuk Integrated Resource Management Department, with Kelly Brown as director, was very supportive throughout this research process and Hilistis Pauline Waterfall was especially generous in mentoring me on Heiltsuk protocols and in sharing with me important details of the colonial history of the Heiltsuk. Ǧiáxsiẍa.

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To my daughters, Arya and Emilie Rose,

may you always find joy in learning and strive to expand your horizons.

Chapter 1: Introduction

Women are an integral part of fisheries economies worldwide, yet remain in the shadows, where their contributions are often invisible and undervalued. The overlooked contributions by women to fisheries economies around the world undermine the importance of women's fishing and fisheries-related activities to food and livelihood security, and to community wellbeing. Studies which have specifically accounted for the contributions by women in fisheries have found these to be substantial (Harper *et al*. 2013; Zhao *et al*. 2013; Kleiber *et al*. 2014b). While there has been increasing recognition over the years of the importance of women in fisheries, and greater attention to gender as a differentiating factor in fisheries resource access and distribution of benefits, gender inequalities persist.

"*Without an adequate analysis of gender, fisheries management and development policies may have negative effects on people's livelihoods, wellbeing and the environment they depend on, or fail altogether to achieve intended outcomes*" (Weeratunge *et al*. 2010, p. 405).

Effective fisheries management requires a triple bottom line approach which can identify and assess ecological, economic, and social impacts and trade-offs associated with various management approaches, including impacts on all stakeholders involved in the sector and related economy. As climate change (Sumaila *et al.* 2011), marine pollution (Derraik 2002; McCrea-Strub *et al.* 2011; Abbott and Sumaila 2019), and unsustainable fishing practices (Pauly *et al.* 2002; Worm *et al.* 2006; Srinivasan *et al.* 2012) continue to put pressure on already fragile fish stocks, information is urgently needed to be able to assess the trade-offs of various policy

scenarios and to balance these with other national and international objectives around sustainable development, including poverty reduction and gender equality.

The Sustainable Development Goals (SDGs) identify gender equality as one of seventeen global goals aimed at promoting action towards ending poverty, at protecting the planet and at ensuring prosperity and peace for all. SDG 5 aims to achieve gender equality and to empower all women and girls. Similarly, the Voluntary Guidelines for Sustainable Small-scale Fisheries in the Context of Food Security and Poverty Eradication include gender equity and equality as one of the core objectives of this human-rights based approach to fisheries development (FAO 2014b). These international efforts to advance gender equality as a broad societal goal identify the importance of gender equality to sustainability and to fisheries-related food and livelihood security (Chuenpagdee and Jentoft 2019). This thesis aims to provide insights that are aligned with these efforts linking gender equality to the sustainability of fisheries and fishing communities using the language of economics, which can be readily incorporated into the existing policy discourse.

1.1 Scope and concepts

For the purposes of this thesis, gender refers to the socially constructed attributes and opportunities of being male or female, which shapes the roles and responsibilities, power relations, and socially defined appropriate activities for men and women (FAO 2017). Sex refers to the biological attributes associated with male and female bodies, which, through the process of socialization, are assigned a gender identity. While gender is often defined in a binary way as being either male or female, an expanded and increasingly accepted definition of gender identity,

at least in some contexts, includes male, female and non-binary identities (e.g., transgender, two-spirit, genderqueer, etc.). In this thesis I use a binary system as most employment datasets, if disaggregated, are disaggregated by sex, indicating numbers of men and women. In future such datasets may include additional categories to acknowledge and account for non-binary peoples. I acknowledge that the binary perspective used here is a limitation of this research as it does not capture the complexities of gendered practices and relations that exist in the world. This complexity could be better captured through a relational analysis of gender in the diverse social, cultural, economic, and ecological contexts where fishing occurs. However, this is beyond the scope of this work. Nevertheless, this research is a step in that direction, identifying key information required for a more thorough analysis of gender and gender relations across many different fisheries contexts.

While socially constructed gender roles vary considerably across the diverse social contexts found throughout the world, these roles are all dynamic, being continuously shaped and re-negotiated according to changing social, economic, and environmental conditions (Harris 2006; FAO 2017). Gender relates to power and interacts closely with other sources of power, such as class, race, religion and sexuality in ways that are compounding (Hawkins and Ojeda 2011; Mohanty 1991). In the fisheries sector and in fishing communities around the world, gender differences exist in access to and control over fisheries resources and decision-making where women are often at a disadvantage (FAO 2017). This, in part, relates to fishing being considered, much like hunting, an exclusively male domain. Fishing in many contexts is associated with masculinity, to the extent that even those women who fish prefer to be called ‘fishermen’ (Reedy-Maschner 2009; Branch and Kleiber 2017). While there is increasing evidence pointing

to the substantial involvement of women in fisheries as harvesters, processors, and marketers of fish and invertebrates (Weeratunge *et al*. 2010), unhelpful assumptions about gender roles allow inequalities to persist. My focus on women in this thesis is to bring attention to a category that is often missing in fisheries research, in economic analyses, and in policy, an omission that compromises our ability to make informed policy and management decisions.

The invisibility of women in the fisheries sector is partly due to the long-held view that fishing is an exclusively male domain and is exacerbated by the categories and terms used to define people who fish and people who participate in activities related to fishing. There are a variety of terms used in the literature, by practitioners and by those who are involved in fishing activities themselves, including both gendered and gender-neutral terms. For example, the gendered terms, 'fishermen' and 'fisherwomen' are used in some contexts while, increasingly, the gender-neutral terms 'fishers', 'fisherfolk' and 'fisherpeople' are used to be more inclusive and to acknowledge that both men and women fish in some contexts (Branch and Kleiber 2017). There is considerable variation in the use of terms across disciplines and contexts, with some debate over which is most appropriate (Branch and Kleiber, 2017). I will not go into this debate any further beyond identifying the challenges of synthesizing sex-disaggregated data from different contexts where categories of data collection and terminology are far from standardized. To the extent that it was possible to identify gender-biased data collection, an attempt is made to correct for this in the analysis. However, given the very limited fisheries data, disaggregated by sex and a lack of standardized approaches across countries and contexts for the collection of these data, there is substantial uncertainty associated with the results. Throughout this dissertation I use the term 'fisher' as a gender-neutral but inclusive term for men or women who fish or extract fish and

invertebrates in some way from the marine environment. This term does not refer here to men and women involved exclusively in pre- or post-harvest activities.

Although a deeper understanding of gender relations and the gender barriers that exist in the fisheries sector are critically important to advancing the objectives of gender equity and equality as laid out in the Sustainable Development Goals and the Small-scale fisheries guidelines, I focus here on women and, specifically, on women in marine capture fisheries. I further narrow the scope by focusing predominantly on small-scale fisheries (SSF) because of the crucial role of SSF to food and livelihood security, especially in developing countries and coastal regions of the world. By focusing on the contributions of women, the datasets presented in this thesis are not disaggregated by sex, but can be used to create these as outputs, and include information about the roles performed by men to contextualize the contributions by women and to provide a more comprehensive picture of the fisheries-related economy. I draw on feminist perspectives that acknowledge that women are, in many fisheries contexts, disadvantaged in relation to men and that these gender inequalities have an adverse effect on all (Porter 2014). However, other categories of social difference interact with gender to produce compounding systems of power and oppression with implications for access to and control over fisheries resources.

Despite increasing recognition of gender inequalities in some fisheries contexts and the broader implication these have on society, gender is rarely considered as an important variable in fisheries data collection. This limits the use of gender analysis as a tool to identify gender inequalities in policies and programs and to highlight differences between men and women in terms of access to resources, to employment opportunities, etc. Standardized and widespread

collection of gender-disaggregated data requires bringing attention to why these data are needed in the first place. My research aims to bring such attention, highlighting the contributions by women to fisheries economies around the world, providing quantitative data to support existing qualitative descriptions of women in fisheries, advancing academic theories related to fisheries livelihood strategies, labour patterns, and wellbeing in fishing communities and economies (Allison and Ellis 2001; Weeratunge *et al.* 2010, 2014). This work also aims to provide data and scientific insights that support policies that aim to promote greater gender equality and empowerment of women in resource management.

Overall, this thesis and the chapters herein aim to provide valuable inputs for fisheries policy and program development at the intersection of gender, fisheries, and economics. This work pulls together many studies and insights on gender aspects of the fishing industry and communities around the world to assess the contributions by women in fisheries to food and livelihood security, and to community wellbeing. While previous studies have done this on local or regional scales, this will be a first attempt to estimate these contributions on a global scale, with a set of indicators, comparable across countries and regions, at the intersection of gender, fisheries, and economics. The overall aim is to provide empirical data for developing fisheries policies and programs that are more equitable and inclusive. A local level case study was conducted to gain a more nuanced appreciation for the many ways that women contribute to fisheries-related economies that might not be visible at other scales of analysis or more narrow framings of the fisheries-related economy. This case study also explores how indigeneity and indigenous politics intersect with gender to shape the contributions by women to the fisheries economy and how

these are represented and valued. While this thesis focuses on women and gender in fisheries, insights link to broader themes of equity and social justice in fisheries and beyond.

1.2 Objective and research questions

The overall objective of this research is to highlight the contributions by women to fisheries economies around the world at various scales and to use a framework that translates easily into policy discourse, where economic analyses and terminology are the norm. Through this framework, I develop policy-relevant indicators at the intersection of gender, fisheries, and economics with the aim of drawing attention to the contributions by women in fisheries to food and livelihood security and to community wellbeing. Each chapter focuses on a different dimension and/or scale of analysis, linking to broader debates and themes, through estimates of participation by women in small-scale fisheries, catch by women, landed value[1] and participation in fisheries leadership and governance.

The following are the research questions addressed in the thesis:

- What can a feminist perspective bring to fisheries economics (Chapter 2)?
- What contribution do women make to the fisheries catch at national and global scales (Chapter 4)?

[1]Landed value is the total gross revenue from fisheries, calculated as the product of ex-vessel prices, i.e. the price that a fisher receives when they sell their catch (Sumaila *et al.* 2007), and the tonnes of landed catch.

- What is the landed value of the contributions by women in small-scale fisheries at national and global scales (Chapter 4)?
- How are women represented in fisheries leadership and decision-making in various contexts (Chapter 3 and 5)?
- What insights can an intersectional lens bring to understanding contributions to the fisheries related economy (Chapter 5)?

1.3 Theoretical framework

This work draws on analytical approaches from a variety of disciplines including feminist economics (Agarwal 1997; Kuiper and Barker 2006; Bjornholt and McKay 2014), feminist political ecology (Harris 2008, 2009; Reed and Christie 2009; Nightingale 2011), social and environmental justice (Polido and Peña 1998; Porter and Sheppard 1998; Schlosberg 2009), resource economics (Sumaila *et al.* 2007, 2010; Dyck and Sumaila 2010; Halpern *et al.* 2013; Richardson *et al.* 2015), and social-ecological systems theory (Berkes and Turner 2006); hence, this project is fundamentally interdisciplinary. It also draws from Indigenous worldviews and insights from Heiltsuk Elders and knowledge holders, broadening this research to include principles of transdisciplinarity (Chuenpagdee and Jentoft 2019). While each chapter includes different dimensions, the overarching goal of this work is to provide new insights and data to advance feminist perspectives in fisheries policy and economics, where women's contributions in fisheries are both ***visible*** and ***valued*** by society.

1.3.1 Engaging with feminist perspectives

There are many different approaches to feminism that are relevant to this research; however, here I engage mostly with feminist economics and feminist political ecology. Feminist economics criticizes conventional economic systems and analyses for failing to account for the informal and/or care work that is disproportionally done by women around the world (Bjornholt and McKay 2008; Waring 1988). This is especially relevant in a fisheries context where data collection and statistics rarely account for sub-sectors that are not market-based and for the many informal activities that contribute to the viability of fishing businesses and operations. This feminist perspective is discussed more thoroughly in Chapter 2 and also motivates Chapters 3 and 4. In these latter two chapters, I emphasize both formal and informal activities that contribute to fisheries-related economies in diverse contexts round the world. I go on to estimate small-scale fisheries catches, often for home consumption, that are overlooked in national estimates of fisheries catches, with implications for policies related to food and livelihood security in coastal communities, particularly in those parts of the world that are most vulnerable in terms of climate change and other anthropogenic impacts.

This work also engages with feminist political ecology, which acknowledges and interrogates gender differences with respect to resource access, uses, knowledge, governance and experiences (Rocheleau *et al*. 1996). In this way, gendered practices and relationships in fisheries can be understood, not as essential (i.e., linked to being male or female) but as being mediated by socio-cultural expectations and responsibilities and other contextual factors (Harris *et al*., 2017a). Feminist political ecology recognizes that gender is a critical variable that intersects with other categories of social difference (class, race, culture, ethnicity, religion, etc.) to influence access to

and control over resources, shaping how men and women experience and respond to their environments as dynamic systems (Hawkins and Ojeda 2011; Rocheleau *et al*. 1996). This approach to feminism is especially useful for understanding gender dimensions of fisheries as social-ecological systems that are dynamic and evolving. I engage with this feminist perspective broadly throughout this research, informing my analysis and interpretation of findings.

In the following chapters, I investigate the contributions by women to fisheries economies around the world, drawing from these multiple frameworks, theories, and sources to build a more comprehensive picture of the fisheries-related economy. Exploration of existing data and literature in combination with the insights of local experts and knowledge holders informs this research.

1.4 Thesis overview

This thesis includes a literature review and three main research chapters bookended by an introduction and conclusions section. The introduction (Chapter 1) gives a brief rationale for this work, including research objectives and questions, and an outline of the structure of the thesis. Chapter 2 is a review of selective literature at the intersection of gender, fisheries, and economics, where I make a case for bringing a feminist perspective to fisheries economics. Chapter 3 investigates the role of women in the fisheries sector of five major fishing countries, drawing on existing studies and expertise to highlight the contributions by women in fisheries in these contexts to food, income, and livelihood security. Chapter 4 expands on the insights from these five countries to develop a global picture, and using a meta-analytical approach, accounts for participation by women in the fisheries sector in each fishing country of the world, using

these estimates to quantitatively assess the contributions by women to the total marine fisheries catch in terms of volume and value. Chapter 5 is a community-level case study which explores the contributions by Indigenous women to the broader fisheries-related economy through their role in a recent fisheries crisis and conflict on the Pacific coast of Canada that led to changes in governance of an economically and culturally important resource. Chapter 6 is the conclusions section, which pulls together the findings from the three research chapters to underscore the importance of bringing a gender perspective into fisheries economic analyses and discourse to provide a more complete understanding of fisheries-related economies and the often-overlooked and undervalued contributions by women in fisheries. I also highlight some of the challenges for developing policy relevant data at the intersection of gender, fisheries, and economics, where multiple scales, disciplines, and jurisdictions make developing a set of standardized, comparable and globally applicable indicators difficult, but not impossible.

Chapter 2: A review of selected literature on women and fisheries economics

2.1 Introduction

Women in fisheries provide multiple benefits to society—labour, food, economic stimulus and so on—while also receiving individual benefits from their involvement in fisheries, such as income, food, empowerment, and bargaining power (Harper and Kleiber 2016). However, these contributions by women in fisheries are often overlooked and undervalued (Harper *et al.* 2013). In terms of labour inputs to the fisheries sector, there is much better recognition of the participation by women in formal, paid, full-time work in the post-harvest sector (e.g., processing and marketing), while informal, unpaid and/or care work, which is disproportionately undertaken by women (Boserup 1970; Bjornholt and McKay 2014), is largely overlooked. Women in fisheries are often not seen as important stakeholders in the sector, and thus are under-represented in fisheries leadership and decision-making (Monfort 2015). The implications of missing women in fisheries statistics and at the decision-making table are widespread with potential impacts on fisheries sustainability, food and livelihood security, and efforts to improve ecosystem health and the wellbeing of fisheries-dependent communities around the world (Harper *et al.* 2013; Kleiber *et al.* 2015; Gissi *et al.* 2018)

In this chapter, I provide a selective review of literature at the intersection of gender, fisheries, and economics, making the case for bringing a feminist perspective to the field of fisheries economics as a pathway to developing fisheries policies that promote, rather than hinder, gender equality. To make this case, I explore key contributions to these overlapping areas of scholarship and suggest how feminist perspective could improve fisheries research and policy. This review is

by no means exhaustive of the literature that has contributed to this topic from a variety of related disciplines. To highlight some of the key contributions that influenced and shaped my interdisciplinary research journey, I have included a table of selected literature at the - intersection of gender, fisheries and economics (Table 2.1). These key contributions are further described in the following sections.

2.2 Women and the fisheries economy

Recognition of the important role of women in fisheries economies started to emerge in the literature in the 1980s, with key works by Chapman (1987) and Nadel-Klein and Davis (1988). Chapman (1987) highlights the role of women in providing a crucial, steady supply of protein to Pacific islanders throughout Oceania via their subsistence fishing activities in nearshore marine habitats (intertidal and lagoon areas). This pivotal study of women's fishing in Oceania not only brought early attention to gender differentiated fishing practices and spaces, but also made the connection between the failure to observe women in fisheries and the lack of attention to gender as an important category of data collection. The broader consequences of this oversight are an under appreciation of the contributions by women in fisheries to food security across Oceania, and how this influences human health and wellbeing across the region.

Table 2.1 Selected key contributions relevant to the intersection of gender, fisheries and economics.

Citation	Title	Description
Boserup, 1970	Women's role in economic development	Focuses on the lack of recognition of the contributions by women to developing economies by way of unpaid work in the informal sector.
Chapman, 1987	Women's fishing in Oceania	Highlights the important contributions by women in fisheries to marine-related food security in the Pacific region.
Nadel-Klein and Davis, 1988	To work and to weep: women in fishing economies	Provides a cross-cultural look at the roles of women in fisheries around the world, highlight their social, economic, and technological contributions.
Waring, 1988	If women counted	Brings attention to the failure of conventional measures of economic growth to include women's unpaid work and the value of nature as productive aspects of the economy.
Williams, 2002	Making each and every African fisher count: women do fish	Highlights women's contributions to the changing economy of East and West African fishing communities.
Bennett, 2005	Gender, fisheries and development	Identifies the need for gender-disaggregated data to improve policy interventions related to sustainable fisheries and communities in West Africa.
Neis *et al*., 2005	Changing tides: Gender, fisheries and globalization	Highlights the ways that women's lives and gender relations within the fisheries sector are being shaped by globalization.
Elmhirst and Resurreccion, 2008	Gender, environment and natural resource Management: new dimensions, new debates	Provides a synthesis and evolution of theoretical approaches at the gender and resource management nexus.
Williams, 2008	Why look at fisheries through a gender lens?	Suggests that a comprehensive understanding of the fishing industry requires a deliberate focus on gender and age-differentiated roles, responsibilities, access and opportunities.
Walker and Robinson, 2009	Economic development, marine protected areas and gendered access to fishing resources in a Polynesian lagoon	Identifies potential negative impacts of MPA management on women's fishing patterns and food production in the Pacific Islands.

Citation	Title	Description
Weeratunge, 2010	Gleaner, fisher, trader, processor: understanding gendered employment in fisheries and aquaculture	Focuses on four thematic areas– markets and migration, capabilities and well-being, networks and identities, governance and rights – as analytical entry points for bringing attention to gender in fisheries.
World Bank, 2010	Hidden Harvest: The global contribution of capture fisheries	Presents female participation estimates for fisheries employment, indicating that half of fishworkers worldwide are women.
Monfort, 2015	The role of women in the seafood industry	Highlights the role of women in the seafood industry and inequities they face, identifies gender data gaps and calls on policy-makers to support for women in the sector.
de la Torre-Castro *et al*., 2017	Gender analysis for better coastal management – Increasing our understanding of social-ecological seascapes	Illustrates the importance of gender analysis in marine spatial planning in order to achieve optimal social, economic and ecological outcomes.
Gissi *et al*., 2019	Un-gendering the ocean: Why women matter in ocean governance for Sustainability	Emphasizes importance of gender-balanced representation in ocean governance, including fisheries.

While there have been many advances in the field of fisheries research and policy since Chapman published her paper in 1987, including a greater focus on human dimensions of fisheries (Bell *et al.* 2009; Hall-Arber *et al.* 2009), managers and policy makers in Oceania (and around the world) continue to struggle to meaningfully include gender as an important variable in fisheries research, management, and policy (Williams *et al.* 2018). However, Chapman must be acknowledged for her important and influential insights to this field, and credit must also be given to the Pacific Community, formerly known as the Secretariat of the Pacific Community (SPC), for bringing attention to gender dimensions of fisheries in the region. In recent decades, scholars and researchers have continued to shape the gender and fisheries discourse in Oceania and beyond, with work highlighted in SPC newsletters and numerous peer-reviewed publications (Kronen *et al.* 2008; Walker and Robinson 2009; Ram-Bidesi 2015).

Another early depiction of women in fisheries economies comes from the book, *To Work and to Weep: Women in Fishing Economies*, by Nadel-Klein and Davis (1988). This key publication also brought attention to the important role that women play in fisheries economies in terms food and livelihood security: "women play a number of vital roles in the technological, economic, and social processes by which fish become sources of protein and human income" (Nadel Klein and Davies, 1988, p.19). Nadel Klein and Davies (1988) go beyond the provisioning of food and income to bring attention to the broader political economy, highlighting the contributions by women as harvesters, processors, venders, and political activists, defending their communities in the public sphere (Nadel-Klein and Davis 1988). This important work challenges the commonly-held view that women play mostly a supporting role in fisheries, and instead argues that the

economic contributions of women in fisheries create resilience in fishing communities and economies as women respond and adapt to the uncertainties inherent in the fisheries sector. For example, with fluctuations in fisheries catches and associated income, fishing communities draw on their social networks for support, with women often having a pivotal role in developing and maintaining these networks (Anna 2012).

Much like Chapman (1987), the work by Nadel Klein and Davis (1988) also identifies gender-differentiated roles and activities across fisheries subsectors. However, the latter also focus on the gendered impacts of change in the fisheries sector, including response to economic change. For example, the displacement of women from traditional fishing roles and activities as a fishery becomes more profitable. While the shift from artisanal to industrial processing has made women more visible in the sector, Nadel Klein and Davis (1988) point out that these new job opportunities are often low-paid, seasonal, and temporary work with few benefits. These issues continue to plague the fisheries sector today, with poor working conditions and other human rights violations as ever-present concerns (International Labour Organization 2013, 2015; Tickler *et al.* 2018). While some progress has been made in recognizing the contributions by women to fisheries economies and in shaping the narrative around women and gender in fisheries (Williams *et al.* 2005; Britton 2012; Porter 2014; Thorpe *et al.* 2014; Kleiber *et al.* 2015), gender inequalities persist and often remain hidden from view.

Around the same time as Chapman (1987) and Nadel-Klein and Davis (1988) were exposing hidden aspects of the fisheries economy, Waring (1988) published the ground-breaking critique of the system of national accounts, *If Women Counted*. This book went on to be considered the

founding document for feminist economics, pointing to the failure of conventional measures of economic growth to include women's unpaid work and the value of nature as productive aspects of the economy. This influential text and Waring's theories have been incorporated into much scholarship since the publishing of this book, including a peer-review journal dedicated to the topic (MacDonald 1995; Agarwal 1997; Seguino 2000; Power 2004; Bjornholt and McKay 2014). These works have influenced the political economy discourse and, while some feminist approaches have been taken up more prominently in fisheries (MacDonald 1995; Porter 2014), fisheries research, particularly in the area of fisheries economics, has not engaged substantially with feminist economic approaches. Only a few studied were identified from the fisheries literature that cite feminist economics as their methodological approach (Fairbairn-Dunlop 2014; Thorpe *et al.* 2014). While the use of feminist economics as an analytic framework for fisheries research has not been widespread, it offers important insights and modes of inquiry to highlight the contributions by women to fisheries economies and the spaces they occupy, particularly in terms of accounting for subsistence activities that are often missing in macroeconomic analyses and in fisheries statistics (Fairbairn-Dunlop 2014). While a benefit of this approach is to capture a broader range of activities that contribute to fisheries economies, taking stock of all the labour inputs (formal and informal) associated with this sector, the limitation of this approach is that it does not necessarily identify or critique the social and institutional factors that have led to these activities being overlooked in the first place.

Applying a feminist perspective to fisheries economics requires that we redefine what is considered fisheries-related 'work' and how this gets recorded in national accounting systems. In 1970, Danish economist Esther Boserup argued that conventional measures of economic activity

have underestimated the significance of women's contributions to the economy in various regions of the developing world by failing to recognize the value of unpaid work to the productive economy and by underestimating the paid work that is outside of formal sectors (Boserup 1990). Almost 50 years later, this continues to be the case in many sectors of the economy, with the fisheries sector being especially poor in accounting for the unpaid and informal contributions by women. The subsistence sector, which was the focus of Chapman's work, is particularly under-represented and under-reported in fisheries statistics and accounting (Zeller *et al.* 2015; Pauly and Zeller 2016a) with the collection of fish and invertebrates for home consumption being especially lacking in national datasets (Harper *et al.* 2013). Drawing insights from Waring (1988) and Boserup (1970), feminist economics can help to broaden our definition of fishing and fisheries-related work for a more comprehensive account of the value of fisheries to national economies.

2.3 From recognition to empowerment

In fishing communities around the world, access to resources and training, financial capital, education, skills development, and decision-making processes are shaped by social, cultural, and economic factors (Matthews 1995; Matthews *et al.* 2012). Women often experience socio-cultural barriers that limit their access to these domains, and many fisheries programs and policies fail to recognize the importance of women in the fisheries sector and their contributions to food security, poverty alleviation, and resilience. With women concentrated in the post-harvest sector, they are often further marginalized in production-focused fisheries management and policymaking (Thorpe *et al.* 2014), which have traditionally focused on large-scale industrial fisheries, ignoring small-scale and non-marketed fisheries, e.g., subsistence, discards, etc. (Zeller

et al. 2015; Pauly and Zeller 2016a). The majority of fisheries subsidies also go to support large-scale fisheries production (Schuhbauer and Sumaila 2017), with limited support for post-harvest activities or small-scale subsectors, where women are more involved (Harper and Sumaila 2019).

Only recently have small-scale fisheries started to gain widespread recognition at the International policy level for their contributions to food and livelihood security in coastal communities around the world (Chuenpagdee *et al.* 2006; Pauly 2006; FAO 2014b). However, management approaches have lagged in terms of increased capacity to manage this critically important subsector, which provides the bulk of fish for human consumption globally, with minimal energy expenditure and more sustainable technologies than large-scale fisheries (Pauly 2006). Those involved in the small-scale sector continue to be excluded from management and decision-making processes, and their interests are not necessarily represented in fisheries project and policy development. This power imbalance is further exacerbated for women who already face considerable discrimination across all sectors of society in terms of decision-making authority (Ñopo *et al.* 2011). The compounding effects of marginalization of small-scale fishers and of women makes gender inequality in fisheries especially significant. The implications of this marginalization on poverty and food security are critically important in terms access to and the ability to benefit from fisheries resources, which are differentiated by gender, economic class, ethnic groups, age, and religion (HLPE 2014). The connection between gender equality and fisheries-related food and nutritional security are receiving increasing attention at the international level (FAO 2014a; HLPE 2014). Fisheries experts from around the world that came together in 2014 in a high-level panel to describe the role and importance of fish in advancing food and nutrition security for all underscored that “food insecurity and malnutrition arise from

inequalities, including those related to gender" (HLPE 2014, p. 66). This high-level recognition is further acknowledged in the *Voluntary Guidelines for Small-Scale fisheries in the Context of Food Security and Poverty Eradication*, which identifies gender equality as a core objective (FAO 2014b).

2.4 Gender and governance

In fisheries economies around the world women are under-represented in fisheries decision-making (FAO 2013; Harper *et al.* 2017). Although there are some examples where this is not the case (Meltzoff 1995; Clabots 2013), efforts are needed on a broad scale to enhance female participation in fisheries governance. Recent studies reveal the benefits of diversity and inclusion for resource management, with balanced gender representation linked to collaboration and better management outcomes in fisheries and other natural resource sectors (Westermann *et al.* 2005; Leisher *et al.* 2015; de la Torre-Castro 2019). These findings emphasize the need for the balanced representation of men and women in fisheries leadership and decision making. In a broader ocean governance context, a recent *Marine Policy* paper by Gissi *et al.* (2018) argues that women's perspectives and voices are critical to promoting sustainable oceans. They present numerous examples of contributions women have made to advancing global ocean sustainability and governance, including examples from fisheries. They reiterate what other scholars have suggested previously, that to fully understand the social-ecological linkages in marine ecosystems, women must be included in fisheries management and promoted in fisheries leadership and decision-making positions (Berkes 2015; Kleiber *et al.* 2015; de la Torre-Castro *et al*. 2017; Gissi *et al.* 2018).

2.5 Improved accounting in fisheries

Women have been and continue to be under-valued for their contributions to the economy across various sectors of society (Bjornholt and McKay 2014), and the seafood industry is no exception. Increasingly, the seafood industry has become a global network of suppliers and consumers, with long value chains spanning several countries and relying on cheap inputs (e.g. labour), often at a cost to vulnerable populations (Monfort 2015; Tickler *et al.* 2018). The fishing industry has long relied on the labour of women around the world to add value to seafood and to bring products to market (Nadel-Klein and Davis 1988; Neis *et al.* 2005). Women are thought to represent half of fishworkers worldwide (World Bank 2010), yet their contributions continue to be overlooked in many contexts. Without proper recognition and compensation for the contributions made by women, fisheries' accounting may be under-estimating the true costs of fisheries and over-estimating profits (Harper and Kleiber 2016). Where work is informal and/or unpaid, current accounting systems fail to properly value the contributions from fisheries, and those involved in them, to food and livelihood security. Conventional economic indicators. such as Gross Domestic Product. do not properly represent the activities of all sectors within the economy, focusing primarily on market-based activities (Stiglitz *et al.* 2010) and overlooking the many informal activities and transactions that take place in countries all over the world (Neuwirth 2011). In fishing communities, the subsistence sector, which includes home consumption, trade, bartering, and gifting, makes up a substantial component of the rural economy, yet these factors are rarely accounted for when evaluating the viability or sustainability of a fishery and related economy. Thus, there is a critical need for developing and testing a set of indicators, both qualitative and quantitative, that more fully account for the social and economic contributions of fisheries' activities and actors, including both men and women (Porras 2019). The routine

collection and dissemination of sex-disaggregated data for fish value chains could improve fisheries economics and national accounts, while also highlighting the contributions by women that have been previously overlooked and undervalued.

2.6 From gender mainstreaming to gender transformative approaches

Numerous national and international initiatives have recognised the importance of gender equality to broader societal goals and have implemented policies aimed at closing this gender gap, for example minimum requirements for the gender composition of parliaments (World Bank 2013) or boards of directors (e.g., in Norway and several other European Countries [Bertrand *et al.* 2014]). With these programs, some progress has been made in certain contexts in narrowing the gender gap, for example in education, health, and labour market participation, but considerable gaps persist in many regions of the world, and in certain sectors (World Economic Forum 2014).

At the international policy level, several key initiatives and agencies offer great potential for altering the fisheries policy discourse around gender. For example, the Sustainable Development Goals feature gender equality and women's empowerment as one of seventeen key development goals. Although these are not legally-binding policy instruments, they articulate, at an international level, a mutually agreed upon set of goals and targets that influence the policy discourse and that inform policy development. However, more needs to be done to connect and to integrate gender equality across the various other goals related to sustainable development, and especially in the context of fisheries.

There is a vast space that exists between aspirational goals and on-the-ground change, with much that needs to be done in between to fill this gap. There is evidence of progress in some contexts in putting these principles into practice at the national, policy-development level. For example, Canada recently introduced a tool called Gender Based Analysis Plus, which is "an analytical process used to assess how diverse groups of women, men and non-binary people may experience policies, programs and initiatives" (Status of Women Canada 2018). While tools such as this offer great potential for addressing gender inequalities across various sectors of the economy—including fisheries—they must be done alongside a broader critique of the processes of development, globalization, and patriarchy that contribute to and that perpetuate many of the social inequalities that are at the core of gender disparities in the fisheries sector and beyond. Without an adequate critique of these systems within which fisheries economies exist, bringing a gender lens to fisheries will only go so far in narrowing the gap between men and women in terms of access to and control over fisheries resources. Rather than simply adding gender to the agenda, which was the main achievement of gender mainstreaming, closing the gender gap requires gender transformative approaches that go beyond instrumental interventions to address structural dimensions of women's position and power (Nazneen *et al.* 2011; Kantor 2013). These approaches have been applied in agriculture and aquaculture, with important tools and insights that could be adapted to fisheries contexts.

2.7 Where to go from here?

Gender inequalities in access to fisheries resources and the benefits derived from them may compromise important contributions that fisheries make to food, income, and livelihood security (Bennett 2005). This insight is not new but there is still much to be done to transform the way

that we view and value work in the fisheries sector so that there can be social, economic, and political equality between the sexes. In the following chapters, I take steps in this direction, bringing attention to the various types of fisheries-related work that women participate in and that contribute to the political economy of fisheries. In a fisheries management sense, gender is a critical variable in understanding fisheries as social-ecological systems, while also key to improving governance. To fisheries economics, a feminist perspective enhances our understanding of the costs and benefits associated with fisheries. When evaluating fisheries policies, management strategies, and alternatives, understanding the gender dimension is crucial to mitigating risks for both men and women involved in fisheries and to maintaining the flow of fisheries-related benefits to society.

Chapter 3: Contributions by women to fisheries economies: insights from five maritime countries[2]

3.1 Introduction

Women are thought to represent 47% of the global fisheries workforce (World Bank 2010) and, in some regions, contribute 25-50% of the small-scale fisheries catch (Harper *et al.* 2013; Kleiber *et al.* 2014); however, these contributions are often overlooked, underestimated, and/or undervalued. One reason for this oversight is in how fishing is defined, i.e., who is counted as a 'fisher' and what counts as 'fishing' (Kleiber *et al.* 2015). Traditionally, it has been those who go out to sea to catch fish, from a vessel, using specialized gear that are seen and counted (mostly men), while those who collect invertebrates and small fish from shore are not (e.g., women, men, and children). Another reason that women's work in fisheries is overlooked is that it is often unpaid, informal, part-time, or simply considered an extension of women's household responsibilities. As we expand the scope of our definition to be more inclusive of all people who fish and contribute to fisheries—formally and informally—we - can see that women do fish and that they are involved in many other fishing-related activities along the fish value chain.

Recognition of the role of women in fisheries is not new. Several decades ago, key publications brought to light, through rich descriptions, the important contributions women make to fisheries and to associated economies around the world (Chapman 1987; Nadel-Klein and Davis 1988).

[2]A version of this chapter is published as Harper, S., Grubb, C., Stiles, M., and U.R. Sumaila (2017) Contributions by women to fisheries economies: Insights from five maritime fishing countries. *Coastal Management* 45 (2): 91-106.

Chapman (1987, p. 284) describes "the key role women play in village protein subsistence in Oceania", highlighting the important contributions women in fisheries make to food security in the region and identifying associated policy implications. Nadel-Klein and Davis (1988) highlight the nature of women's work in fisheries and their contributions to fishing economies with examples from various parts of the world through an anthropological lens. Since these initial contributions, there has been a growing body of literature on various dimensions of gender and fisheries, and increased attention from fisheries and development organizations and initiatives around the world (e.g., United Nations Food and Agriculture Organization, The Asian Fisheries Society, The International Collective in Support of Fishworkers, The Pacific Community, Too Big to Ignore).

While much of the early work on gender and fisheries focused on rich qualitative descriptions of women's roles in fishing communities, often in the social sciences literature, recent work has expanded on this to also quantify contributions by women in terms of total catch, value to the economy, household food, income, and nutritional security and employment (Kronen and Vunisea 2009; Harper *et al.* 2013; Hauzer *et al.* 2013; Zhao *et al.* 2013; Kleiber *et al.* 2014; Fröcklin *et al.* 2014; Thorpe *et al.* 2014). Quantitative assessments such as these are rare but crucial in highlighting important and potentially overlooked social and economic contributions by women in fisheries in addition to identifying gender inequalities and policy priorities. At present, we may be underestimating the size and economic value of the fishing industry globally by overlooking these contributions by women.

Although there is increasing attention being given to gender dimensions of fisheries at the international level in various reports and initiatives that identify gender as an important variable in understanding food and livelihood security and as a critical entry point for interventions to improve these (FAO 2013, 2014a; HLPE 2014; Monfort 2015), women continue to be marginalized in access to and control over fisheries resources in many countries and contexts (Matthews *et al.* 2012; Thorpe *et al.* 2014). An overall lack of attention to gender dimensions in fisheries policy and management may be compromising the outcomes of valuable efforts to rebuild fisheries and to improve the livelihoods and wellbeing of all those in fishing communities, for example, by overlooking habitats and species fished by women as well as the contributions these make to household food and nutritional security (Weeratunge *et al.* 2010; Hauzer *et al.* 2013; Kleiber *et al.* 2014).

Gender inequality in fisheries is embedded within a broader context of the marginality of fisher people worldwide (Pauly 2006); thus fishers, especially small-scale fishers, are often excluded from policy and decision-making processes (Allison and Horemans 2005; Weeratunge *et al.* 2014). The invisibility of many fisheries workers and the focus on production of large-scale commercial subsectors cause investigators to overlook many important social and economic dimensions of the fisheries sector and to ignore the needs of many of its workers (Williams *et al.* 2012). Developing more inclusive and representative management processes and policies in fisheries first requires identifying all those involved (i.e., men and women), across all fisheries subsectors and throughout the full length of the fish value chain. Only then can we start to tackle gender inequalities in the fisheries sector and to contribute to more equitable and sustainable fisheries.

This study takes an in-depth look at gender dimensions of fisheries through country-level statistics for Mexico, Peru, Senegal, South Africa, and Vietnam. These countries were selected as they each have extensive marine fisheries that contribute significantly to national and household food and income security. They represent geographic diversity as they are located in five different United Nations' geographic subregions on three continents (United Nations 2014) and represent various levels of socio-economic development, from High (Mexico and Peru) to Medium (South Africa and Vietnam) and Low (Senegal) on the Human Development Index (United Nations Development Programmme 2015). Together, these countries comprise 14% of the total global catch and 8% of the total global landed value from fisheries (Pauly and Zeller 2016b). They also represent a wide variety of governance contexts as represented by Government Effectiveness Indicators that range from -0.4 for Senegal to 0.3 for South Africa (World Bank 2016). While some social and economic aspects of fisheries in these countries have been highlighted (Sumaila *et al.* 2007; Dyck and Sumaila 2010; Cisneros-Montemayor *et al.* 2013), gender dimensions have received much less attention. Based on existing case studies, available statistics, and consultation with local experts, here I summarize the status of women in the fishing industry of these five countries. I also take a critical look at the quality of information for each country and whether this information is appropriate for developing gender-sensitive fisheries policies.

3.2 Approach and limitations

To better understand the gender dimension of fisheries in the five countries studied and to identify blind spots and inaccurate measurement of economic activity, information was gathered systematically through online searches in directories and databases related to gender and/or

fisheries. Sources ranged from peer-reviewed articles to grey literature, including reports, data, and expert knowledge from governmental, non-governmental, and media sources. Primary literature was identified through searching Google Scholar, Aquatic Sciences and Fisheries Abstracts, and Web of Science databases using the search terms, 'gender' or 'women' AND 'fisheries', 'fishing' or 'gleaning' AND '[Country X]' in English and in the primary language for that country, if not English. Other online sources consulted include publications from the International Collective in Support of Fishworkers (ICSF), the Pacific Community (SPC), and the Gender in Aquaculture and Fisheries group of the Asian Fisheries Society (AFS). In relying on existing data sources, rather than engaging in primary, on-the-ground, data collection, this work has many limitations related to a lack of standardized data, incomplete sources (i.e., reflecting only a portion of the sector), and potentially gender-biased data collection (i.e., roles and participation by women under-estimated due to survey methods and assumptions), which introduce considerable uncertainty into these estimates. Insights and findings from this exercise must be interpreted with these limitations in mind.

All sources identified for this chapter were reviewed for both quantitative and qualitative information on gender roles and participation in fisheries and in contributions to food and livelihood security, decision-making, and policy dimensions. Where sources were in another language, Google Translate was used and/or the help of a person fluent in the language was sought. Information was also sought from local experts that were identified through existing fisheries contacts and/or relevant publications. Interviews were conducted over the phone, via skype or by email, and in person with fisheries researchers, government officials, and/or people working for non-governmental organizations to gain additional perspectives on gender roles in

the fisheries sector of the five countries. Interviews were conducted under the approval of the University of British Columbia's Behavioural Ethics Board (ID: H14-01334).

3.3 Gender dimensions of fisheries in five countries

In many cultures and countries around the world, fishing is closely linked to the expression of masculinity, which Branch and Kleiber (2017) highlight perpetuates the assumption that fishing is an activity done only by men. While there is considerable evidence to dispel this assumption, social norms and values in many cultures influence gender roles in fishing households and communities, with men involved in certain activities while women participate in others. With increasing policy attention to gender dimensions of fisheries, there is an urgent need for country-level gender-disaggregated data in fisheries. And while a focus on gender includes both men and women, it is the often unrepresented and unmeasured role of women that this chapter attempts to bring to light while also addressing deficiencies in gender-relevant data. In this section, I highlight women in the fisheries of five maritime fishing countries (summarized in Table 3.1), with specific attention to participation by women in fisheries activities and decision-making. Also, I identify gaps in the availability of gender-relevant data for each country and include gender specific measures in fisheries policy (summarized in Table 3.2).

Table 3.1 Fisheries sector participation by women in Mexico, Peru, Senegal, South Africa and Vietnam, in fishing and fishing-related activities and the associated percentage of total fisheries participation.

Country	Participation by women						
	Fishing	%	Fisheries-related[a]	%	Total	%	Decision-making
Mexico	300[b]	<1	10,300	52	10,600	7	Minimal[e]
Peru	1,350	2	77,600	47	78,950	33	Minimal
Senegal	1,350	1	36,000	90	37,350	23	Moderate[f]
South Africa	5,850	13[c]	18,900	63[d]	24,750	32	Minimal[g]
Vietnam	40,000	4	784,000	65	824,000	37	Minimal

Notes: [a] fisheries-related work included mostly processing and marketing; [b]small-scale cockle fishers only; [c]includes small-scale fisheries only; [d]processing only; [e]some women's organizations; [f]moderate representation in fisheries organizations, < 5% in fisheries governing bodies; [g] some evidence of increasing female representation.

3.3.1 Mexico

In Mexico, fishing is culturally constructed as masculine work; however, many women are involved throughout the fish value chain, with the seafood industry relying heavily on temporary, part-time, and low-cost processing labour provided by women (Salazar and Castañeda 2002). A recent national census report suggested that approximately 10,500 women participate in fisheries in Mexico, mainly in processing and trade, representing 7% of total participation in fisheries (INEGI 2011). This same report suggested a substantial increase in female participation in fisheries compared to a census conducted a decade prior but provided no detail as to which subsectors have increased or why. In terms of particular sectors and activities, specific case-studies have highlighted the harvest of invertebrates by women (Mackenzie 2001; Valdez-Gardea 2001). However, Mackenzie (2001) was the only study found that attempted to quantify the number of women involved. Given Mexico's extensive coastline and dependence on marine resources by coastal communities, there are likely many more women involved in fisheries than are highlighted in the estimates presented here. Therefore, these estimates are considered very conservative, should be treated as minimal, and substantial efforts are needed to improve upon

them to reflect a more realistic picture. Regional studies highlighting post-harvest activities indicated that women represent 50% of seafood processors in Mexico's Yucatan Peninsula (Salazar and Castañeda 2002) and 65% of squid processors in Mexico's Santa Rosalia on the Baja California Peninsula (Soares *et al.* 2005), but country-wide estimates of female participation in the capture and processing of fish and invertebrates were not readily available.

Table 3.2 Availability of gender-relevant indicators for fisheries and the inclusion of gender measures in fisheries policy for Mexico, Peru, Senegal, South Africa, and Vietnam.

Indicator	**Mexico**	**Peru**	**Senegal**	**S. Africa**	**Vietnam**
Fishing activities	Limited[a]	Yes	Yes	Yes	Limited
Fishing-related	Limited	Yes	Limited	Limited	Limited
Decision-making	Limited	No	Limited	Limited	Limited
Target species/habitat	Limited	Yes	Yes	Yes	Limited
Catches	No	No	Yes	No	No
Gears	No	Yes	No	Limited	No
Gender in fisheries policy	No	No	No	Yes	No

Notes: [a]Data were considered limited if source lacked detail, was not comprehensive (i.e., inclusive of all sectors/entire country), was > 10 years old, and/or was from grey literature.

Details on participation by women in decision-making were also scarce. Some limited evidence suggests that women are becoming increasingly involved in fisheries committees or forming their own cooperatives and unions in some regions, but progress has been slow (Salazar and Castañeda 2002; Cruz-Torres 2004). One study indicated that women represent less than 3% of partners in the El Botadero Oyster Cooperative, despite their prominent role as processors (Pérez-Brito *et al.* 2012). In many cooperatives in Mexico, women may become cooperative members only if they are widowed and without a son over the age of 18, but are not guaranteed entry and rarely hold leadership positions (Salazar and Castañeda 2002; Pérez-Brito *et al.* 2012), which may restrict women's access to financial resources (e.g., credit and loans offered only

through cooperatives), and the benefits they can derive from fisheries. However, in some cases women have formed their own cooperatives, such as the women crab processors of Tabasco (Salazar and Castañeda 2002), the Mujeres Trabajadoras del Mar Cooperative of the Yucatan peninsula (Godoy 2011), the women shrimp vendors of Sinaloa (Cruz-Torres 2004), and La Cooperativa Mujeres del Golfo of the Peninsula of Baja California (Comunidad y Biodiversidad 2016). In these cases, women organized themselves in order to increase their political and economic power within the community and as a support network for activities that are often met with resistance. These organizations also provide a forum for women to contribute to discussions over pressing issues, such as food security and climate change. For women shrimp traders of Sinaloa, Mexico, their role as marketers was only formally recognized after a long struggle to gain legal rights to sell their shrimp and to form a union (Cruz-Torres 2004). When women first started selling shrimp in this region, their activities were discouraged and considered illegal. Through their collective action, persistence and resistance, the women were able to establish their own space within a strongly male-dominated industry (Cruz-Torres 2012). The issue here, as elsewhere, is not only gender equality per se but simple economic efficiency.

In terms of national fisheries policy, gender is not explicitly addressed. However, there is growing recognition of the need for fisheries policy reform in Mexico (Cisneros-Montemayor *et al.* 2013) and, if acted upon, this may create not only an opportunity for bringing in gender measures but also a more accurate measure of economic activity. Still, policy reform alone will not necessarily guarantee more equitable fisheries. As highlighted by the women shrimp traders of Sinaloa, it is also through women's collective action and agency that cultural and institutional change occurs. Therefore, efforts to promote gender equality in fisheries should focus on

reforming discriminatory laws and gender-blind policies, while simultaneously encouraging women to develop their own voice and leadership skills to encourage more meaningful inclusion in fisheries decision-making.

3.3.2 Peru

In Peru, fishing is typically considered a male occupation—in part because fishing at sea is dominated by men but also because it is socially and culturally considered a male domain (Delgado-Gustavson 2011). However, the ability of fishermen to engage in fishing relies heavily on the unpaid work that women perform to maintain the household and community networks, although this work is rarely valued or recognized (Delgado-Gustavson 2011). A recent census revealed that, despite being considered an exclusively male occupation, approximately 1,350 artisanal fishers are women (representing just over 3% of estimated artisanal fishers) and another 2,050 women are identified in the census as artisanal vessel owners (Instituto Nacional de Estadística e Informática 2012). The census also included sex-disaggregated data on species targeted and gear used by men and women. Previously, fishing activities by women had only been mentioned briefly (Garcia 2000; Silva 2000). The many more women involved in fisheries-related activities, notably in the processing and retail subsectors, were highlighted in a recent Peruvian fisheries value chain study by Christensen *et al.* (2014), which revealed that approximately 75,600 out of 232,400 marine capture fisheries-related jobs are held by women.

Participation by women in decision-making aspects of fisheries is not well documented for Peru. In general, fishermen's organizations do not include women in their management councils (Garcia 2000). Participation by women in seafood processing trade unions is low, in part

because women fear losing their jobs by becoming involved in collective bargaining (Piedra 2008). However, information on this aspect of the fisheries sector is not adequately described.

In the policy realm, the Peruvian fisheries sector does not specifically address women or gender (Delgado-Gustavson 2011) despite national legislation in place to promote gender equality across all sectors (i.e., Law of Equal Opportunities between Women and Men, enacted in 2007; [FAO 2015]) and new departments established to promote and to strengthen gender equality (Ministerio de la Mujer y Poblaciones Vulnerables 2016). However, in 2012, the first national census of artisanal fishers was conducted by the Ministry of Production (PRODUCE) and the National Institute of Statistics and Informatics (INEI), which interviewed men and women in the artisanal fisheries sector to better understand social and economic attributes of this sector (Instituto Nacional de Estadística e Informática 2012). The census marked an important step in highlighting gender dimensions of fisheries in Peru, even though this was not a specific aim of the study. A more recent study conducted by the Food and Agriculture Organization of the United Nations further investigates the role of women in fisheries and aquaculture in Peru, with recommendations for improving participation by women and promoting gender equality (FAO 2015).

3.3.3 Senegal

In Senegal, men go out to sea to fish; women receive the catch as it arrives onshore and control much of the post-harvest portion of the fish value chain (Soumare 2006). Most of the literature highlighting women in Senegalese fisheries has focused on post-harvest activities, where an estimated 90% of seafood processors (approximately 36,000) are women (Deme *et al.* 2012).

However, women are also involved in the direct capture of invertebrates from shore for subsistence and/or artisanal purposes (Grandcolas 1997; Walter 2006). A recent study suggests that an estimated 1,350 women are involved in these activities (Belhabib *et al.* 2014), contributing an estimated 10,000 tonnes per year to the total national catch, valued as 30.5 million 2015 constant USD based on average ex-vessel prices for shellfish in Senegal (Swartz *et al.* 2012). While this portion of the catch taken by women represents only 8% of the total landed value of the domestic Senegalese marine fisheries catch (Belhabib *et al.* 2014), it makes important social and economic contributions beyond the direct landed value, such as providing nutritionally dense foods to a region with growing food insecurity and supplying the funds to send children to school (Williams 2000; Hall-Arber 2012).

Gender inequalities in the fisheries sector have been highlighted through the work of development organizations, such as USAID and others, that have identified some of the challenges that women in this sector face, e.g., lack of access to institutional credit, lack of access to infrastructure for preservation, storage, and transfer of products, fees to access markets, and the administrative difficulties in obtaining licenses to trade (Wade *et al.* 1997). Other reports have highlighted a recent trend in Senegal, but also described elsewhere, of relocating fish processing facilities away from landing sites, which disproportionately impacts women as it can substantially increase transportation distances and costs (ICSF 2002; HLPE 2014). Women in Senegal are also being adversely affected by the increase in technologically-advanced processing facilities (often foreign owned) that provide work for far fewer women than traditional processing activities (Carr and Chen 2004) and that compete with traditional processors (mostly women) for access to fish (Gueye 2016). This shift towards a global seafood market has

potentially significant implications for women who have traditionally dominated small-scale fish processing and trade for local markets. With fish being increasingly processed and shipped abroad, women fish processors and traders have taken a considerable financial hit because they are often unable to access these markets to sell their fish (Wade, Faye, and Korsrud 1997). However, more work is needed to understand the gendered implication of these changes and what policies might be implemented to mitigate them.

Fisheries policy in Senegal remains weak on gender-specific measures. Furthermore, Senegal's new Fisheries Act (adopted in July 2015) does not address major deficiencies in processing infrastructure, which is of direct importance to fish processors who are predominantly women. While women fish processors and traders may benefit indirectly from new policy measures to curb illegal fishing (e.g., by increasing the supply of artisanal fish and/or lowering prices), there are no specific measures in the new policy that address women or gender directly (APRAPAM 2015). At a recent fisheries workshop in Joal, Senegal, conducted by the Living Oceans Foundation and the *Sea Around Us*, over 80% of the attendees were women, mainly processors, who raised many important concerns including the lack of funding for processing facility upgrades (D. Belhabib, pers. comm., March 15, 2016). Although women are clearly important stakeholders in the fisheries sector, and are engaged in discussions on key fisheries issues, they represent less than 5% of fisheries' governing bodies (Coastal Resources Center 2016). Efforts are therefore needed to involve more women in decision-making aspects of fisheries to ensure that their concerns are addressed and that their contributions recognized.

3.3.4 South Africa

Fisheries in South Africa were historically characterized by a sharp division of labour with women involved in pre- and post-harvest activities while men went out to sea, but these gender roles have started to shift with changes to fishing policies (permitting and rights allocation), mechanization, and declining fish stocks (Swartz 2013). Today, both men and women in South Africa are involved in various fishing and fishing-related activities but data describing participation in these activities are limited. The only available quantitative estimates of participation in fishing activities, disaggregated by sex, suggest that approximately 25,000 women are involved in fisheries as processing factory workers (Jeebhay *et al.* 2008) and small-scale fishers (Branch *et al.* 2002), which together represent 32% of total fisheries sector participation. Many more studies provide qualitative descriptions of participation by women in small-scale fishing activities including some detail on species targeted (Kyle *et al.* 1997; Sunde 2002; Harris *et al.* 2003; Groenmeyer 2011; Velile Jiyane and Fairer-Wessels 2012; Emdon 2013; Swartz 2013). In the processing subsector, research on the gendered impacts of changes in the processing sector in South Africa found that the market transition from processed to live rock lobster has had a disproportionately negative impact on women, who now receive far fewer of the direct benefits from this resource via income from value-added processing activities (Sunde 2010; Rohe 2012).

Information on participation by women in fisheries decision-making was not widely available for South Africa. Some regional information suggests that women are becoming increasingly involved in fisheries' committees in some fishing communities in the Eastern Cape and KwaZulu Natal Provinces (J. Sunde, pers. comm., March 25, 2014). While evidence suggests that

participation by women in fisheries management and decision-making may be increasing, the depth of their involvement and influence has yet to be understood.

South Africa has made some progress on the inclusion of gender equality measures in fisheries policy. This progress has largely been the result of a several-decade-long struggle to bring about greater equitability to the fisheries sector, especially the small-scale subsector. In 1998, the Marine Living Resources Act (MLRA) was introduced in South Africa following the election of South Africa's first democratic government and the end of Apartheid (Sunde 2010), with the aim to provide more equitable fisheries access and benefits; however, for many small-scale fishers, the result was further exclusion and disempowerment (Isaacs *et al.* 2007). The new fisheries management system and rights allocation process did not provide adequate measures to protect the fishing rights, food security, and livelihoods of small-scale fishers (Sowman and Cardoso 2010), further entrenching certain pre-apartheid inequalities and creating additional barriers to resource access, especially for those who were already economically disadvantaged. These policy changes created new tensions between men and women as they negotiated reduced access to fisheries resources in the face of poverty, drug abuse, violence, and food and livelihood insecurity (Isaacs 2013). These policies also failed to address gender disparities, with women being subject to continued discrimination in their abilities to access and benefit from fisheries resources (Sunde 2010). However, in June 2012, after over a decade of lobbying the South African government for a policy that would better promote poverty alleviation, food security, and gender equity (Masifundise Development Trust 2010), a small-scale fisheries policy that includes a specific section on gender was adopted. This newly-adopted fisheries policy marks an important step forward in terms of gender mainstreaming in the fisheries sector as it recognizes

the important role of women in fisheries and outlines gender-specific measures, such as promoting the economic empowerment of women and reducing inequalities in access to marine resources and the benefits derived from them (Commonwealth of Australia 2012). While small-scale fisheries policy reform in South Africa created an opportunity for bringing gender considerations into focus, it may be some time before these measures are implemented and any real progress is made.

3.3.5 Vietnam

Fishing households in Vietnam are characterized by a gendered division of labour, with men going out to sea to fish while women engage in selling and processing fish (World Bank 2005). Participation in the fisheries sector of Vietnam is estimated at 4.7 million workers with an estimated 825,000 of these workers being women (Than Thi Hien 2008). There is some evidence that women are involved in marine capture fisheries (e.g., fishing from boats in lagoons and collecting invertebrates by foot from shore) (World Bank 2005; Lentisco and Phuong Thao 2013); however, these activities are not well documented in terms of species and habitats targeted and gear used. Women have been observed in Halong Bay, Vietnam, fishing for crabs alongside men, providing further evidence for their involvement in fishing (M. Stiles, pers. comm. September 24, 2014). Looking at participation in fishing-related activities, several sources indicate that women are heavily involved in processing, with approximately 80-85% of seafood processors being women (World Bank 2005; Than Thi Hien 2008; Matthews *et al.* 2012). Hien (2008) estimates that roughly 40,000 women are involved in marine capture fishing and as many as 784,000 are involved in the post-harvest sector.

In terms of participation in decision-making, the role of women is not well described. However, the United Nations Regional Fisheries Livelihoods Programme (RFLP) has been actively engaged in improving participation by women in fisheries decision-making in Vietnam and has reported some notable progress (Lentisco and Phuong Thao 2013).

Fisheries management and policy in Vietnam does not appear to specifically address gender, despite gender measures being implemented in other government regulated sectors (Ha Thi Khiet 2007). The Law on Gender Equality, adopted in 2006, provided legal impetus for promoting gender equality in politics, the economy, education, and health in Vietnam but did not explicitly mention fisheries. The Labour Code, which was revised in 2006, improved conditions for women in the labour market, but gender gaps persist in areas, such as education, employment, healthcare, and rural sectors, including fisheries (Hue 2008; Thinh 2009). Although the Ministry of Agriculture and Rural Development has an overall gender balance strategy, within the Directorate of Fisheries, only the aquaculture subsector includes a specific action plan on gender equality (Thi Hoa Hong Nguyen, pers. comm., April 14, 2014).

3.4 Discussion

Both men and women in Mexico, Peru, Senegal, South Africa, and Vietnam are involved in the fisheries sector. However, in these countries, large-scale, boat-based fisheries are dominated by men, whereas participation by women is concentrated in post-harvest activities (e.g., large- and small-scale processing and marketing) and, to a lesser extent, small-scale capture fisheries (mainly the collection of invertebrates from shore). Although none of the five countries had sex-disaggregated national fisheries participation data spanning all subsectors, our in-depth search of

existing literature and information revealed that women participate substantially in fisheries. The estimates presented here represent data that was accessible and collated at a national level. There is substantial uncertainty associated with these estimates, and efforts must be made within each of these contexts to improve sex-disaggregated data collection. The estimates synthesized here are predominantly drawn from employment statistics and census data that often overlook part-time and informal work. Only when studies were available that specifically accounted for subsistence fisheries, and the contributions by women, such as for Senegal (Belhabib *et al.* 2014), were they explicitly included in estimates of fishing participation. Peru was the only country with national fisheries census data that included sex-disaggregated data on number of fishers, target species and gear types. Senegal was also the only one of the five countries with national-level information on the volume and associated value of catches taken by women. Fishing participation estimates for South Africa were from a small-scale fisheries study conducted by Branch *et al.* (2002), while species information was presented in several studies on specific regions or fisheries. The only available estimate of participation by women in South Africa's seafood processing sector was from a health study conducted almost a decade ago. The quality of information for participation by women in Vietnam`s fisheries sector was likely the weakest of the five countries. Quantitative estimates were from the Centre for Marinelife Conservation and Community Development but details on how these estimates were derived were not readily available (Than Thi Hien 2008), whereas estimates for Peru were based on a recent, detailed, peer-review value chain study (Christensen *et al.* 2014) and National census data (Instituto Nacional de Estadística e Informática 2012). Overall, I found that up-to-date, quantitative information on women's fishing activities with the level of detail necessary for developing gender-sensitive fisheries policies was very limited for all of these countries, with the

exception of Peru. However, it should be noted that even where sex-disaggregated data are presented, biased data collection methods can severely under-estimate participation by women in fisheries, especially in those informal and unpaid activities where women often dominate.

Estimates of participation in fisheries-related activities in all five countries included mainly processing and retail activities, overlooking the many additional activities that women undertake to support fishing families and operations, such as bookkeeping, gear repairs, and provisioning for fishing trips. While these informal contributions are highlighted in some cases through qualitative descriptions (Garcia 2000; Silva 2000; Valdez-Gardea 2001; Pérez-Brito *et al.* 2012), they are much more difficult to quantify. Therefore, the numbers presented here (and summarized in Table 3.1), most certainly underestimate women's total labour contributions to fisheries and related sectors.

While efforts need to be made to recognize the contributions women make to fishing communities and the local economy, efforts are equally needed to increase the participation by women in management and decision-making. The above estimates of participation by women in the fisheries sector and associated qualitative descriptions of gender roles and contributions indicate that women are important stakeholders in the fisheries sector of these five countries but are under-represented in fisheries management and decision-making. None of the five countries had comprehensive nation-wide estimates of participation by women in fisheries management or decision-making. Increasing the involvement of women in fisheries cooperatives, unions, and management will help promote issues particular to women in the sector and will increase the numbers of women in leadership positions. With the increased involvement of women,

management outcomes and initiatives could also improve by including a more diverse set of perspectives. The gender specific roles and spaces highlighted here can contribute to gender specific understandings of fisheries systems. The knowledge and experience of women who are gleaners, processors, and traders in the fisheries sector bring different but equally valuable knowledge and perspectives that are critically important for addressing increasingly complex fisheries management challenges. Women's perspectives on changes to the intertidal habitats where they glean provide valuable insights on the impacts of climate change, and understanding the social, economic, and ecological dimensions of women's roles in these spaces is important for developing mitigation strategies (Thomas *et al.* 2018). The examples presented in this chapter also provide important insights for conservation organizations that are increasingly acknowledging that the success of their programs hinge upon understanding the social and economic circumstances that are deeply embedded in environmental struggles around the world.

Programs aimed at improving the livelihoods and wellbeing of fishers and their families must acknowledge the roles (formal and informal) that both women and men play in the fisheries sector and identify the intersecting social, economic, and institutional factors that disadvantage some groups, and especially women, in these contexts. For example, government transfers to support fishers (a.k.a. fisheries subsidies), while often well-intended to improve food and livelihood security in developing country contexts, may have gender-differentiated outcomes which must be identified at the outset (Harper and Sumaila 2019). Likewise, fisheries subsidy reform must consider the implications for both men and women in the fisheries sector, in primary and secondary activities. In terms of climate adaptation strategies, understanding gendered roles and responsibilities in coastal fisheries are critical to mitigating impacts and developing solutions

that benefit men, women and children in the most vulnerable regions. With increasing evidence of the vital but often overlooked role of women in fisheries and the economy, and as fisheries management incorporates more socially explicit goals with greater emphasis on equality, gender considerations may finally gain the momentum necessary to become fully mainstreamed. This is increasingly being emphasized at both the international level through various policy instruments and at the local level where gender equality is recognized as critical to building resilience in coastal communities (Fröcklin *et al.* 2014). However, a major impediment to developing gender sensitive policies and programs continues to be the lack of quantitative data. To advance such policies, all countries must routinely collect and disseminate comprehensive sex-disaggregated data for all fisheries subsectors. To make this possible, capacity for collecting sex-disaggregated data must also be addressed. This includes dedicated funding and training for the collection of data that overcome existing limitations and biases and not reproducing existing assumptions about fisheries being an exclusively male domain.

Despite the increased emphasis on gender equality at the national level across various sectors, fisheries policy in these five countries has been relatively slow in taking up gender measures, except for South Africa where notable progress has been made. Fisheries policy reform that targets equity and pays greater attention to small-scale fisheries provides one possible entry-point for adopting more gender sensitive fisheries policies. However, as the example of South Africa shows, such reforms take time and face challenges and resistance.

Several decades after valuable contributions by women in fisheries started to be acknowledged, gender measures are finally making their way into fisheries policy at the international level

(World Bank 2010; FAO 2013; Monfort 2015). For example, many countries around the world recently endorsed the international guidelines for securing sustainable small-scale fisheries, developed by the Food and Agriculture Organization's Committee on Fisheries (COFI) in consultation with civil society (Jentoft 2014), which includes gender equality as a cross-cutting principle (FAO 2014b). While these are voluntary guidelines, and not all fishing countries are in support of them, they put pressure on countries to address gender inequalities in the fisheries sector. With gender equality prominently featured in the United Nation's Sustainable Development Goals (United Nations 2016), the many countries that have committed to these goals will have an even greater responsibility to address gender inequalities in all sectors of the economy, including fisheries. However, as this chapter reveals, for five major fishing countries, the necessary data for advancing these goals with respect to gender equality and fisheries is currently insufficient.

3.5 Conclusion

Bringing to light the contributions by women in fisheries and highlighting gender inequalities in this sector must be integrated into fisheries management and policy to align with international efforts towards sustainable fisheries and development. While there is considerable evidence from the five countries explored here to suggest that women participate significantly in the fisheries sector and that gender inequalities exist, this information is limited in scope and depth with much more detailed data needed to identify gender gaps and to develop policy measures to close them. Although some important progress has been made very recently on developing gender-sensitive fisheries policies and programs in certain countries and contexts, much still needs to be done to address gender inequalities in the fisheries sector and to promote the social and economic

wellbeing of men and women in fishing communities around the world. To start, substantial efforts and enhanced capacity are urgently needed for the collection and dissemination of sex-disaggregated data on fisheries sector employment, income, catch, and revenue. I begin this process by collating what currently exists and by identifying the many gaps that need to be filled for a more accurate picture of fisheries economies and seascapes worldwide.

Chapter 4: Counting women: estimating the contributions by women in small-scale marine capture fisheries production to the global economy

4.1 Introduction

Marine capture fisheries provide food, income, and livelihoods to millions of people globally (Andrew *et al.* 2007; Teh and Sumaila 2013). While it is recognized that some of the most vulnerable and marginalized people in society rely the most on fisheries resources, the understanding of how fisheries (or changes to fisheries) affect these people is limited (Allison and Ellis 2001; Andrew *et al.* 2007). The role of women in fisheries has lacked particular focus, and until recently, gender considerations have been largely overlooked in fisheries programs and policy developments (Weeratunge *et al.* 2010; Harper *et al.* 2013; FAO 2013; 2014b). Several recent high level fisheries reports and policy instruments outline gender equality as an integral component of efforts to secure coastal livelihoods and the wellbeing of men and women in fishing communities around the world (Matthews *et al.* 2012; FAO 2014b; HLPE 2014); however, a lack of standardized data and metrics is a major constraint in terms of both making and assessing progress. This study aims to contribute new insights and data for improving the visibility of women in the fishing industry and in the related economy as part of a broader effort to improve sex-disaggregated fisheries data and to promote gender equality across the fisheries sector and beyond.

Building resilience in rural coastal communities in the face of global economic and environmental change requires acknowledging the role and contributions of all those involved in

marine resource related economies, including women. As fisheries policy and governance are increasingly addressing the human dimensions of marine resource use and the interdependent nature of social and ecological systems (Hall-Arber *et al.* 2009), understanding the role of women and gender in these systems is crucial for developing effective policies and programs that strike a balance between the sustainability of fisheries resources and the viability of fishing communities (Berkes 2015).

4.1.1 Missing women

> *"The lack of acknowledgement of women's fishing participation or of the significant contribution to the livelihoods of coastal people is due, in part, to the non-remuneration of their fishing activities. The lack of data and appropriate economic valuation of subsistence fisheries result in women's fishing activities not being included in most official statistics. Women's small-scale economic activities are also not seen as independent economic ventures, for in most cases, their marketing participation is viewed as part of their daily chores of meeting family needs"*(Vunisea 2004, p.1).

Fishing has long been considered a male domain, i.e., it is often assumed for social, cultural, and religious reasons that women do not participate in fishing activities. Fisheries' data collection and management efforts have typically focused on large-scale commercial fisheries, paying much less attention to small-scale fishing activities, especially those for home consumption (i.e., subsistence), and particularly, those where small fish and invertebrates are collected from shore, also known as 'gleaning' (Kleiber *et al.* 2015; Fröcklin *et al.* 2014). These activities are often not

perceived as ‘fishing’, and the people involved may not refer to themselves as ‘fishers/ fishermen/ fisherwomen’, making survey design difficult if these activities are to be accounted for (Hanazaki *et al.* 2013). This is particularly the case for shellfish harvesting, which is often overlooked as fisheries production. For example, a fisheries scientist, Daniel Pauly, recounts his experience working in the Philippines in the 1990s, where on regular visits to Batangas Bay, South of Manila, he did not recognize that the women and children scattered along the reef flats were, in fact, collecting shellfish to bring home to eat. It was not until reading about women’s gleaning activities in Chapman (1987) that he made that connection. Recent studies have calculated how productive, despite their invisibility, these activities can be in terms of volume of catch relative to men’s fishing activities (Harper *et al.* 2013, 2017; Fröcklin *et al.* 2013; Kleiber *et al.* 2014). This perception bias, even by trained practitioners, continues today with the collection of shellfish, often by women and children, going unnoticed by fisheries scientists, managers and policy-makers. While there have been increasing efforts to highlight these contributions with the work of WorldFish (www.worldfishcenter.org/), Gender in Fisheries and Aquaculture (www.genderaquafish.org), The Pacific Community (https://www.spc.int/), The United Nation Food and Agriculture Organization (www.fao.org/fishery/topic/16605/en), and the International Collective in Support of Fishworkers (www.icsf.net/) and many other organizations at the local level as major drivers of and contributors to these efforts, much still needs to be done to adequately recognize the contributions by women in fisheries globally.

Many qualitative accounts of cultures and contexts around the world describe the participation by women in generating fisheries catches (although perhaps not identified as such), but these are often not reflected in fisheries’ employment statistics and census data. However, fishing is a

social activity, embedded within the economy at multiple scales, which is bound to cast a 'shadow' on the surrounding economy (Pauly 1998). Thus, it will also generate evidence to describe the participation by women in the fisheries sector. In this study, I dive into the literature, drawing on a wide variety of data sources, and I consult with researchers working in various fisheries contexts to better understand the contributions by women in fisheries on a global scale, and specifically, quantitatively, highlight these contributions in terms of food and livelihood security.

4.1.2 Food and livelihood security

Small-scale fisheries, where women are more likely to participate, generate catches which have been substantially under-estimated in many countries of the world (Belhabib *et al.* 2013; Cisneros-Montemayor *et al.* 2013; Harper *et al.* 2014; Zeller *et al.* 2015). Invertebrate fisheries, in particular, which are often dominated by women, are notoriously data-poor, with catch estimates missing from national datasets (Vincent and Harris 2014). Overlooking these contributions by women adds to the marginalization of small-scale fishers and fisheries, and although this subsector provides food and livelihoods to millions of people globally (Pauly 2006), it receives far fewer government supports or management attention as industrial sectors (Jacquet and Pauly 2008; Schuhbauer *et al.* 2017). Therefore, highlighting the marine fisheries catches taken by women in small-scale fishing activities and their associated economic value will bring greater recognition not only to women in fisheries and to issues of gender equality but also will provide more comprehensive accounting in fisheries by including all fisheries actors, activities, and subsectors, with an emphasis on the contributions these make to food and livelihood security. Accounting for these contributions is not only important for women and

gender equality but for the wellbeing of families, children, and future generations, and for the ecological systems that support them (Kleiber *et al.* 2015).

In this study, I present a global assessment of the contributions by women to small-scale fisheries catches and the landed value associated with these catches. The following section describes how I approached this work.

4.2 Methods

To begin the task of estimating the contributions by women in small-scale fishing activities for all maritime countries of the world, I selected a global subset of countries using national fisheries catch value data provided by the *Sea Around Us* (www.searoundus.org). Dividing the globe into geographic subregions (United Nations Statistics Division 2018), I then selected the top three maritime countries by small-scale fisheries catch value (i.e., landed value of both artisanal and subsistence catches) for each of the 21 subregions of the world, which resulted in a sample size of 62 countries (note that Southern Africa as a subregion includes only two countries). This subset included both data-rich and data-poor countries with respect to gender data, and together these 62 countries represent 83% of the global landed value of small-scale fisheries catches, thus capturing the majority of the small-scale fishing activity globally. The synthesis of data focused on this subset of countries, which were then used as the basis for developing indicators for all maritime fishing countries of the world (See Appendix B for data sources, estimates, and assumptions for each of the 62 countries identified).

Small-scale fishing activities, considered here, include fishing, collecting, gleaning and/or harvesting of wild fish and invertebrates (as opposed to farmed, ranched, or aquaculture/mariculture-raised species) from boat or shore, using a range of gear or by hand, for sale (artisanal subsector) or for home consumption (subsistence subsector; FAO 2014b; Zeller *et al.* 2015; Gibson and Sumaila 2017). Recreational fisheries were not included (at least not explicitly). Fishing from boats or operating as a crew onboard a fishing vessel were both included under the category of fishing. The definition of small-scale fisheries varies considerably between countries and regions (Chuenpagdee *et al.* 2006), so for the purposes of this work, the data correspond to each country's definition of small-scale fisheries.

4.2.1 Female participation rates

To estimate participation by women in small-scale fishing activities at the national-level, I used a step-wise approach (Figure 4.1). The first step was to find evidence, either qualitative or quantitative, of women fishing in each of the 62 countries of the global subset. This search for country-specific data included a review of catch reconstruction reports and publications by the *Sea Around Us* (www.seaaroundus.org; [Pauly and Zeller 2016 a,b]) and associated contacts, from primary and/or grey literature sources, and interviews with local experts. For each country, a female participation rate was calculated based on the number of women participating in small-scale fishing activities divided by the total number of participants in small-scale fishing activities. Data sources varied from small-scale fisheries censes to employment statistics, health studies, and socio-economic surveys (See Appendix B for country-specific data sources, estimates and assumptions). Due to a substantial range in the quality and type of data sources available, I was unable to standardize these data to full-time equivalents as is usually done to

calculate and compare employment numbers and rates across a variety of contexts. Female participation rates were then applied to total fisheries employment numbers presented by Teh and Sumaila (2013), which provide comprehensive fisheries employment estimates, including small-scale and informal fishing and related activities that are often not captured by national statistics, and were inclusive of both men and women, but not disaggregated by sex. In cases where there were multiple, differing estimates of female participation for a given country, the decision about which source to use was based on several factors including the quality of the source (i.e. higher priority was given to peer-reviewed sources), the date of the estimate (i.e. more recent sources were given priority) and extent of coverage (i.e. national level estimates, that included a range of fisheries-related activities and subsectors were prioritized).

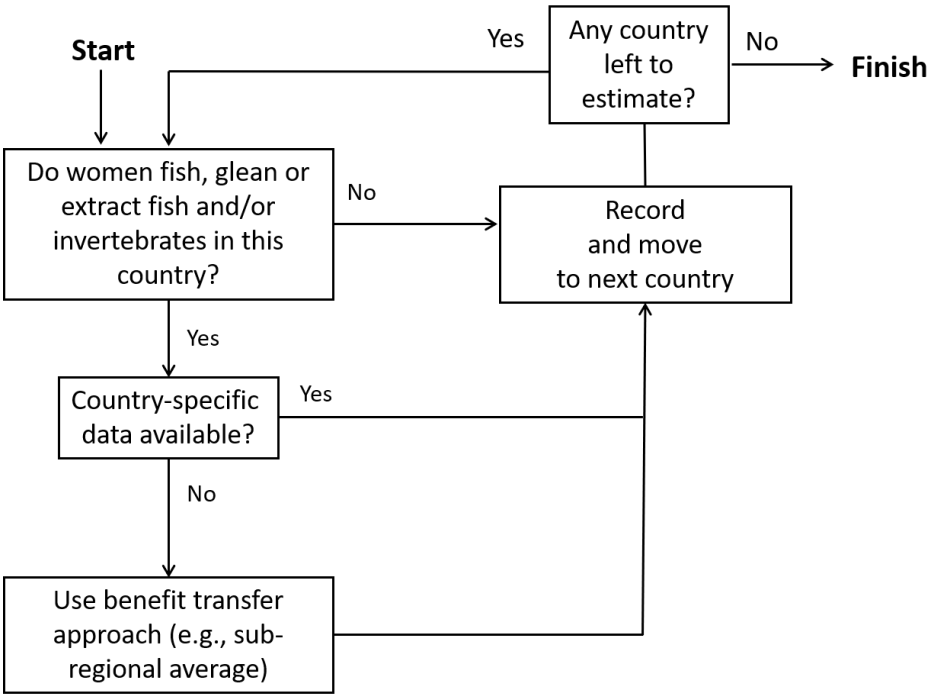

Figure 4.1 Schematic of step-wise approach for estimating participation by women in small-scale fishing (extractive) activities.

Finally, where there was evidence of participation, but quantitative information was unavailable, and to estimate female participation rates for the remaining maritime fishing countries of the world, I used a benefit transfer approach to fill data gaps. This approach involved calculating subregional averages based on data from other countries within that subregion, where data were available (Teh and Sumaila 2013). Similar techniques have been employed in other global-scale fisheries studies where data were limited, e.g., fisheries subsidies (Sumaila *et al.* 2010), fisheries employment (Teh and Sumaila 2013), total catch (Pauly 1998; Zeller *et al*. 2007), and ex-vessel prices (Sumaila *et al.* 2007; Swartz *et al.* 2012). In these data-limited contexts, the available data were compiled, with a sample size large enough for subsequent analysis, using direct value transfer to fill data gaps (Cisneros-Montemayor and Sumaila 2010). This approach assumes that the site used to provide the estimate is similar to the one lacking data. Without a full understanding of the determinants of female participation in fishing across all contexts, the limitation of this approach is that our assumption of similarity is inappropriate in some cases. I assumed that within each subregion, neighboring and nearby countries likely have similar patterns of female participation in fisheries, because of similar social, cultural, and religious factors that are known to influence female labour force participation rates, more broadly (Kus 2011). However, because socio-cultural factors can vary considerably across short geographic distances, even within subregions, I adjusted some estimates based on knowledge of local and

regional similarities in social, economic, and colonial history and migration, where a country lacking data was culturally more similar to another subregion[3].

For countries where my investigation found that women do not participate in small-scale fishing activities whatsoever (i.e., a female participation rate of zero), I made additional efforts to triangulate these findings with additional, independent sources, as to not reproduce culturally-constructed or socially-constructed assumptions about gender roles in the fisheries sector. These zero estimates should be viewed as highly uncertain, as we know that even to the discerning eye, fishing by women in many contexts can be easily overlooked.

4.2.2 Catch and catch effort

To estimate catch by women, female participation rates for small-scale fishing activities (as described in section 4.2.1) were combined with small-scale fisheries catch data. This assumes that men and women fish in the same way. The very limited data available comparing catch per unit effort (CPUE) between men and women (Kleiber *et al.* 2015) indicate that in some fisheries and in certain contexts women had a higher CPUE than men (Kleiber *et al.* 2014, 2015), while in other examples, men had a higher CPUE than women when targeting the same species (Kronen and Vunisea 2009; Purcell *et al.* 2016). We know that men and women often target different species and habitats and use different gears; however, given the limited sex-disaggregated data on effort or the frequency and duration of fishing activities in relation to catch volume for the

[3] For example, for some overseas territories and island countries where the demographics of the country indicate a dominant ethnic group that is from another geographic subregion, the female participation rate for the subregion was based on similarities in ethnic composition rather than geographic proximity (e.g., Reunion, Cook Islands, Ascension Island, Puerto Rico, etc.).

purposes, I have assumed these to be constant. This assumption is justified based on anecdotal evidence that describe men who go fishing, far from shore, for long periods of time and bring back limited catch, while women collect shellfish, near to shore, for a couple hours per day, which can amount to large volumes of catch. There are other situations where men might catch much more than women, based on the types of gear they use. Given the considerable lack of sex-disaggregated data on effort, and/or on the types of fishing activities, species targeted, and gears used by men and women, female participation rates were used as the best available metric, comparable across, and inclusive of all maritime fishing countries of the world. The limitation of using unstandardized participation rates for calculating catch is that, in some cases, this may overestimate catch, while in other cases, this may underestimate it. For this reason, individual country estimates should be interpreted and employed cautiously.

To calculate catch, the female participation rate for small-scale fishing activities for each country was multiplied by the total small-scale fisheries catch for that country based on comprehensive catch data from the *Sea Around Us* (www.searoundus.org). These data include both reported and unreported catch components, with subsistence catches often based on *per capita* seafood consumption rates in combination with coastal population data, resulting in a comprehensive estimate of domestic fisheries catches for local consumption, irrespective of who caught them. Both artisanal and subsistence catches were included in the estimate, as fish and invertebrates caught by women are used both for home consumption and for sale in local markets. While it may be the case that women are more involved in subsistence than commercial fisheries, participation in subsistence/informal sector is more likely to be overlooked or underestimated, so these two sources of bias were considered to influence the results in opposing directions. With

those caveats in mind, small-scale fisheries catch–both subsistence and artisanal–for the most recent decade (years 2005-2014), were used to calculate the average annual small-scale fisheries catch (in tonnes). Female participation rates for each country (as a proxy for effort) were applied to total small-scale fisheries catches for each country to estimate the volume of catches by women in small-scale fishing activities.

4.2.3 Landed value and economic impact

The economic value associated with catches taken by women was calculated in a similar way using female participation rates for small-scale fishing activities and the landed value of small-scale fisheries catches, averaged over a ten-year period, 2005-2014. The landed values were derived from *Sea Around Us* catch data (Pauly and Zeller 2016a) and country specific ex-vessel price data from the Fisheries Economics Research Unit (Sumaila *et al.* 2007; Swartz *et al.* 2012; Tai *et al.* 2017). I calculated the total revenue (i.e., landed value) of the catch taken by women with subsistence and artisanal catches treated in the same way, assuming that the 'shadow' prices for the subsistence sector are the same as the ex-vessel prices (Sumaila *et al.* 2007; Cisneros-Montemayor *et al.* 2018). This assumes that species caught by men and women have an equivalent market-value, which may not always be the case. However, without sex-disaggregated catch data at the species level, we assumed that overall these were equivalent, knowing that there will be variation at the local level. Given that women often target invertebrates, which can have much higher ex-vessel prices than fish targeted by men, this may underestimate the value of catches by women. For example, in Senegal the ex-vessel price for miscellaneous marine molluscs is 2.60 USD/kg (in 2010), while the ex-vessel price for *Sardinella* spp. is 0.58 USD/kg (Sumaila *et al* 2010).

Economic impact associated with these catches were estimated using country-specific output multipliers (Dyck and Sumaila 2010) that are based on the direct, indirect, and induced impacts associated with fishing. Landed values and economic impact were presented in 2010 USD, with landed values for each country adjusted to real dollars using Purchasing Power Parity (PPP) conversion factors presented by the World Bank, which is the number of units of a country's currency required to buy the same amounts of goods and services in the domestic market as US dollars would buy in the United States (World Bank 2018). Country-specific PPP conversion factors from 2010 were used wherever available. For countries without these data, subregional averages were used.

Table 4.1 Scoring system for calculating uncertainty associated with estimates of female participation in fisheries, catch amount and value. Adapted from Mastrandrea *et al*. (2010) in Guidance Note for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties Intergovernmental Panel on Climate Change (IPCC).

Score	±%	Corresponding IPCC criteria
4 Very high	10	High agreement & robust evidence
3 High	20	High agreement & medium evidence or medium agreement and robust evidence
2 Low	30	High agreement & limited evidence or medium agreement & medium evidence or low agreement & robust evidence.
1 Very low	50	Less than high agreement and less than robust evidence

4.2.4 Measuring uncertainty

To capture variations in the data used to calculate volume and value of small-scale fisheries catches attributable to women and the uncertainty around these estimates, I used an approach applied in other data limited contexts, whereby a scoring system is used to calculate confidence intervals around the estimates. This approach is based on the treatment of uncertainty outlined by

Mastrandrea *et al*. (2010) for use by the Intergovernmental Panel on Climate Change (IPCC) and adapted by Pauly and Zeller (2016a) to capture uncertainty (Table 4.1).

Table 4.2 Criteria for assessing the quality of evidence used in estimating the contributions by women in the fisheries sector. Adapted from Pauly & Zeller (2017), based on Mastrandrea (2010).

Agreement	High agreement	> 2 data sources, no conflicting accounts found.
	Medium agreement	> 1 data source, conflicting accounts which could be resolved
	Less than high agreement	≤ 1 data source, conflicting accounts that could not be resolved.
Robustness	Robust evidence	data (qualitative and quantitative) from peer-reviewed source or comprehensive census; estimate covers entire country;
	Medium robustness	data from case-study, scaled up to country level; census data not comprehensive (i.e. overlooks labour by women)
	Less than robust	estimate based on regional or sub-regional average.

Female participation rate estimates were given a score from 1 to 4, based on the quality of the data, measured as 'agreement' of sources and 'robustness' of evidence. High agreement occurred when there were multiple, independent sources indicating similar estimates, and evidence was considered robust when the source was a peer-reviewed study or a detailed, comprehensive census providing national-level coverage (Table 4.2). Data taken from the grey literature, based on a regional average or single case-study, scaled-up to a national estimate were considered less robust. Each score is associated with a corresponding percentage (Table 4.2), which is then used to calculate the confidence intervals associated with catch and value estimates. For example, an estimate with an uncertainty score of 1, which is associated with the highest degree of uncertainty, had a confidence interval range of ± 50%, while a score of 4 has the lowest degree of uncertainty and a confidence interval range of ± 10%. Median values and 95% confidence intervals were calculated using a Monte Carlo simulation method, which has been used

previously for fisheries catch and value data where there is considerable uncertainty associated with the data (Teh and Sumaila 2013). Here, I used this method to calculate the median catch and 95% confidence interval based on 10,000 iterations of the simulation and assuming a uniform distribution (Teh and Sumaila 2013).

4.2.5 Validating outputs

To refine estimates of female participation in fishing, I consulted with local experts to verify the results, wherever possible. For each of the 62 countries, emails were sent to individuals with expertise on gender and/or fisheries for a given country. Feedback was received for approximately one third of the countries, which were used to improve estimates and better understand the data and their limitations. For countries where I determined, through this inquiry, that women do not participate at all in small-scale fishing (i.e. a female participation of zero), I made additional efforts to verify this information. Validation of catch and value estimates were also done, wherever possible, for countries where published data existed on marine fisheries catches by women, calculated independently from this study, e.g., Senegal (Belhabib *et al.* 2014), Tanzania (Appendix B), Samoa (Appendix B), and other Pacific Island countries (Harper *et al.* 2013).

4.3 Results

Globally, small-scale fisheries production activities involve an estimated 2.1 million women, who mainly target invertebrates from intertidal and nearshore habitats, representing approximately 11% of small-scale fishers worldwide (See Appendix Table A1 for a full list of countries with female participation rates and numbers of women). Regionally, female

participation rates in fishing activities were estimated to be highest in the Oceania region, with average female participation of 45% in Melanesia and 31% in Micronesia, while the lowest participation by women in fishing activities was estimated for Western Asia and Eastern Europe (2%; Table 4.3). The overall average participation rate for Asia was estimated here to be 7%, with higher rates for Eastern Asia (16%) and Southeastern Asia (12%) than for Southern Asia (3%) and Western Asia (2%). In Africa, Eastern Africa had the highest participation rate at 26% whereas Northern Africa had the lowest at 2%.

In terms of small-scale fisheries catches, globally, women catch approximately 2.9 million (± 520, 000) tonnes per year of fish and invertebrates. Catches by women were found to be highest in Asia, estimated at over 1.7 million tonnes per year (Table 4.3). In Africa catches by women amounted to over 260,000 tonnes per year, annually and in Oceania they were estimated at over 80,000 tonnes annually (Appendix Table A2 includes catch and landed values for all maritime fishing countries).

The landed value of catches taken by women were estimated globally at 5.6 billion USD (±952 million), with an overall economic impact of 16.7 billion USD per year. When adjusted to real dollars using PPP, the landed value is estimated at over 9.8 billion 2010 dollars (Table 4.3), with an economic impact of 25.6 billion real dollars. As with catches, the landed value of catches taken by women was highest for Asia, estimated at over 3 billion USD or 6 billion real 2010 dollars when adjusted using PPP (Table 4.3).

Table 4.3 Estimated contributions by women in small-scale fisheries, including participation rates and numbers, catch volume and landed value.

Geographic Area	Female participation rate	Number of female participants	Catch by women (10^3 t)	Lower (2.5%)	Upper (97.5%)	LV in 10^6 2010 USD	LV in 10^6 Real 2010 USD[a]
Africa	**0.10**	**237,470**	**262**	**175**	**351**	**450**	**1,081**
Eastern Africa	0.26	104,900	121	82	161	203	563
Middle Africa	0.05	13,500	23	12	34	48	85
Northern Africa	0.02	18,000	4	3	5	9	25
Southern Africa	0.13	5,800	9	7	11	32	52
Western Africa	0.05	95,270	106	71	141	157	356
Americas	**0.13**	**912,870**	**776**	**593**	**955**	**1,701**	**2,236**
Caribbean	0.10	305,700	19	12	25	46	67
Central America	0.06	8,480	10	6	14	18	35
Northern America	0.10	24,190	127	92	161	432	429
South America	0.25	574,500	621	482	755	1,205	1,705
Asia	**0.07**	**694,460**	**1,743**	**1,220**	**2,266**	**3,015**	**6,051**
Eastern Asia	0.16	127,800	1,039	736	1,340	1,997	3,367
Southeastern Asia	0.12	316,600	548	372	725	839	2,152
Southern Asia	0.03	246,700	136	99	174	136	441
Western Asia	0.02	3,360	21	14	29	48	99
Europe	**0.04**	**7,920**	**60**	**40**	**79**	**164**	**172**
Eastern Europe	0.02	1,450	17	9	25	13	25
Northern Europe	0.03	2,280	14	10	17	31	23
Southern Europe	0.07	3,720	25	18	33	108	113
Western Europe	0.03	470	3	2	4	13	11
Oceania	**0.25**	**265,320**	**84**	**61**	**106**	**257**	**337**
Austr. & New Zealand	0.13	5,030	19	14	23	85	69
Melanesia	0.45	237,000	46	33	58	127	211
Micronesia	0.27	20,070	12	8	16	23	27
Polynesia	0.19	3,220	7	6	9	22	29
Global	**0.11**	**2,118,040**	**2,925**	**2,089**	**3,757**	**5,587**	**9,877**

Notes: [a]Values adjusted using Purchasing Power Parity conversion factors from the World Bank to estimate real dollars.

4.4 Discussion

Women make valuable contributions to fisheries economies and marine derived food security around the world, but over three decades after these important contributions were brought to light (e.g., in the works by Chapman [1987]; Nadel-Klein and Davis [1988], etc.), the continued lack of policy attention calls for new ways to represent these contributions. Representing the contributions by women in fisheries quantitatively, using a currency that is well understood by policymakers (i.e. monetary value), aims to bring new attention to women in fisheries. The findings presented in this chapter highlight the substantial contributions by women in small-scale fisheries in terms of catch, mostly for subsistence purposes and local markets, and the landed value associated with this catch. Globally, the catch by women has an estimated value of over 5.5 billion USD, which when adjusted to real dollars based on country-specific Purchasing Power Parity, the landed value is approximately 9.8 billion real dollars. The economic impact of this estimate is 25.6 billion real dollars, representing over 11% of the total value of small-scale fisheries catches globally. This adjusted value is especially significant considering gendered patterns of household expenditures, as highlighted in Chapter 3 for Senegal, where women's income goes disproportionately towards household provisioning and children's education (Harper *et al.* 2017).

This research is the first attempt to assemble quantitative estimates of the catch and value of catch by women on a global scale, drawing together existing studies and data, and the knowledge of local experts to highlight and to account for the contributions by women in small-scale fishing activities for all maritime countries of the world. Other important efforts on this scale have focused on female participation in fisheries sector employment, which overall suggests that

globally 47% of fishworkers are women, when pre- and post-harvest activities are included (World Bank 2010). In 2016, the United Nations Food and Agriculture Organization made substantial efforts to collate sex-disaggregated employment statistics for the fisheries and aquaculture sectors from data submitted voluntarily by member countries (Gee and Bacher 2017). This chapter takes this work a step further by estimating catch and associated landed value related to fishing activities performed by women, with broader implications on food and livelihood security.

Since the 1950s, the United Nation's Food and Agriculture Organization (FAO) has been collecting national fisheries employment statistics from its member countries; however, these data are only recently being disaggregated by sex. While some FAO member countries collect sex-disaggregated fisheries data, many countries lack the capacity to collect these data or resist doing so. Recent efforts by the FAO to collect and disseminate sex-disaggregated fisheries employment data are summarized by Gee and Bacher (2017) and presented in the most recent State of World Fisheries and Agriculture Report (FAO 2018). For the period 2009-2014, approximately 27% of the 194 FAO member countries (n=52) provided sex-disaggregated fisheries and aquaculture employment data. The State of the World Fisheries Report 2018 indicate a similar estimate of around 10% for fisheries production (FAO 2018). Although summary statistics from this dataset have been presented, the data for each country have not yet been released and were, therefore, not available for comparison here. However, at a high level, female participation in fisheries production globally was found to be similar, with the FAO estimates relying on the voluntary reporting of countries. Here I used a wide range of data sources, including FAO studies and reports, for countries that were chosen independently of the

availability of data, and I made substantial efforts to validate the data and to address uncertainty in the data by calculating confidence intervals around each estimate. The data presented here, which focus on small-scale capture fisheries participation, catch, and landed value, compliment efforts by the FAO to compile sex-disaggregated fisheries data and could be combined to develop a more complete dataset of countries and indicators. If combined, these efforts could contribute towards a much more robust understanding of the social, economic, and environmental dimensions of global food systems.

The fisheries catch estimates presented in this chapter are considered conservative. More could be done to further validate and improve these estimates by way of inviting feedback and criticism from countries and by encouraging them to include information about gender in fisheries census and employment statistics. The collection and reporting of sex-disaggregated statistics are crucial to a comprehensive understanding of resource use patterns, which is necessary for ecosystem-based approaches to managing fisheries (de la Torre-Castro *et al.* 2017). In cases where men and women target different species, use different gears, and fish in different habitats (Kleiber *et al.* 2015), a gender lens is necessary to understand the implications of various management strategies, to assess the trade-offs, and to improve the outcomes of fisheries management efforts (de la Torre-Castro *et al.* 2017). For example, understanding gendered patterns of resource use is essential for Marine Protected Area planning that is both ecologically beneficial and socially equitable (Walker and Robinson, 2009).

This chapter focuses on one segment of the fish value chain—production. There are many other segments (and inputs) along the fish value chain that involve women and where gender

inequalities exist that require policy attention. For example, processing of fish and invertebrates into marketable, tradable, and exportable products can be highly labour intensive, with women providing much of the low-cost labour in this post-harvest activity (FAO 2013; Nuruzzaman *et al.* 2014), as is described for some of the countries investigated in Chapter 3. However, women's labour contributions in the processing and marketing subsectors have been highlighted to a much greater extent than fisheries production (i.e., catching fish), where it is often assumed women do not participate. For a comprehensive assessment of the contribution by women to fisheries-related economies, we must include the entire length of the catch-to-consumption pathway, as is highlighted in the value chain study by Christensen *et al*., 2014 for Peruvian fisheries. Here, I highlight small-scale fisheries production (i.e., marine extractive activities), where the contributions by women have certainly been overlooked in a policy and management sense (Williams *et al.* 2012; FAO 2014b; Belhabib *et al.* 2015; Kleiber *et al.* 2015; Ogden 2017). While catches attributed to women's fishing activities represents approximately 5% of the overall landed value of marine fisheries globally (including all small- and large-scale sectors), the contribution to food and livelihood security at local and national levels is non-trivial and must be considered alongside this economic valuation. Additional metrics are urgently needed to fully capture the significance of these contributions in terms of food, nutrition, poverty alleviation, and beyond. This study identifies many gaps that exist when it comes to sex-disaggregated data in fisheries. Information, such as gender-specific target species, habitats fished and gear used, is critical for understanding possible gendered impacts of climate change and developing appropriate mitigation strategies, for Marine Protected Area planning and for understanding fisheries-related food security. This information is especially critical at a time

where there is increasing pressure to align these marine policy dimensions with global targets and strategies to reduce hunger, to alleviate poverty and to promote gender equality.

Looking specifically at the Sustainable Development Goals, Goal 5 is to achieve gender equality and to empower all women and girls. Recognizing and supporting the participation by women in fishing activities can contribute towards this goal through economic empowerment and influence on household bargaining power; however, to advance this, women must be included in fisheries leadership and decision-making (Harper and Kleiber 2016). This requires more than token inclusion; it requires that women's voices inform and contribute to policy development. However, even the SDGs must strive for better integration of gender into all other aspects of their goals and targets. For example, SDG 14 (Life below the water) does not adequately address women or gender, and by failing to do so, undermines the role of women in advancing this goal. A specific focus on gender, and especially highlighting the overlooked contributions by women, provides not only a more comprehensive account of the value of fisheries to National economies, but also enhances our understanding of fisheries as linked social-ecological systems.

This chapter is a step towards a more complete picture of fisheries economies and fisheries as social-ecological systems; however, the findings presented here are still only a partial picture and should be interpreted and used in this way. These numbers must be used alongside the narratives and within the context to which they belong, and they should be revisited and revised as new information emerges. As gender roles and relationships are continuously being negotiated, these numbers will change. The dynamic and interconnected social, cultural, economic and ecological factors that shape fisheries systems will also influence these numbers over time. While these

numbers should be used cautiously, my vision is that they kickstart important conversations at local, national, and international levels about how women are seen and valued in the fisheries sector and in society more broadly. These conversations must include important discussions around the impact that climate change and ocean acidification will have on women who feed their families by collecting invertebrates from the intertidal zone. These conversations also need to address the distributional impacts of fisheries subsidies and their reform, looking at how to develop fiscal policies that are informed by and respond to the interest of both men and women in fisheries. If we are to simultaneously advance gender equality and fisheries sustainability, a much more robust dataset, disaggregated by sex, is needed to support fisheries program and policy development, implementation, and evaluation that is gender sensitive and equitable, and which are in line with international efforts related to sustainability.

Chapter 5: Indigenous women respond to fisheries conflict and catalyze change in fisheries governance on Canada's Pacific coast[4]

5.1 Introduction

Scholars interested in understanding social-ecological systems have identified the agency of individuals as a key factor in the transformation of systems towards more sustainable futures (Westley *et al.* 2013; Moore *et al.* 2014). While there has been increasing critical engagement with understanding the role of power and agency in social-ecological system transformations (Walker *et al.* 2004; Olsson *et al.* 2006; Gelcich *et al.* 2010), this literature has not fully considered the positionality of those involved in these transformations. Positionality[5] refers to one's location within the larger social structure (e.g., gender, race, class), and is key to how people experience, articulate, and respond to environmental struggles (Polido and Peña 1998). Intersecting identities, such as gender, race, and class, influence how people are uniquely situated in these struggles, and adopting an intersectional lens to highlight the unique positionality of those involved in fostering transformations can offer important insights into these processes (cf. Staeheli *et al.* 2004). To explore how positionality influences governance transformations within social-ecological systems, I look at a recent fishery crisis and conflict that

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[5] The term *positionality* is often employed to signal how a researcher's social position might influence the research design, interpretation, and outputs of a study. This is also referred to as reflexivity, whereby, through the act of self-reflection, one's work can be better situated and interpreted. Here I use *positionality* as it is used by Polido and Peña (1998) in the context of environmental justice where social position is seen to influence how people experience and respond to environmental struggles.

led to a shift in the management of Pacific herring (*Clupea pallasii*) on the Central Coast of British Columbia, Canada. In this example, I examine how Indigenous women responded during this crisis and conflict, and I argue that women played an essential role in creating and advancing the preconditions for a governance transformation. I then discuss these findings as they relate to existing literature on women's roles in environmental justice movements (Pardo 1990; Bell and Braun 2010) and gender dimensions of resource governance (Westermann *et al.* 2005; Pandolfelli *et al.* 2008), with particular attention to the role of Indigenous women (Udel 2001; John 2015). Through this examination, I add novel dimensions to our understanding of these transformation processes—in ways that draw attention to care, equity, and intergenerational justice as impetus for resistance and change (John 2015; Harris *et al.* 2017b).

Struggles over access to and control of natural resources have long been a part of the socio-political landscape around the world; however, for Indigenous peoples and other marginalized groups whose livelihoods depend directly on the natural environment, resource conflicts often extend beyond the ecological to encompass issues of social, cultural, and economic inequality (Escobar 2006). Indigenous peoples, whose access to resources has been severely constrained due to colonialism, these struggles are about more than just the resource itself, but about challenging the status quo and about reasserting power and authority (Escobar 2006). Women play a central role in challenging these unequitable patterns and injustices, often positioning themselves in these struggles as mothers and caretakers, defending the health and wellbeing of their children and future generations (Pardo 1990; Parisi and Corntassel 2007; John 2015; Harris *et al.* 2017b). This positioning has been a source of strength in many environmental struggles. For example, female Haida Elders on Canada's Northwest Coast were on the frontlines of

protests on Lyell Island in the 1980s over the threats of deforestation and development in their traditional territories. These actions eventually led to the creation of the Gwaii Haanas National Park Reserve and a precedent-setting co-management agreement between Canada and the Haida Nation (Jones *et al.* 2017).

The present moment marks an especially critical period for Indigenous peoples in Canada with respect to the recognition of natural resource rights. With the election of a new federal Liberal government in 2015, the signing of the United Nations Declaration on the Rights of Indigenous Peoples in 2016, and a formalized process of reconciliation under way (as part of the Truth and Reconciliation Commission of Canada), the Canadian Government appears to be committed to improving their relationship with what are named officially in the Constitution of Canada, "Aboriginal Peoples": defined as the First Nations (peoples once known as "Indians"), Inuit, and Métis[6]. This commitment to building stronger nation-to-nation relations between Canada and Indigenous peoples marks an important period for redefining fisheries governance systems with respect to Indigenous fishing rights. These efforts are key to ongoing efforts of First Nations in British Columbia towards self-determination, in particular because treaties were generally not signed in the province (with a few exceptions, making BC distinct vis-à-vis other parts of Canada), but also given the current reorientation towards reconciliation in terms of renewed relationships with Indigenous peoples in Canada.

[6]In this paper I use the term "Indigenous" to refer to all peoples who trace their ancestry to the original populations of Canada, except when referring to the Canadian legal context (e.g., Aboriginal fishing rights or licenses) or to a specific Indigenous group in Canada (e.g., the Heiltsuk Nation).

Negotiations by Indigenous groups over fishing rights began in the late 1800s as the provincial and dominion colonial governments began imposing regulations which restricted access by Indigenous groups to fisheries resources and economies and have been ongoing (Harris 2000). The recent struggle over herring along the Pacific Coast of Canada, including for Heiltsuk peoples of the Central Coast, has put further pressure on the federal government to negotiate and implement co-management arrangements with First Nations (Jones *et al.* 2017). While some recent progress has been made in enhancing the Indigenous fishing rights agenda (Von der Porten *et al.* 2016), truly shared decision-making power is not yet a reality. However, the case study described here highlights an important shift in fisheries governance where Heiltsuk women played a pivotal role in galvanizing the preconditions for a transformation in fisheries governance with important implications for the reorientation of Indigenous resource rights in Canada towards reconciliation. In the next section, I provide a brief description of the Heiltsuk-herring relationship, including some of the recent political and legal history, to set the stage for exploring the role of women and the changes they were able to effectuate in this recent conflict.

5.2 Background on the Heiltsuk-herring relationship

Herring roe or spawn (layers of fertilized herring eggs) deposited on kelp or other plant material growing naturally near protected shorelines has long been a source of food, nutrition, trade, and livelihood for Northwest Coast Indigenous peoples, including the Heiltsuk. Over millennia, some Pacific Coast groups, such as the Heiltsuk, also set out plant materials (branches or whole trees or specially harvested kelp) in open ponds. The Heiltsuk harvested herring spawn-on-hemlock and spawn-on-kelp using feather boa kelp (*Egregia menziesii*) for local consumption and traded the surplus with other First Nations. In the 1970s, a commercial overseas market developed for

herring spawn deposited on giant kelp (*Macrocystis pyrifera*) hung in closed ponds, which ushered in state-imposed limitation policies and regulations. It was the only commercial fishery, for a short time, in which "Indian bands"[7] and individuals owned the majority of the limited number of licenses issued. In the 1980s, the Heiltsuk Band, with a single, community license negotiated yearly for increased access to the colonial controlled commercial spawn-on-kelp fishery in order to participate in this increasingly lucrative enterprise. However, the federal fisheries agency refused to issue additional licenses to anyone (Newell 1997). The Heiltsuk Band then in 1989 filed a lawsuit against the fisheries department for five licenses, claiming an Aboriginal right. The federal court dismissed the case, in part because the government promised to issue additional licenses to First Nations through a scheme that would, largely, fail. The Heiltsuk Band persevered in the struggle over access to the herring fishery.

In 1988, two Heiltsuk Band members were charged with selling herring-spawn-on-kelp without a commercial fishing license (Newell 1997). This case made its way to the Supreme Court of Canada, with the court eventually ruling in favour of the Heiltsuk. The resulting Gladstone decision (*R.* v *Gladstone* [1996] 2 S.C.R. 723) confirmed the constitutionally-protected Aboriginal right of the Heiltsuk to harvest spawn-on-kelp (SOK) for commercial purposes (Harris 2000). The Gladstone decision increased fishing access and participation by the Heiltsuk, creating economic development opportunities in a community with high unemployment. While herring is of substantial economic importance to the community, its social and cultural

[7] "Indian Band" is a legal term used under Canada's Indian Act to describe groups of status Indians. This term was used here in reference to the legislated access by Indigenous peoples to fisheries resources as delineated by Federal fisheries policy at the time.

significance make access to this resource by the Heiltsuk even more imperative (Bennett *et al.* 2018).

Although the Gladstone decision was a major win in terms of the recognition of Indigenous fishing rights, it has been over twenty years since this decision, and federal fisheries governance does not reflect court-established direction on the involvement of First Nations in fisheries decision-making processes. The low abundance of herring on the Central Coast led to a closure of the commercial sac-roe and SOK fisheries from 2008 to 2013. The following year, despite recommendations by First Nations for the fishery to remain closed for stocks to rebuild, commercial herring fisheries were re-opened. This led to protests and litigation in 2014 and 2015 by the Heiltsuk and other First Nations (Jones *et al.* 2017). Then, in 2015, the controversial opening of the commercial sac-roe fishery led to conflict on the water, where two Heiltsuk women were on the frontlines, taking actions to protect their rights to conserve herring for their community and for future generations. Following this conflict on the water, a delegation of Heiltsuk women, Elders, and youth delivered an eviction notice to the local federal fisheries agency office, located on Denny Island in Heiltsuk Territory, resulting in a four-day occupation and lock-down of the fisheries office by the elected leadership. This political flashpoint prompted further negotiations between the Heiltsuk and the federal fisheries agency, leading to a new, jointly-developed herring management plan, adopted in early 2016. Then in January 2017, the Province of British Columbia and the Heiltsuk Nation signed a framework agreement for reconciliation, providing further grounds for power-sharing in the governance of fisheries resources.

5.3 Analytical approach

In this study I bring together theories of governance transformations in social-ecological systems (SES) with insights from the literature on women in environmental justice and activism to examine how Heiltsuk women responded during a recent herring crisis and conflict to influence a system-wide shift in governance. First, I draw from the literature on transformations in governance, making connections to Moore *et al*.'s (2014) analytical framework for transformations in social-ecological systems and Westley *et al*.'s (2013) theory of transformative agency. Walker *et al*. (2004, p.1) define transformability as "the capacity to create a fundamentally new system when ecological, political, social, or economic conditions make the existing system untenable". Such transformations make use of crises as windows of opportunity for change, where novel and innovative strategies are combined with diverse experiences and knowledge in navigating these transformations (Folke *et al.* 2010; Gelcich *et al.* 2010). Westley *et al*. (2013) suggest that the agency of the people in a SES is a key component in processes of transformation. They employ the concept of institutional entrepreneurship as an explicit form of leadership to understand effective agency in complex systems. Institutional entrepreneurship differs from traditional, top-down leadership in that it is through the collective actions of individual actors (or actor groups), which, working together, build a common vision among stakeholders and mobilize the social capital needed to transform complex systems (Gelcich *et al.* 2010; Westley *et al.* 2013).

I build on and extend the above concepts and theoretical understandings, combining this framework with insights related to the role of women in environmental justice movements and Indigenous activism, and the specific empirical considerations related to this case to examine

what Heiltsuk women brought to this particular struggle and their role in transforming fisheries governance. Women involved in environmental justice movements at times have invoked notions of a 'motherhood identity' or other attributes as motivation and legitimation for their participation (Udel 2001; Bell and Braun 2010). For Indigenous women, their traditional roles and responsibilities as mothers and caregivers go beyond their immediate households and families to include their communities, extensive kinship networks, as well as broader relationships with other non-human species and the natural world (John 2015). As a key example, Indigenous women leading and supporting the *Idle No More* movement in defense of Indigenous rights in Canada connected strongly to a sense of responsibility for the protection of all children, animals and plants, and emphasized intergenerational care and equity (John 2015). While the ethic of caretaking and stewardship of land and resources is a core element of many Indigenous cultures (Brown and Brown 2009; Norman 2017), inclusive of all genders, the role of women as mothers and caregivers is often identified as providing motivation and strength for political activism, in addition to shaping their diplomatic strategies (Udel 2001; Parisi and Corntassel 2007; Grey 2010). The strength that Indigenous women bring to these struggles also often comes from traditional gender norms in many Indigenous cultures, including the Heiltsuk, that hold women in high regard and that consider them the backbone of their nations, as protectors of water and other specific roles (Waterfall 1993; Whyte 2014; John 2015). In the Heiltsuk context, women's traditional roles as teachers, disciplinarians, caregivers, and healers are honored and, as has been highlighted in other Indigenous cultures, these roles are viewed as essential to cultural continuity and survival (Waterfall 1993; Udel 2001; Whyte 2014).

5.4 Methods

Insights for this study were informed by visits to the community of Bella Bella between March 2015 and May 2017 and focused on the events leading up to and following the 2015 herring crisis and conflict. During these visits, the primary author attended community meetings and demonstrations, co-led a herring science workshop, and conducted semi-structured, face-to-face interviews (n=18). Questionnaires on cultural, economic, political, and social aspects of herring systems completed by participants during the herring workshop informed the schedule of questions for the interviews. Workshop and interview participants included men and women, with diverse perspectives and roles within the community from Elders to teachers, resource managers, hereditary and elected Chiefs, members of the elected Council, and participants in the herring fishery. Although there are some limitations associated with an extended period of data collection following a specific event, I was less concerned with specific details as I was with capturing what participants considered the most significant aspects of the conflict in terms of influencing change. The 18 interviews conducted over this study period ranged from 15 to 60 minutes in length, with most being audio recorded. For the interviews that were not audio-recorded, detailed notes were taken. I transcribed and digitized all the interviews myself to provide consistency. Finally, I consulted numerous archival documents, acquired by special request from the Heiltsuk Cultural Education Center.

Interview data, workshop questionnaires, and archival documents were analyzed using both deductive and inductive approaches, where initial categories and themes were drawn from pre-existing literature and knowledge, while other themes emerged from the data. Thematic categories included gender roles and responsibilities in Heiltsuk society and politics (Waterfall

1993), Heiltsuk laws and worldview (Brown and Brown 2009), and literature on social-ecological transformations (Westley *et al.* 2013; Moore *et al.* 2014), women in environmental justice (Pardo 1990; Agarwal 2000), and Indigenous activism (Udel 2001; John 2015). Triangulation of sources and verification of themes were used to provide credibility for the findings (Marshall and Rossman 2011). Although all interviews provided valuable insights and context to understanding gender roles in the community and the contribution by Heiltsuk women to the process of transforming fisheries governance, only certain interviews, and mainly those by women, are highlighted here.

This project was developed with the consent and ongoing input from the Heiltsuk Nation (i.e., from the Heiltsuk Integrated Management Department, the Heiltsuk Tribal Council, and the women and men who participated in this study). While I am non-indigenous, the analysis was done with extensive input from Heiltsuk collaborators and co-authors. Ethics protocols were followed throughout this research, including those set forth by the Heiltsuk Nation, the University of British Columbia, and Simon Fraser University. The direct naming of participants was done out of respect and as the preferred citation method by the community, supported by the Heiltsuk and the university ethics boards (H15-01079).

5.5 Results and analysis

The role of Heiltsuk women in this process of transforming fisheries governance and in challenging the current system, which continues to marginalize Indigenous peoples with respect to fisheries and all other aspects of their social, economic, and cultural systems, is significant. Shifts in ecological regimes (e.g., fluctuations in herring abundance), institutional processes (i.e.,

Supreme court system, litigation, protests, etc.), and economic realities (high unemployment, etc.) together created an important window of opportunity for change. The ability of the community to seize this opportunity, to effectively mobilize and to set up the preconditions for a transformation in governance relied heavily on the contributions by Heiltsuk women during this recent conflict. Women brought strength and cohesion to this struggle over herring by calling upon both traditional and contemporary roles through their responsibilities as mothers, teachers, community and domestic managers, and as political leaders in defense of their children, culture, and future generations. In the following sections I describe these contributions that acted to strengthen the community and to catalyze change.

5.5.1 'Making it happen': building momentum and creating cohesion

Throughout the 2015 herring crisis and conflict, Heiltsuk women were on the frontlines of demonstrations and negotiations, communicating and coordinating across groups and holders of power. Louisa Housty, who worked closely with the Heiltsuk Integrated Resource Management Department and with the female elected Chief and Council throughout the herring conflict, acting as the headquarters of communication in Bella Bella, recalled, "*As we mobilized people for the blockade and the protests, it was all women out there*" (May 21, 2015). While the conflict intensified in Bella Bella, Heiltsuk also protested at government and industry offices in Vancouver, with women at the forefront of these demonstrations, leveraging their informal networks through social media and mobile phones to stay connected, build momentum, and gain support for this struggle, while keeping the protests peaceful (Chief Marilyn Slett, May 31, 2017). Men were there, too, with community leaders including Kelly Brown, Harvey Humchitt, Frank Brown, and Gary Housty on the frontlines; however, participants stressed that it was the

actions of women that created community cohesion during this time of crisis and conflict. Several interviewees recalled and emphasized that women were the ones coordinating, providing logistical support, mobilizing people and resources, and communicating across the various people and networks involved in this resistance, as is highlighted in the following quote: "*When the lock-down was finished, it was the women who did a lot of the negotiations outside, we were the ones that made sure everyone was fed, we were the ones who made sure there was transportation. The men were the warriors, they were there, ready, but the practical work of making it happen, it was evident that it was driven mostly by the women*" (Hilistis Pauline Waterfall, May 23, 2017).

Adding to this, Chief Marilyn Slett, reflects on the success of the demonstrations and lock-down, attributing it to, "*a lot of strong women leadership, grassroots leadership, mobilizing people and helping to keep the pressure on DFO* [the federal fisheries agency]" (Chief Marilyn Slett, May 31, 2017).

Together these quotes highlight some of women's gendered roles around community organizing, coordinating, and informal leadership, which although often ascribed a lower value in society, are associated with status and prestige in some Indigenous contexts (Udel 2001). In this case, these gendered roles provided strength to the struggle over herring and were essential to establishing the preconditions for transforming governance by leveraging social networks and building momentum (Olsson *et al.* 2006; Moore *et al.* 2014; Table 5.1). Using Westley *et al*.'s (2013) terminology, it was through institutional entrepreneurship that these key actors (many of whom were women) caused a system-level disturbance which opened a window of opportunity to push forward the Heiltsuk agenda for transforming fisheries governance.

5.5.2 Intergenerational care

For some of the Heiltsuk women interviewed, the herring crisis and conflict brought to the fore their roles as mothers, and with that, the responsibility to advocate for the wellbeing of their children, their community and future generations (Louisa Housty, May 21, 2015). While some women spoke directly of their roles as mothers, others spoke to this in a broader sense as supporting and caring for the community, and for the resources they depend on, such as herring, that are so important to Heiltsuk identity. For example, as Jess Housty reflects on her experience during the 2015 herring demonstrations, she speaks to her leadership role in supporting her family and community as an elected council member and as an independent community organizer around safe and effective civil disobedience while also acknowledging her responsibility to future generations, including her own unborn child:

"*One of the things that has been really interesting for me as I have been working through my political leadership role in the community is understanding how resources like herring and the fight to manage them meaningfully and adequately and the fight to make sure that the community is fed and can maintain social and cultural relationships and everything that goes with that resource…*"

She goes on to explain that it is about much more than fish:

"*It's about much more than a specific resource but also how that resource gives you a window into everything that is important to the community in terms of values and working together and moving forward sustainably. I was 8 ½ months pregnant when I was at the occupation camp and that so firmly rooted me in the understanding that I was there watching the leaders through the window in this really difficult negotiation and feeling my baby kicking in my belly and being surrounded by so many generations who were rising up with so much joy and love in the face of*

such great, dismal challenge. I think that really illuminated for me all that's strong in the community and all the hope for transformation that exists that is so much more than just fish" (Jess Housty, February 23, 2016).

These reflections echo accounts from Indigenous women in other contexts who have been at the forefront of resistance movements related to natural resource conflicts, motivated by their roles as caretakers of their children and grandchildren, and as transmitters of culture (Kuokkanen 2011). Here, these responsibilities as mothers and caretakers were also powerful motivators for collective action, in this case to ensure the survival of a species that is crucial to Heiltsuk identity and wellbeing.

5.5.3 Collaboration and keeping the peace

The success of the 2015 demonstrations in gaining political attention and in catalyzing change may be attributed, in part, to the strong presence of women who worked collaboratively to create a unified vision between elected officials and traditional leadership. The actions taken by the elected female Chief, Marilyn Slett, and elected Council, which is dominated by women (i.e., 2/3 of the current Heiltsuk Tribal Council is female), supported by the male hereditary leaders or *Hemas*, demonstrate the importance of collaboration and a shared vision to initiate change. Heiltsuk Elder Hilistis Pauline Waterfall highlights aspects of this as she describes the scene from outside the fisheries agency office on Denny Island in March 2015:

"*When the herring was at risk again of being depleted with a threatened commercial opening, it was Marilyn* [Chief Slett] *who really, in her role as an elected leader, stepped in, with Kelly Brown and Frank Brown and others, and just took it upon herself to fulfill her role and making*

sure she did what was needed to state our case about protecting the sustainability of our herring species. And although it was difficult for her, I was able to support her. We weren't allowed in because it was a lock-down, but we were able to speak to her through the window. The chiefs [male hereditary Chiefs] *were really good about going over and saying this is really good work, just continue doing it, we support you and Kelly*" (Hilistis Pauline Waterfall, May 23, 2017).

As parallel efforts took place and tensions mounted at government offices in Vancouver, Chief Marilyn Slett advised those on the frontlines of the commitment to peaceful protests. The link between the strong presence of women at these demonstrations and the success of these actions in setting up the conditions for a transformation is supported by the literature that relates the participation by women in collective action and resource management to increases in collaboration, solidarity, and conflict resolution (Westermann *et al.* 2005; Pandolfelli *et al.* 2008). Heiltsuk creation stories refer to women as peacemakers and as being responsible for intertribal alliances (Brown and Brown 2009), and these characteristics appear very prominently in the contemporary leadership style of the women involved in this conflict. A crest commissioned by the Heiltsuk Tribal Council highlights both the formal and informal leadership of women in the herring conflict and their role in supporting, inspiring, and bringing strength to this struggle (Figure 5.1). Women's gendered identities, as mothers and caregivers, can depoliticize their perceived role in resource and environmental conflicts, strengthening their ability to mobilize and to create change (Pardo 1990; Udel 2001).

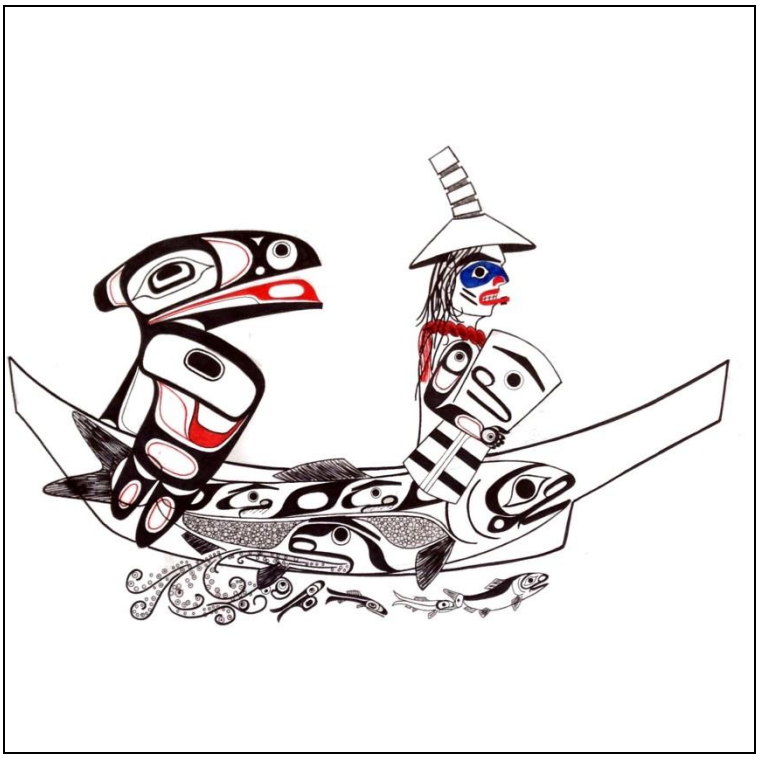

Figure 5.1 Herring crest by Heiltsuk artist Nusi (Ian) Reid showing raven and a Heiltsuk noblewoman sharing a canoe surrounded by spawning female herring. Raven represents the head Chief of the Heiltsuk supporting and inspiring the community as well as the noblewoman. Permission to use this image was granted by Chief Marilyn Slett, Heiltsuk Tribal Council (April 2019).

5.5.4 Building solidarity through intergenerational knowledge transfer

Throughout the herring conflict, key women in the community worked together, leveraged roles as teachers and transmitters of culture, and engaged Heiltsuk youth with the Herring song to diffuse tension and to build a common vision.

In March 2015, language and culture coordinator Fran Brown taught and led the elementary school children in the wáṅái song, which was sung during demonstrations in the Heiltsuk language. This song about the herring harvest (by Fran Brown and Clyde Tallio) became an icon of the conflict and of Heiltsuk unity throughout this struggle. Fran describes how this song was

received by children at the Bella Bella Community school and the influence it had through this stressful time:

"*The herring song had a huge impact, a rippling effect, generated a huge movement, and I could literally feel it with all these kids, in the morning all these chairs were filled, voluntarily*" (Fran Brown, March 21, 2015).

For a Nation that suffered huge losses of language and identity from the damages of colonial policies, being able to learn and sing about traditional food gathering in the Heiltsuk language brought a great sense of pride and self-identity, creating intergenerational connectivity. This song continues to be a source of community empowerment, illustrating the legacy of this vehicle and emblem of social cohesion and strength that remains long after the initial conflict. "*Language is part of who we really are, it connects us to the land, to the sea, and to our resources*" (Fran Brown, May 21, 2015).

During the herring conflict, this song provided support and strength to those directly engaged in negotiations with state officials. Its collective voice generated the momentum needed to move from crisis and conflict to cooperative conversations with federal fisheries managers about change in fisheries governance. Louisa Housty worked with Fran Brown to bring the children to events and community meetings to break the tension and to bring positive energy through the youth, who represented the Heiltsuk's future. In understanding transformation within linked social-ecological systems, this is a powerful example of institutional entrepreneurship, where key women in the community worked together, leveraged their roles as teachers and transmitters of culture, and engaged with the intergenerational transfer of traditional knowledge to build a

common vision among the Heiltsuk (Table 5.1). This song was instrumental in mobilizing the social and cultural capital necessary for transforming this linked social-ecological system.

5.5.5 Collective decision-making

The actions taken by women related to the herring crisis and conflict highlight both traditional and contemporary leadership roles of women in Heiltsuk society. Several participants shared that, traditionally, women in Heiltsuk society always had a role in decision-making, acting as advisors to Chiefs, who were typically male (Waterfall 1993). Each hereditary Chief had an advisor who was not born into a chieftainship lineage. This was to assure the voices of all people were expressed in advising the Chief. These advisors were either men or women. As Hilistis Pauline Waterfall (October 18, 2017) describes, "*My great grandfather, Albert Humchitt's advisor was a woman and it was said that he never hosted a feast or potlatch without her by his side to advise him*". Although women had decision-making power, these leadership roles were not always obvious or visible. Numerous accounts, from both men and women interviewed, suggest that women's roles and responsibilities were valued and important, that shared responsibility was the norm, and that there was a sense of gender equality around decision-making.

Although power asymmetries existed in Heiltsuk society along the lines of kinship and other factors differentiating people within the community, some of which continue to exist today, a gender balance of power seems to be a characteristic of traditional Heiltsuk society, even if specific roles were differentiated. While men and women might have made distinctly gendered contributions to the community and in politics, (e.g., men went out to hunt and fish while women

attended to domestic and community affairs; men as Chiefs and women advising them), these were perceived as complimentary (Pauline Waterfall, May 23, 2017; Jess Housty, February 23, 2016). Furthermore, gendered roles were somewhat interchangeable as people responded to daily needs and adapted to ensure survival (Waterfall 1993). Tsosie (2010) highlights this characteristic as a common feature of gender dynamics across a variety of Indigenous contexts where women have transcended gender roles in leadership and other activities in response to changing conditions.

While a balance of power between men and women may have been the traditional norm, colonialism disrupted the traditional governance system of Chiefs and the women who advised them, which contributed to gender inequalities (Pauline Waterfall, May 23, 2017). Despite this disruption, Heiltsuk women found ways to continue their political influence. For example, Kelly Brown (November 1, 2017) describes his mother, Elizabeth Brown, and grandmother, Brenda Campbell, continued to advise the head Chiefs of the time and worked to establish the Native Sisterhood of British Columbia (c. 1933), which supported advocacy around Indigenous fishing rights and the wellbeing of Indigenous fishing communities across the Province of British Columbia.

Today, there is strong representation of Heiltsuk women in elected political leadership, a situation that is not the case for many Indigenous communities across Canada where the elected leadership is dominated by men (Sayers *et al.* 2001). Indeed, in many contexts, the traditional role of women in collective decision-making was undermined by colonial policies that displaced Indigenous women from their communities and from leadership positions (John 2015). For the

Heiltsuk, there is a strong tradition of women's involvement in collective decision-making, and, as the socio-political context continues to evolve, women are reaffirming their place in society, drawing strength from traditional roles and responsibilities, to protect herring and other resources in their traditional territories that are key to their cultural survival.

Table 5.1 Essential elements in establishing the preconditions for social-ecological system transformations with empirical examples of the contributions by Heiltsuk women in catalyzing change in herring governance, highlighting gender dimensions of Social-ecological system transformations.

Essential elements for the transformation of SES	**Contributions by women to transforming herring governance**
Cause social disruption; create window of opportunity	Conflict on water between two Heiltsuk women and commercial seine boat; Occupation/lock-down of federal fisheries agency office by female elected Chief.
Self-organization around new ideas	A group of women and youth draft and deliver letter to federal fisheries office, communicate across groups and organize meetings.
Gather momentum: Strengthen informal networks	Heiltsuk women on the frontlines of demonstrations at industry and government offices in city centers, coordinate and connect through social media.
Co-ordinate logistics	Women call on roles as domestic and community managers to coordinate demonstration-related logistics (i.e. safety plan, transportation).
Create social cohesion; build and strengthen community identity	Key women in the community work together, leveraging roles as teachers and transmitters of culture, engaging Heiltsuk youth with the Herring song to diffuse tension and build a common vision.
Enable negotiations among holders of power	Female elected Chief effectively negotiates with federal fisheries managers on behalf of male hereditary Chiefs, emphasizing Collaboration and peace.
Give voice to marginalized actors	Women teaches herring song to Heiltsuk youth; Heiltsuk women, youth, and Elders paddle over to federal fisheries agency office to issue eviction notice.

As Indigenous peoples across Canada strive for self-determination, there are numerous examples of Indigenous women leading efforts, often at a grassroots level, for more equitable and inclusive policies related to food security, water, and, other natural resources, motivated by a sense of

responsibility for the health and wellbeing of their families and communities and defenders of culture (Kuokkanen 2011; Palmater 2011; John 2015). Through the processes of reconciliation and self-determination, Indigenous women are reaffirming their traditional leadership and caregiving roles while also occupying new spaces within a changing socio-political landscape (Udel 2001; John 2015). However, more attention is needed to understand these gender dynamics in order to support Indigenous communities, and especially Indigenous women, in efforts to transform governance and to create more equitable policies in fisheries and beyond.

5.6 Conclusion

In this chapter, I engage with the concept of positionality when considering fisheries governance transformations using the Heiltsuk-herring case study to highlight how Indigenous women responded in a recent resource conflict to catalyze change in fisheries governance. Our analysis demonstrates the importance of gender and indigeneity in considering governance transformations in social-ecological systems. This work underscores the value of strong participation by Indigenous women in fisheries governance and decision-making, as important stakeholders in this sector, to be certain, but also as powerful agents of change in their communities, which deserve attention and further analysis.

In recent efforts by the Heiltsuk to restore access to the valuable spawn-on-kelp fishery by protecting the herring stocks in their traditional territory, Heiltsuk women brought strength to this struggle by drawing on their traditional roles and responsibilities in the community and by acting as important leaders in transforming fisheries governance. While the success of recent acts of self-determination hinged on the strength of the entire community, including Elders, men,

women, and children, strong agency and entrepreneurship by Heiltsuk women brought the community together, creating intergenerational solidarity and movement towards change. The unified voice that emerged from the community during this fisheries management conflict prompted attention and action by federal policy makers, resulting in substantial progress towards further assertion of Indigenous resource rights. These movements are not only seen as key for the fishery, or to reposition these women at the forefront of resource governance, or of their community, but also as key to broader processes of reconciliation. Even as Canada has made commitments to reconciliation, few examples exist of specific pathways that will enable movement in this regard, including models of effective co-governance of resources. The women involved in this conflict over the herring fishery promoted changes important to the long-term sustainability of the fishery, but also with heightened attention to intergenerational care, equity, and environmental justice, and as such, in ways that speak to broader agendas implicit in reconciliation.

Making progress on Canada's commitment to reconciliation will require transforming existing systems of power, including the gendered and racialized institutions and structures, that have marginalized Indigenous peoples in Canada for far too long. For the reconciliation process to be meaningful, systems of governance need to change substantially to reflect a new relationship between Indigenous peoples and the state, where decision-making power is shared, and the voices of men and women are included and supported. Transforming fisheries from a colonial governance system to one oriented towards reconciliation, where equity and social justice are central features, is crucial to the survival of herring and the people who rely on them.

Chapter 6: Conclusions

6.1 Summary

This study contributes towards understanding the human dimension of fisheries, which invites a shift in perspective from a production-focused, market-based, male-oriented view of fisheries to one that includes a broader definition of the fisheries-related economy, highlighting small-scale fisheries, gleaning, and the range of fishing-related activities and spaces occupied by women. This work brings a gender perspective to fisheries economics, highlighting the important contributions by women to fisheries economies around the world, developing policy relevant data and insights at the intersection of gender, fisheries, and economics.

The findings and insights presented here go into social and economic dimensions of fisheries that have received limited attention either in terms of subject matter or scale of analysis. The global meta-analysis of women's contributions to fisheries economies measured as participation in small-scale fishing, fisheries catch and associated revenue highlights the extent of participation by women in small-scale fishing activities around the world and the substantial contributions they make to domestic food security, which are especially important in developing countries where fish and invertebrates make up a substantial portion of accessible protein and available nutrients. Across all regions of the world, women participate in the shoreline and nearshore collection of invertebrates, often for home consumption. This activity is often done while fulfilling domestic and care responsibilities that fall largely on the shoulders of women around the world. When this 'productive' work is done in parallel with 'reproductive' or care work, it is easily missed by national accounting systems and by statistical data collection, undermining the

value of this work to the economy and to society overall. This is especially significant considering the increased vulnerability of coastal populations to the impacts of climate change, which will put further strain on the ecological systems and resources that support them. Throughout this thesis, I argue that a focus on women in fisheries brings to light important contributions by women to food, nutritional, and livelihood security, contributions that are a benefit to men, women, and children in diverse contexts around the world, and which, therefore, require more attention in fisheries policy and management.

The first chapter introduces the area of research and policy context related to gender and fisheries. Chapter 2 presents a review of select publications at the intersection of gender, fisheries, and economics. Chapter 3 highlights women in the fisheries of five major fishing countries (Mexico, Peru, Senegal, South Africa, and Vietnam), describing their contributions to food and livelihood security. Chapter 3 also identifies data gaps, such as the limited information on female participation in fisheries leadership and governance. Where this information existed, women were largely under-represented in fisheries decision-making. This chapter also highlights areas where data are limited at the national level for developing gender sensitive fisheries policy and programs. Chapter 4 expands on the investigation of five major fishing countries to assess the global contribution by women in fisheries to food and livelihood security, accounting for approximately 12% of participants in small-scale fishing activities (approximately 2 million women), catching roughly 2.9 million (± 520,000) tonnes of marine fish and invertebrates, with an associated landed value of 5.6 billion (± 952 million) USD, or 9.8 billion real dollars, and an overall economic impact of 25.6 billion real USD. These catches are mostly taken along the

shoreline, on foot, or from small, non-motorized vessels using low-technology, low-emission gear in coastal waters.

Chapter 5 investigates the subtle ways that women contribute to fisheries-related economies, not necessarily captured through conventional fisheries economic indicators, through a case study. This chapter describes how Indigenous women in one community on the Pacific coast of Canada responded to a fisheries crisis and conflict to catalyze change in the governance of a culturally- and economically-important species, Pacific herring (*Clupea pallasii*). Together, the chapters of this thesis highlight the importance of expanding our understanding of fisheries-related economies and how bringing a gender lens to fisheries economics is key to understanding the contributions of fisheries to broader societal wellbeing.

6.2 A more complete account of fisheries economies

One of the major and cross-cutting themes of this thesis is the continued lack of sex-disaggregated fisheries data at the national level, despite increasing recognition of the importance of women to the fisheries sector and in fishing communities in many contexts around the world. The result is a partial picture of the fisheries landscape, where half of the population is missing, with implications for the entire population. Developing effective fisheries policies that respond to broader social and economic concerns, such as food security, climate change adaptation, and overall human wellbeing, must be gender sensitive and responsive.

This is an important time for revising fisheries policies and programs to align them with broader societal goals around sustainability and social justice. These goals are currently at the center of

international policy discourse, with social justice and equity, including gender equality, being articulated and emphasized in the United Nation's Sustainable Development Goals (SGDs), the United Nations Declaration on the Rights of Indigenous Peoples, and the United Nations Food and Agriculture Organization's Voluntary Guidelines for Sustainable Small-scale Fisheries (FAO 2014b; Jentoft 2014; Singh *et al.* 2018). With these international efforts comes pressure for countries to develop indicators and tools to meet obligations and targets around gender equality and other key objectives.

A major constraint in the development, implementation, and monitoring of gender-sensitive policies in fisheries is the lack of sex-disaggregated data at the national level. This has long been identified as a constraint in fisheries policy (Bennett 2005; Weeratunge *et al*. 2010; Kleiber *et al*. 2015), but has renewed urgency as countries make efforts to advance the Sustainable Development Goals and operationalize the Small-scale Fisheries Guidelines, which identify gender equality as critical to achieving other important goals and objectives. As fisheries policies are often developed and applied at a national level, identifying and accounting for fisheries sector participation by sex at the country level is necessary for advancing national gender equality strategies and meeting international obligations. However, this must be done by through collated, sub-national data, collected in a way that overcomes existing blind spots in terms of recognition and representation of women in fisheries statistics.

Improving data on gender dimensions of fisheries requires efforts at all levels. While qualitative research highlighting the important role of women in fisheries has been accumulating for several decades now, with some important progress in putting gender on the fisheries policy agenda,

there is still a lack of recognition of the magnitude and significance of contributions by women in fisheries. Some countries collect and disseminate sex-disaggregated fisheries participation data, but many do not (Bennett 2005; Gee and Bacher 2017). There are several reasons that these data are not routinely collected, which may explain the paucity of universally available and accessible sex-disaggregated data for the fisheries sector. Firstly, employment data collected via national census efforts often focus on formal, paid, and full-time work, which overlooks the informal, unpaid, and part-time work that, in fisheries, and other sectors of the economy, often involve a disproportionate number of women and people of ethnic minorities (Teh and Sumaila 2013; Pryck and Termine 2014). Data collection efforts in fisheries have traditionally focused on the amount of fish caught, with some estimates of the number of fishers going out to sea to catch fish (often only registered fishers), and on the industrial sector only, including seafood processing sector jobs, but rarely have they included the entire fish value chain, including small-scale artisanal and subsistence fisheries value chains, and the various types of work—formal and informal—that fall therein. The International Labour Organization has made attempts to amend national labour statistics by accounting for employment in the informal economy; however, these numbers do not include informal fisheries work (International Labour Organization 2018), likely because it is more difficult to account for the range of work included often in rural communities where capacity to collect these data are limited but also because informal sectors are not considered an important contributor to the economy. In terms of seafood processing and marketing jobs, the data, disaggregated by men and women, is more plentiful at the country level, as they are often captured by national labour censes and in industry employment statistics.

The lack of comprehensive, sex-disaggregated data on fisheries sector participation is often the consequence of limited dedicated financial resources and capacity for the collection of sex-disaggregated data coupled with the fact that gender is not considered an important variable in fisheries policy and management. This also points to broader limitations in terms of societal valuation of certain types of work (e.g. domestic, informal, care-related) that fall outside of national accounting systems in terms of contribution to a country's Gross Domestic Product (GDP) but that contribute to the economy in fundamental ways (Bjornholt and McKay 2014). Some countries are attempting to remedy this by, for example, including estimates of unpaid labour in cost of fishing calculations, such as has been implemented in some EU countries (STECF 2017). However, there is no standardized accounting system that includes these informal channels and contributions, such as shadow values, social networks and capital, unpaid work, etc., into fisheries economics. While these informal channels may not involve the physical transfer of money, they contribute substantially to the functioning of society, and are necessary to understanding the full range of costs and benefits in fisheries. This failure to adequately recognize the roles and activities of women in fish value chains and the contributions that these make to the fisheries-related economy limit the support they receive (legal, financial, or political) and further marginalizes them in fisheries management and decisions-making.

A noteworthy challenge in highlighting the contributions by women to the fisheries-related economy in contexts around the world is the tension that exists across disciplines, and especially the disconnect between qualitative and quantitative approaches to social and economic research. Traditional economic approaches for valuing natural resources are criticized for not capturing appropriate or relevant data for developing policies that aim to maintain human wellbeing

(Weeratunge *et al.* 2014). Economic evaluations in fisheries (and other sectors of the economy) rarely account for all labour inputs, overlooking contributions by women and children by way of informal and care work. A broader definition of the fisheries-related economy must go beyond fisheries jobs and landed values to include the contributions to fishing families and communities by way of informal, unpaid, and care work that is often disproportionately undertaken by women in society. The role of women in the functioning of families and communities is rarely considered in economic terms. Feminist economists have brought these concepts to the fore, but they remain on the fringes of conventional economic analyses. Closing the gender gap in many areas of the economy is recognized as important to increasing overall societal wellbeing (Eswaran 2014). A key component of closing the gender gap is to bring informal and care work into focus and account for these contributions in a more meaningful and formalized way. However, as Marilyn Waring herself cautions, there can be consequences to translating intangible social and environment amenities and services into monetary estimates (Dobell and Walsh 2014). While bringing these into conventional economic analyses is a way of recognizing their value, the fear is that in doing so these amenities and services become commodified in ways that are exploitative. Nevertheless, feminist economics offers an important lens for a more comprehensive understanding of the fisheries-related economy and an approach for capturing the broader range of actors and activities involved in fisheries, which must be considered in managing fisheries resources in a more sustainable and equitable way.

6.3 Valuing care work

In Chapter 5 of this thesis, broader concepts of the fisheries-related economy are explored, bringing forward the importance and valuation of informal and care work to sustainability in

fisheries. While not specifically focused on the topic of informal work, this chapter describes how Indigenous women responded to a recent fisheries crisis to catalyze change in governance, with implications for the overall sustainability of the fisheries and to the wellbeing of their community (Harper *et al.* 2018). Heiltsuk women brought their unique position to the fore, responding to threats over their way of life by connecting to their traditional roles and responsibilities (as teachers, advisors, peace-makers, mothers) and by bringing strength to this crisis. This chapter contributes novel insights to understanding governance transformations in fisheries by highlighting gender and intersectional identities as important to conceptualizing fisheries as social-ecological systems (Berkes 2015; Calhoun *et al.* 2016).

While the traditional roles and responsibilities that women called upon in this case study are, in western cultures, often ascribed a lower value, these roles and responsibilities are valued and celebrated in this Indigenous culture and contributed towards broader efforts to sustainably manage the fisheries resource. Unpacking societal values around care work across cultures, and in the context of this case study, requires acknowledging the tension that exists between various notions of feminism. Traditionally gendered female roles, such as caregiver, are viewed by white feminists as oppressive, while for some Indigenous women, affirming traditional roles, such as care work or 'motherwork', is a form of resistance against colonial oppression (Udel 2001). Traditional caregiving roles in an Indigenous context may be valued very differently than they are by mainstream feminists and those concerned with the devaluation of domestic work, as is often highlighted in feminist critiques of fisheries economics that overlook the informal labour contributions of women in fishing communities and fisheries-related economies (Harper and Kleiber 2016).

With these insights in mind, counting women in a fisheries context depends very much on how women are valued by society, which varies considerably between cultures and contexts. Cultural and contextual diversity aside, informal and unpaid work largely falls on the shoulders of women around the world, and this must be acknowledged. Counting women in fisheries, therefore, requires a major shift in how men and women around the world define and value various types of work. This goes beyond fisheries to include all sectors of society but is especially needed in a fisheries context. There also needs to be an overhaul in the system of national accounts to reflect a broader set of values. This thesis is a step in that direction, creating tools in fisheries to more accurately represent the reality in which people live and contributing towards a more equitable system where everyone has an opportunity to thrive.

6.4 Policy recommendations

Throughout this dissertation I have identified several policy areas of relevance to this research, including food and livelihood security, climate change, fisheries sustainability, and human wellbeing. Broadly, gender analysis is critical to all these areas in order to develop policies that do not exacerbate existing inequalities and that are designed in a way to actively promote gender equality and the empowerment of women and girls. Women are important stakeholders in the fisheries sector, as is highlighted throughout this thesis and the many works cited herein. As such, several key recommendations flow from the findings presented here, including:

- Engaging women and men, equally, in discussions about fisheries access, uses, and sustainability at all levels and stages of policy development;
- Increasing gender-balanced representation in fisheries leadership and management by actively engaging more women in decision-making arenas. What this entails might differ

from one context to another but will require understanding who has power and looking for ways to overcome institutional and systemic barriers to more balanced representation. This goes beyond gender to include the various other social factors (e.g., race, class, ethnicity, religion, etc.) that influence power and voice in fisheries decision-making;

- Providing access to training and resources that support both men and women in small-scale fisheries and related activities;
- Increasing institutional capacity to collect gender-disaggregated data with dedicated funding for training data collectors to overcome gender biased data collection and hiring gender specialists in fisheries agencies and organizations to integrate these data collection efforts into fisheries policy development.

6.5 Advancing knowledge

This thesis invites fisheries economists and policy-makers to broaden their perspective on the fisheries-related economy, to expand the definition of fisheries-related work, and to take stock of the full set of activities in the catch-to-consumption pathway. Feminist perspectives offer an important lens through which to expand our gaze and to look beyond what has traditionally been recognized as inputs to the fisheries sector, incorporating a more nuanced view that acknowledges the broad set of actors in fish value chains and the relationships that exist between them. Feminism is an opening to exploring and understanding other inequalities that are imbedded in fisheries systems worldwide, including the marginalization of small-scale fishers, Indigenous peoples, women and children, migrants, displaced and impoverished fishers, among other vulnerable groups. While feminism takes many forms and has a variety of theoretical underpinnings, here I engage predominantly with feminist economics and feminist political

ecology. These approaches to feminism informed how I thought about this research and how I interpreted the findings as well as the insights I drew from them in terms of advancing knowledge at the intersection of gender, fisheries and economics.

Feminist economics focuses on the undervaluation of women and women's work in society broadly. Waring (1988) criticizes the system of national accounts for failing to reflect informal and care work that is disproportionately done by women around the world. The fisheries sector in general, and especially small-scale fisheries, are poorly represented in national accounts; however, efforts to redress this are in process, with recent work acknowledging this oversight and suggesting ways to better incorporate the contributions by women in fisheries into national accounting systems (Porras 2019). The challenge is to shift thinking from considering the fisheries-related work done by women in many contexts around the world as simply a part of their domestic responsibilities towards valuing this work in a much more tangible way. This shift is not something that can happen overnight. It requires a conscious effort to overcome deeply-embedded social norms and values and to challenge the dominant economic system (Bjornholt and McKay 2014). Fisheries are in crisis in many contexts around the world, and climate change will only exacerbate this, with adverse consequences for the most vulnerable people in society. The ability to adapt and develop resilience in the face of global environmental change and crises requires an overhaul of the institutions that have been complicit in the production of privilege and power, which have made certain portions of the population especially vulnerable. Drawing on feminist economics, this thesis identifies, though various examples, the ways in which fisheries economics and accounting reinforce vulnerabilities in fishing communities and the

fisheries sector by overlooking important contributions by women in the small-scale fisheries sector.

Feminist political ecology, also concerned with power and privilege, points to important social determinants of access to and control over natural resources, while also acknowledging the inter-relationships between these social determinants and environmental change (Rocheleau *et al.* 1996; Harris 2009). Feminist political ecology could push forward social-ecological systems thinking by explicitly considering power, including gender, in understanding linked human-nature systems. However, the literature on gender and environment, rooted in Feminist Political Ecology, has not as of yet focused much on coastal or marine systems (Kawarazuka *et al*. 2017), and has been criticized for focusing more on social than ecological dimensions (de la Torre-Castro 2019). On the other hand, social-ecological systems theorists have been criticized for not engaging more with power and agency (Calderón-contreras and White, 2019), with gender as an important and overlooked dimension of this. Here, I engage both in terms of gendered decision-making, where women are, in many contexts, under-represented in fisheries management. This has implications for conservation and sustainability, whereby the unique perspectives and experiences acquired by women occupying different spaces in the fisheries sector, are missing from discussions related to the complex management challenges faced by fisheries and oceans around the world. Through the case study of the Heiltsuk women who were influential in pushing forward Indigenous rights with respect to the management of herring, I engage with this concept in terms of the unique strengths that Indigenous women brought to this struggle, drawing attention to intergenerational care and equity. In drawing insights from feminist political ecology, I contribute towards advancing social-ecological systems thinking, and especially the

body of work that deals specifically with governance transformations by focusing on the role of gender and indigeneity in these processes.

Feminist political ecology has much to offer in terms of bringing attention to the inter-relationship between social inequalities and environmental change but to draw meaningful insight for fisheries management and governance, must equally attend to social and ecological dimensions (Kawarazuka *et al*. 2017). In a fisheries context, declines in fish stocks will likely have gendered consequences, which require mitigation strategies that respond to the needs of both women and men. Here, I highlight that men and women often work in different spaces, catch different species and fish in different habitats, and underscore the specific but often overlooked spaces where women operate. Climate change will not necessarily impact these spaces and resources equally (Thomas *et al* 2018), meaning that policies and programs *must* be tailored to address these challenges in ways that do not reproduce existing social inequalities.

6.6 Limitations and next steps

This thesis only begins to explore what a feminist perspective can offer in terms of improving fisheries economics and policy. The scope of this research was restricted for practical reasons to marine capture fisheries and to a narrow set of activities, highlighted through very limited data. Estimates presented here are derived from a range of data sources, both in terms of coverage and quality. This was partially accounted for by estimating uncertainty but even as a range, these estimates should be used cautiously. Firstly, the estimates of female participation, catch and landed value are not static. These reflect a snapshot in time, and as gender roles are continuously negotiated, participation rates will change. Shifts in socio-political landscapes and changing

socio-ecological landscapes will also influence these numbers over time. A more nuanced perspective on the response of specific policies and differentiated impacts on men and women will require more than a snapshot, calling for fisheries statistics, disaggregated by sex, to be routinely collected and presented as a time series.

In terms of policies related to fisheries-related food and livelihood security, a deeper understanding is needed that includes inland fisheries, aquaculture, and other food systems, including traditional foods and the activities related to these systems. This would provide a more robust picture of global food systems and the role that women in fisheries play in these systems, but such an analysis would require considerable human and financial resources, beyond what was available for this dissertation. The FAO, Duke University, and WorldFish are currently leading a large multi-year project involving collaborators all over the world to take stock of small-scale fisheries globally as part of the Illuminating Hidden Harvests (IHH) project. There is potential to contribute data and insights from this thesis to inform gender dimensions of this work. Another important area of future work, and one that could be integrated into the IHH project, is to understand the role of women in fisheries decision-making and the barriers limiting their participation in various contexts around the world. The topics explored herein and the collaborations made through this work have opened many potential avenues for future work, as there is much that still needs to be done to understand the role and contributions of women in fisheries around the world and to advance gender equality is this sector and beyond.

References

Abbott, J. and Sumaila, U.R. (2019) Reducing marine pollution: What can economists contribute. *Review of Environmental Economics and Policy* **in press**.

Agarwal, B. (1997) "'Bargaining'" and Gender Relations: Within and Beyond the Household. *Feminist Economics* **3**, 1–51.

Agarwal, B. (2000) Conceptualising environmental collective action: why gender matters. *Cambridge Journal of Economics* **24**, 283–310.

Allison, E.H. and Ellis, F. (2001) The livelihoods approach and management of small-scale fisheries. *Marine Policy* **25**, 377–388.

Allison, E.H. and Horemans, B. (2005) Poverty alleviation, sustainable livelihoods and management in small-scale fisheries. In: *Overcoming factors of unsustainability and overexploitation in fisheries: selected papers on issues and approaches.* R 782. FAO, Rome, pp 307–338.

Andrew, N.L., Béné, C., Hall, S.J., Allison, E.H., Heck, S. and Ratner, B.D. (2007) Diagnosis and management of small-scale fisheries in developing countries. *Fish and Fisheries* **8**, 227–240.

Anna, Z. (2012) The Role of Fisherwomen in the Face of Fishing Uncertainties on the North Coast of Java, Indonesia. *Asian Fisheries Science* **25S**, 145–158.

APRAPAM (2015) Le Code de la Pêche maritime de 2015. Available at: https://www.aprapam.org/2015/07/27/le-code-de-la- peche-maritime-de-2015/ [Accessed December 27, 2016].

Belhabib, D., Koutob, V., Gueye, N., Mbaye, L., Mathews, C. and Lam, V. (2013) Lots of boats and fewer fishes: a preliminary catch reconstruction for Senegal, 1950-2010. *Fisheries Centre Working Paper*. Vancouver.

Belhabib, D., Koutob, V., Sall, A., Lam, V.W.Y. and Pauly, D. (2014) Fisheries catch misreporting and its implications: The case of Senegal. *Fisheries Research* **151**, 1–11.

Belhabib, D., Sumaila, U.R. and Pauly, D. (2015) Feeding the poor: Contribution of West African fisheries toemployment and food security. Ocean and Coastal Management 111, 72–81.

Bell, J.D., Kronen, M., Vunisea, A., Nash, W.J., Keeble, G., Demmke, A., Pontifex, S. and Andre, S. (2009) Planning the use of fish for food security in the Pacific. *Marine Policy* **33**, 64–76.

Bell, S.E. and Braun, Y.A. (2010) Coal, identity, and the gendering of environmental justice activism in central appalachia. *Gender & Society* **24**, 794–813.

Bennett, E. (2005) Gender, fisheries and development. *Marine Policy* **29**, 451–459.

Bennett, N.J., Kaplan-Hallam, M., Augustine, G., Ban, N., Belhabib, D., Brueckner-Irwin, I.,

Charles, A., Couture, J., Eger, S., Fanning, L., Foley, P., Goodfellow, A.M., Greba, L., Gregr, E., Hall, D., Harper, S., Maloney, B., McIsaac, J., Ou, W., Pinkerton, E., Porter, D., Sparrow, R., Stephenson, R., Stocks, A., Sumaila, U.R., Sutcliffe, T., Bailey, M. (2018) Coastal and Indigenous community access to marine resources and the ocean: A policy imperative for Canada. *Marine Policy* **87**, 186–193.

Berkes, F. (2015) *Coasts for people: Interdisciplinary approaches to coastal and marine resource management*. Routledge, New York.

Berkes, F. and Turner, N.J. (2006) Knowledge, learning and the evolution of conservation practice for social-ecological system resilience. *Human Ecology* **34**, 479–494.

Bertrand, M., Black, S.E., Jensen, S. and Lleras-Muney, A. (2014) Breaking the Glass Ceiling? The Effect of Board Quotas on Female Labor Market Outcomes in Norway. 28/2014. Chicago.

Bjornholt, M. and McKay, A. eds (2014) *Counting on Marilyn Waring: New Advances in Feminist Economics*. Demeter Press, Bradford.

Boserup, E. (1990) Economic Change and the Roles of Women. In: *Persistent Inequalities*. (ed I. Tinker). Oxford University Press, New York, pp 14–24.

Boserup, E. (1970) *Women's role in economic development*. George Allen & Unwin Ltd., London.

Branch, G.M., May, J., Roberts, B., Russell, E. and Clark, B.M. (2002) Case studies on the socio-economic characteristics and lifestyles of subsistence and informal fishers in South Africa. *South African Journal of Marine Sciences* **24**, 439–467.

Branch, T.A. and Kleiber, D. (2017) Should we call them fishers or fishermen? *Fish and Fisheries* **18**, 114–127.

Britton, E. (2012) Women as agents of wellbeing in Northern Ireland's fishing households. *Maritime Studies* **11**, 16.

Brown, Y.K. and Brown, F. (2009) Staying the Course, Staying Alive-- Coastal First Nations Fundamental Truths: Biodiversity, Stewardship and Sustainability. Victoria.

Calderón-contreras, R. and White, C.S. (2019) Access as the Means for Understanding Social-Ecological Resilience: Bridging Analytical Frameworks. *Society & Natural Resources*, 1–19.

Calhoun, S., Conway, F. and Russell, S. (2016) Acknowledging the voice of women: implications for fisheries management and policy. *Marine Policy* **74**, 292–299.

Carr, M. and Chen, M. (2004) Globalization, social exclusion and gender. *International Labour Review* **143**, 129–160.

Chapman, M.D. (1987) Women's fishing in Oceania. *Human Ecology* **15**, 267–288.

Christensen, V., de la Puente, S., Sueiro, J.C., Steenbeek, J. and Majluf, P. (2014) Valuing seafood: The Peruvian fisheries sector. *Marine Policy* **44**, 302–311.

Chuenpagdee, R. and Jentoft, S. (2019) *Transdisciplinarity for Small-Scale Fisheries Governance: Analysis and Practice*. Springer International Publishing, Cham, Switzerland.

Chuenpagdee, R., Liguori, L., Palomares, M.L.D. and Pauly, D. (2006) Bottom-Up, Global Estimates of Small-Scale Marine Fisheries Catches. Vancouver.

Cisneros-Montemayor, A.M., Cisneros-Mata, M.A., Harper, S. and Pauly, D. (2013) Extent and implications of IUU catch in Mexico's marine fisheries. *Marine Policy* **39**, 283–288.

Cisneros-Montemayor, A.M., Harper, S. and Tai, T.C. (2018) The market and shadow value of informal fish catch: a framework and application to Panama. *Natural Resources Forum* **42**, 83–92.

Cisneros-Montemayor, A.M. and Sumaila, U.R. (2010) A global estimate of benefits from ecosystem-based marine recreation: Potential impacts and implications for management. *Journal of Bioeconomics* **12**, 245–268.

Clabots, B.M. (2013) Gender Dimensions of Community-Based Management of Marine Protected Areas in Siquijor, Philippines. Master's Thesis. University of Washington.

Coastal Resources Center (2016) USAID/COMFISH: Collaborative management for a sustainable fisheries future in Senegal. Available at: http://www.crc.uri.edu/stories_page/bridging-the-gender-and-cultural-gapin- senegals-fisheries-sector/ [Accessed December 8, 2016].

Commonwealth of Australia (2012) Australia's agriculture, fisheries and forestry at a glance 2012. Canberra.

Comunidad y Biodiversidad (2016) The women's fishing cooperative in the Gulf: aquarium fish. Available at: http://cobi.org.mx/en/strategic-lines/sustainable-fisheries/the-womens-fishing-cooperative-in-thegulf-%0Aaquarium-fish/ [Accessed April 27, 2016].

Cruz-Torres, M.L. (2004) Street of the Shrimp Ladies. *Yemaya* **17**, 2–4.

Cruz-Torres, M.L. (2012) Unruly women and invisible workers: the shrimp traders of Mazatlán, Mexico. *Signs* **37**, 610–17.

de la Torre-Castro, M. (2019) Inclusive Management Through Gender Consideration in Small-Scale Fisheries: The Why and the How. *Frontiers in Marine Science* **6**, 1–11.

de la Torre-Castro, M. De, Fröcklin, S., Börjesson, S., Okupnik, J. and Jiddawi, N.S. (2017) Gender analysis for better coastal management – Increasing our understanding of social-ecological seascapes. *Marine Policy* **83**, 62–74.

Delgado-Gustavson, V. (2011) Fishing Communities: Gender, Economic Life, and Welfare Regimes. Master's Thesis. Universitas Bergensis.

Deme, M., Thiao, D., Fambaye, N.S., Sarre, A. and Diadhiou, H.D. (2012) Dynamique des Populations de Sardinelles en Afrique du Nord-Ouest: Contraintes Environnementales, Biologiques et Socio Economiques. Narragansett, RI.

Derraik, J.G. (2002) The pollution of the marine environment by plastic debris: a review. *Marine pollution bulletin* **44**, 842–852.

Dobell, R. and Walsh, J. (2014) Narrative Trumps Numbers. In: *Counting on Marilyn Waring: New Advances in Feminist Economics*. (eds M. Bjornholt and A. McKay). Demeter Press, Bradford, pp 135–148.

Dyck, A.J. and Sumaila, U.R. (2010) Economic impact of ocean fish populations in the global fishery. *Journal of Bioeconomics* **12**, 227–243.

Elmhirst, R. and Resurreccion, B.P. (2008) Gender, Environment and Natural Resource Management: New Dimensions, New Debates. In: Gender and Natural Resource Management: Livelihoods, Mobility and Interventions. (eds R. Elmhirst and B.P. Resurreccion). International Development Research Centre, Ottawa, pp 18–37.

Emdon, L. (2013) Gender, Livelihoods and Conservation in Hluleka, Mpondoland c.1920 to the present: Land, Forests and Marine Resources. Master's Thesis. University of Cape Town.

Escobar, A. (2006) Difference and Conflict in the Struggle Over Natural Resources : A political ecology framework. *Development* **49**, 6–13.

Eswaran, M. (2014) *Why Gender Matters in Economics*. Princeton University Press, Princeton.

Fairbairn-Dunlop, T.P. (2014) A Pacific Way of Counting. In: *Counting on Marilyn Waring: New Advances in Feminist Economics*. (eds M. Bjornholt and A. McKay). Demeter Press, Bradford, pp 119–133.

FAO (2013) Good practice policies to eliminate gender inequalities in fish value chains. Rome.

FAO (2015) Informe final consultatoría sobre el análisis del rol de la muher en los sectores de la pesca y la acuicultura en el Perú [Consultancy analysis on the role of women in the fisheries and aquaculture sector of Peru]. Rome.

FAO (2014a) The State of World Fisheries and Aquaculture 2014. Rome.

FAO (2018) The State of world fisheries and aquctulture 2018 - Meeting the Sustainable Development Goals. Food and Agriculture Organization of the United Nations, Rome.

FAO (2017) *Towards gender-equitable small-scale fisheries governance and development: A handbook*. Food and Agriculture Organization of the United Nations, Rome.

FAO (2014b) Voluntary Guidelines for Securing Sustainable Small-scale Fisheries in the Context of Food Security and Poverty Eradication. Rome.

Folke, C., Carpenter, S.R., Walker, B., Scheffer, M. and Chapin, T. (2010) Resilience Thinking: Integrating Resilience, Adaptability and Transformability. *Ecology and Society* **15**, 20.

Fröcklin, S., de la Torre-Castro, M., Håkansson, E., Carlsson, A., Magnusson, M. and Jiddawi, N.S. (2014) Towards improved management of tropical invertebrate fisheries: including time series and gender. *PloS one* **9**, 1–12.

Garcia, A. (2000) Perú: Gender Issues in the Fisheries Sector. In: *Workshop on Gender and Coastal Fishing Communities in Latin America, 10 to 15 June 2000, Prainha do Canto Verde, Ceara, Brazil*. ICSF, Chennai, pp 97–110.

Gee, J. and Bacher, K. (2017) Engendering Statistics for Fisheries and Aquaculture. *Asian Fisheries Science Special Issue* **30S**, 277–290.

Gelcich, S., Hughes, T.P., Olsson, P., Folke, C., Defeo, O., Fernández, M. and Foale, S. (2010) Navigating transformations in governance of Chilean marine coastal resources. *PNAS* **107**, 16794–16799.

Gibson, D. and Sumaila, U.R. (2017) Determining the degree of "small-scaleness" using fisheries in British Columbia as an example. *Marine Policy* **86**, 121–126.

Gissi, E., Portman, M.E. and Hornidge, A. (2018) Un-gendering the ocean : Why women matter in ocean governance for sustainability Un-gendering the ocean : Why women matter in ocean governance for sustainability. *Marine Policy* **94**, 215–219.

Godoy, E. (2011) Mexican fisherwomen organise against climate change. Available at: http://www.ipsnews.net/2011/08/mexican-fisherwomen-organise-against-climate-change/ [Accessed April 27, 2016].

Grandcolas, D. (1997) Les femmes et la collecte des huitres dans le Saloum (Senegal). Dakar.

Grey, M. (2010) From the Tundra to the Boardroom to Everywhere in Between and the Changing roles of Inuit Women in the Arctic. In: *Indigenous Women and Feminism*. (eds C. Suzack, S.M. Huhndorf, J. Perreault and J. Barman). UBC Press, Vancouver, pp 21–28.

Groenmeyer, S. (2011) Women and Social Policy – Experiences of Some Black Working Women in Contemporary Post-Apartheid South Africa. PhD Dissertation. Norwegian University of Science and Technology.

Gueye, G. (2016) Voices from African Artisanal Fisheries. Stockholm.

Ha Thi Khiet (2007) Introductory statement on Vietnam's combined 5th and 6th National Report on the implementation of the UN Convention on the Elimination of all form of Discrimination Against Women (CEDAW). New York.

Hall-Arber, M. (2012) An Evaluation of the Roles of Women in Fishing Communities of Dakar, the Petit Cote, and Sine Saloum. Narragansett, RI.

Hall-Arber, M., Pomeroy, C. and Conway, F. (2009) Figuring Out the Human Dimensions of Fisheries: Illuminating Models. *Marine and Coastal Fisheries* **1**, 300–314.

Halpern, B.S., Klein, C.J., Brown, C.J., Beger, M., Grantham, H.S., Mangubhai, S., Ruckelshaus, M., Tulloch, V.J., Watts, M., White, C. and Possingham, H.P. (2013) Achieving the triple bottom line in the face of inherent trade-offs among social equity, economic return, and conservation. *Proceedings of the National Academy of Sciences of the United States of America* **110**, 6229–34.

Hanazaki, N., Berkes, F., Seixas, C.S. and Peroni, N. (2013) Livelihood Diversity, Food Security and Resilience among the Caiçara of Coastal Brazil. *Human Ecology* **41**, 153–164.

Harper, S., Grubb, C., Stiles, M. and Sumaila, U.R. (2017) Contributions by Women to Fisheries Economies: Insights from Five Maritime Countries. *Coastal Management* **45**, 91–106.

Harper, S., Guzmán, H.M., Zylich, K. and Zeller, D. (2014) Reconstructing Panama's Total Fisheries Catches from 1950 to 2010: Highlighting Data Deficiencies and Management Needs. *Marine Fisheries Review* **76**, 51–65.

Harper, S. and Kleiber, D.L. (2016) Counting on Women. *Yemaya* **51**, 2–4.

Harper, S., Salomon, A.K., Newell, D., Waterfall, P.H., Brown, K., Harris, L.M. and Sumaila, U.R. (2018) Indigenous women respond to fisheries conflict and catalyze change in governance on Canada's Pacific Coast. *Maritime Studies (MAST)* **17**, 189–198.

Harper, S. and Sumaila, U.R. (2019) Distributional impacts of fisheries subsidies and their reform. *IIED Working Paper* IIED, London.

Harper, S., Zeller, D., Hauzer, M., Pauly, D. and Sumaila, U.R. (2013) Women and fisheries: contribution to food security and local economies. *Marine Policy* **39**, 56–63.

Harris, D. (2000) Territoriality, Aboriginal Rights, and the Heiltsuk spawn-on-kelp fishery. *UBC Law Review* **34**, 195–238.

Harris, J., Branch, G., Sibiva, C. and Bill, C. (2003) The Sokhulu Subsistence Mussel Harvesting Project: Co-managementin Action. In: *Waves of Change: Coastal and Fisheries Co-management in Southern Africa*. (eds M. Hauck and M. Sowman). University of Cape Town Press, Lansdowne, pp 61–98.

Harris, L. (2009) Gender and emergent water governance: comparative overview of neoliberalized natures and gender dimensions of privatization, devolution and marketization. *Gender, Place & Culture* **16**, 387–408.

Harris, L., Kleiber, D., Goldin, J., Darkwah, A. and Morinville, C. (2017a) Intersections of gender and water: comparative approaches to everyday gendered negotiations of water access in underserved areas of Accra, Ghana and Cape Town, South Africa. *Journal of Gender Studies* **26**, 561–582.

Harris, L., Phartiyal, J., Scott, D.N. and Peloso, M. (2017b) Women talking about water. *Candian Women's Studies* **30**, 15–22.

Harris, L.M. (2006) Irrigation, gender, and social geographies of the changing waterscapes of southeastern Anatolia. *Environment and Planning D: Society and Space* **24**, 187–213.

Harris, L.M. (2008) Water Rich, Resource Poor: Intersections of Gender, Poverty, and Vulnerability in Newly Irrigated Areas of Southeastern Turkey. *World Development* **36**, 2643–2662.

Hauzer, M., Dearden, P. and Murray, G. (2013) The fisherwomen of Ngazidja island, Comoros: Fisheries livelihoods, impacts, and implications for management. *Fisheries Research* **140**, 28–35.

Hawkins, R. and Ojeda, D. (2011) Gender and environment: critical tradition and new challenges. Environment and Planning D: *Society and Space* **29**, 237–253.

HLPE (2014) Sustainable fisheries and aquaculture for food security and nutrition. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security. Rome.

Hue, L.T. Van (2008) Gender, Doi Moi and Coastal Resource Management in the Red River Delta Vietnam. In: *Gender and Natural Resource Management: Livelihoods, Mobility and Interventions*. (eds B.P. Resurreccion and R. Elmhirst). IDRC Books; Earthscan, London, pp 33–53.

ICSF (2002) Report of the Study on Problems and Prospects of Artisanal Fish Trade in West Africa. Chennai.

INEGI (2011) Pesca y acuicultura: Censos Económicos 2009. Aguascalientes.

Instituto Nacional de Estadística e Informática (2012) Perú - I Censo Nacional de la Pesca Artesanal del Ámbito Marítimo 2012 [Peru- First National Census of Artisanal Fishers]. Lima.

International Labour Organization (2013) Baseseline Surveys on Child Labour in Selected Areas in Thailand. Bangkok.

International Labour Organization (2018) Key Indicators of the Labour Market. Available at: http://laborsta.ilo.org/informal_economy_E.html [Accessed July 15, 2018].

International Labour Organization (2015) Migrant and Child Labor in Thailand's Shrimp and Other Seafood Supply Chains: Labour Conditions and the Decision to Study or Work. Bangkok.

Isaacs, M. (2013) Small-scale Fisheries Governance and Understanding the Snoek (Thyrsites atun) Supply Chain in the Ocean View Fishing Community, Western Cape, South Africa. *Ecology and Society* **18**, 17.

Isaacs, M., Hara, M. and Raakjær, J. (2007) Has reforming South African fisheries contributed to wealth redistribution and poverty alleviation? *Ocean & Coastal Management* **50**, 301–313.

Jacquet, J. and Pauly, D. (2008) Funding priorities: Big barriers to small-scale fisheries. *Conservation Biology* **22**, 832–835.

Jeebhay, M.F., Robins, T.G., Miller, M.E., Bateman, E., Smuts, M., Baatjies, R. and Lopata, A.L. (2008) Occupational Allergy and Asthma Among Salt Water Fish Processing Workers. *American Journal of Industrial Medicine* **51**, 899–910.

Jentoft, S. (2014) Walking the talk: implementing the international voluntary guidelines for securing sustainable small-scale fisheries. *Maritime Studies* **13**, 16.

John, S. (2015) Idle No More-Indigenous Activism and Feminism. *Theory in Action* **8**, 38–55.

Jones, R., Rigg, C. and Pinkerton, E. (2017) Strategies for assertion of conservation and local Strategies for assertion of conservation and local management rights: A Haida Gwaii herring story. *Marine Policy* **80**, 154–167.

Kantor, P. (2013) Transforming gender relations: Key to positive development outcomes in aquatic agricultural systems. CGIAR Research Program on Aquatic Agricultural Systems, Penang.

Kawarazuka, N., Locke, C., McDougall, C., Kantour, P. and Morgan, M. (2017). Bringing analysis of gender and social-ecological resiliance together in small-scale fisheries research: Challenges and opportunities. *Ambio* **46**, 201–213.

Kleiber, D., Harris, L.M. and Vincent, A.C.J. (2015) Gender and small-scale fisheries: a case for counting women and beyond. *Fish and Fisheries* **16**, 547–562.

Kleiber, D., Harris, L.M. and Vincent, A.C.J. (2014) Improving fisheries estimates by including women's catch in the Central Philippines. *Canadian Journal of Fisheries and Aquatic Sciences* **71**, 656–664.

Kronen, M., Friedman, K., Pinca, S., Chapman, Lindsay Awiva, R., Pakoa, K., Vigliola, L., Boblin, P. and Magron, F (2008) Pacific Regional Oceanic and Coastal Fisheries Development Programme French Polynesia Country Report. Noumea.

Kronen, M. and Vunisea, A. (2009) Fishing impact and food security – Gender differences in finfisheries across Pacific Island countries and cultural groups. *SPC Women in Fisheries Information Buletin*, 3–10.

Kuiper, E. and Barker, D.K. eds (2006) *Feminist Economics and the World Bank*. Routledge, New York.

Kuokkanen, R. (2011) From Indigenous Economies to Market-Based Self-Governance: A Feminist Political Economy Analysis. *Canadian Journal of Political Science* **2**, 275–297.

Kus, M. (2011) The Role of Religion in Determining Female Labor Force Participation Rates. Master's Thesis. Södertörn University.

Kyle, R., Pearson, B., Fielding, B., Robertson, W.D. and Birnie, S.L. (1997) Subsistence Shellfish Harvesting in the Maputaland Marine Reserve in the Northern Kwazulu-Natal, South Africa: Rocky Shore Organisms. *Biological Conservation* **82**, 183–192.

Leisher, C., Temsah, G., Booker, F., Day, M., Agarwal, B., Matthews, E., Roe, D., Russell, D., Samberg, L., Sunderland, T.and Wilkie, D. (2015) Does the gender composition of forest and fishery management groups affect resource governance and conservation outcomes: a systematic map protocol. *Environmental Evidence* **4**, 13.

Lentisco, A. and Phuong Thao, H.T. (2013) Strengthening livelihoods: A fisheries livelihoods programme is helping improve women's roles and participation in decision making in the Vietnamese fisheries. *Yemaya* **43**, 4–5.

MacDonald, M. (1995) Feminist Economics: From Theory to Research. *The Canadian Journal of Economics* **28**, 159–176.

Mackenzie, C.L. (2001) The Fisheries for mangrove cockles, Anadara spp., from Mexico to Peru, with descriptions of their habitats and biology, the fishermen's lives, and the effects of shrimp farming. *Marine Fisheries Review* **63**, 1–39.

Marshall, C. and Rossman, G.B. (2011) *Designing Qualitative Research*, Fifth. SAGE Publications, Thousand Oaks.

Masifundise Development Trust (2010) A Handbook Towards Sustainable Small-scale Fisheries in South Africa: Promoting Poverty Alleviation, Food Security and Gender Equity in Small-scale Fisheries. Cape Town.

Mastrandrea, M.D., Field, C.B., Stocker, T.F., Edenhofer, O., Ebi, K.L., Frame, D.J., Held, H., Kriegler, E., Mach, K.J., Matschoss, P.R., Plattner, G., Yohe, G.W. and Zwiers, F.W. (2010) Guidance Note for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties. Jasper Ridge.

Matthews, E. (1995) *Fishing for Answers: Women and Fisheries in the Pacific Islands*. Women and Fisheries Network, Suva.

Matthews, E., Bechtel, J., Britton, E., Morrison, K. and McClennen, C. (2012) A Gender Perspective on Securing Livelihoods and Nutrition in Fish-dependent Coastal Communities. Bronx, NY.

McCrea-Strub, A. Kleisner, K., Sumaila, U.R., Swartz, W., Watson, R., Zeller, D. and Pauly, D. (2011) Potential impact of the Deepwater Horizon oil spill on commercial fisheries in the Gulf of Mexico. *Fisheries Research* **36**, 332–336.

Meltzoff, S.K. (1995) Marisquadoras of the Shellfish Revolution: The Rise of Women in Co-management on Illa de Arousa. *Journal of Political Ecology* **2**, 20–38.

Ministerio de la Mujer y Poblaciones Vulnerables (2016) No Title. Available at: http://www.mimp.gob.pe/ [Accessed December 12, 2016].

Mohanty, C.T. (1991) Cartographies of Struggle. In: *Third World Women and the Politics of Feminism*. (eds C.T. Mohanty, A. Russo and L. Torres). Indiana University Press, Bloomington, pp 1–47.

Monfort, M.C. (2015) The role of women in the seafood industry. GLOBEFISH Research Programme, Rome.

Moore, M., Tjornbo, O., Enfors, E., Knapp, C., Hodbod, J., Baggio, J.A. and Norström, A. (2014) Studying the complexity of change: toward an analytical framework for understanding deliberate social-ecological transformations. *Ecology and Society* **19**, 54.

Nadel-Klein, J. and Davis, D.L. (1988) *To Work and to Weep: Women in Fishing Economies*. Institute of Social and Economic Research, Memorial University of Newfoundland, Saint John's.

Nazneen, S., Hossain, N. and Sultan, M. (2011) National Discourses on Women's Empowerment in Bangladesh: Continuities and Change. London.

Neis, B., Binkley, M., Gerrard, S. and Maneschy, M.C. (2005) *Changing Tides: Gender, Fisheries and Globalization*. Fernwood Publishing, Halifax.

Neuwirth, R. (2011) Global Bazaar. *Scientific American* **305**, 56–63.

Newell, D. (1997) *Tangled Webs of History: Indians and the Law in Canada's Pacific Coast Fisheries*, 2nd printi. University of Toronto Press, Toronto.

Nightingale, A.J. (2011) Bounding difference: Intersectionality and the material production of gender, caste, class and environment in Nepal. *Geoforum* **42**, 153–162.

Ñopo, H., Daza, N. and Ramos, J. (2011) Gender Earnings Gaps in the World. Bogotá.

Norman, E.S. (2017) Standing Up for Inherent Rights: The Role of Indigenous-Led Activism in Protecting Sacred Waters and Ways of Life. *Society & Natural Resources* 4, 537–553.

Nuruzzaman, M., Selim, S.U.M. and Hiru Miah, M. (2014) Rights, Benefits and Social Justice: Status of Women Workers Engaged in the Shrimp Processing Industries of Bangladesh. *Asian Fisheries Science* **27S**, 151–163.

Ogden, L.E. (2017) Fisherwomen-The uncounted dimension in fisheries management. *BioScience* **67**, 111–117.

Olsson, P., Gunderson, L.H., Carpenter, S.R., Ryan, P., Lebel, L., Folke, C. and Holling, C.S. (2006) Shooting the Rapids: Navigating Transitions to Adaptive Governance of Social-Ecological Systems. *Ecology and Society* **11**, 18.

Palmater, P.D. (2011) Stretched Beyond Human Limits: Death By Poverty in First Nations. *Canadian Review of Social Policy* **65/66**, 112–127.

Pandolfelli, L., Meinzen-Dick, R. and Dohrn, S. (2008) Gender and Collective Action: Motivations, effectiveness and impact. *Journal of International Development* **20**, 1–11.

Pardo, M. (1990) Mexican American Women Grassroots Community Activists: " Mothers of East Los Angeles." *Frontiers: A Journal of Women Studies* **11**, 1–7.

Parisi, L. and Corntassel, J. (2007) In pursuit of self-determination: Indigenous women's challenges to traditional diplomatic spaces. *Canadian Foreign Policy Journal* **13**, 81–98.

Pauly, D. (2006) Major trends in small·scale marine fisheries, with emphasis on developing countries, and some implications for the social sciences. *Maritime Studies (MAST)* **4**, 7–22.

Pauly, D. (1998) Rationale for reconstructing catch time series. *EC Fisheries Cooperation Bulletin* **11**, 4–7.

Pauly, D., Christensen, V., Guénette, S., Pitcher, T.J., Sumaila, U.R., Walters, C.J., Watson, R. and Zeller, D. (2002) Towards sustainability in world fisheries. *Nature* **418**, 689–696.

Pauly, D. and Zeller, D. (2016a) Catch reconstructions reveal that global marine fisheries catches are higher than reported and declining. *Nature Communications* **7**, 10244.

Pauly, D. and Zeller, D. (2016b) *Global Atlas of Marine Fisheries*. Island Press, Washington, DC.

Pérez-Brito, E., Galmiche-Tejeda, Á., Zapata-martelo, E., Martínez-Becerra, Á. and Meseguer-elizondo, R. (2012) Contexto de vulnerabilidad de las Mujeres Desconchadoras de Ostion (Crassostrea virginica), del Ejodo Sinaloa, Primera Seccion, De Cardenas Tabasco [Vulnerability Context of Women Oyster Shellers (Crassostrea virginica) in Ejido Sinaloa Primera Seccion]. *Agricultura, Sociedad Y Desarrollo* **9**, 123–148.

Piedra, G.P. (2008) Hacia el trabajo decente en el Perú: la mujer en la industria pesquera. Geneva.

Polido, L. and Peña, D. (1998) Environmentalism and Positionality: The Early Pesticide Campaign of the United Farm Workers' Organizing Committee, 1965-71. *Race, Class & Gender* **6**, 33–50.

Porras, I (2019) No hidden catch. Mainstreaming values of small-scale fisheries in national accounts. IIED, London.

Von der Porten, S., Lepofsky, D., Mcgregor, D. and Silver, J. (2016) Recommendations for marine herring policy change in Canada: Aligning with Indigenous legal and inherent rights. *Marine Policy* **74**, 68–76.

Porter, M. (2014) What Does Feminist Methodology Contribute to Gender and Fisheries Science? *Asian Fisheries Science Special Issue* **27S**, 119–133.

Porter, P. and Sheppard, E. (1998) Views from the periphery. In: *A World of Difference.* Guilford Press, London, pp 96–119.

Power, M. (2004) Social Provisioning as a Starting Point for Feminist Economics. *Feminist Economics* **10**, 3–19.

Pryck, J.D. De and Termine, P. (2014) Gender Inequalities in Rural Labor Markets. In: *Gender in Agriculture: Closing the Knowledge Gap*. (eds A.R. Quisumbing, R. Meinzen-Dick, T.L. Raney, A. Croppenstedt, J.A. Behrman and A. Peterman). Springer Netherlands, Dordrecht, pp 343–370.

Purcell, S.W., Ngaluafe, P., Aram, K.T. and Lalavanua, W. (2016) Trends in small-scale artisanal fishing of sea cucumbers in Oceania. *Fisheries Research* **183**, 99–110.

Ram-Bidesi, V. (2015) Recognizing the role of women in supporting marine stewardship in the Pacific Islands. *Marine Policy* **59**, 1–8.

Reed, M.G. and Christie, S. (2009) Environmental geography: we're not quite home, reviewing the gender gap. *Progress in Human Geography* **33**, 246–255.

Reedy-Maschner, K. (2009) Chercher Les Poissons: Gender Roles in an Aleut Indigenous Commercial Economy. In: *Gender, Culture and Northern Fisheries*. (ed J. Kafarowski). CCI Press, Edmonton, pp 3–28.

Richardson, L., Loomis, J., Kroeger, T. and Casey, F. (2015) The role of benefit transfer in ecosystem service valuation. *Ecological Economics* **115**, 51–58.

Rohe, J.R. (2012) Shifting policy, shifting industry - Fisherwomen in a sea of change: A gender approach to social wellbeing in a South African small-scale fishing community. Master's Thesis. University of Amsterdam.

Salazar, H. and Castañeda, I. (2002) Background paper: Mexico-Women in Fisheries. In: *Workshop on Gender and Coastal Fishing Communities in Latin America: 10 to 15 June 2000, Prainha do Canto Verde, Ceara, Brazil*. International Collective in Support of Fishworkers, Chennai, pp 45–96.

Sayers, J.F., MacDonald, K.A., Fiske, J., Newell, M., George, E. and Cornet, W. (2001) First Nations Women, Governance and the Indian Act: A Collection of Policy Research Reports. Ottawa.

Schlosberg, D. (2009) *Defining Environmental Justice: Theories, Movements and Nature*. Oxford University Press, Oxford.

Schuhbauer, A., Chuenpagdee, R., Cheung, W.W.L., Greer, K. and Sumaila, U.R. (2017) How subsidies affect the economic viability of small-scale fisheries. *Marine Policy* **82**, 114–121.

Seguino, S. (2000) Accounting for Gender in Asian Economic Growth. *Feminist Economics* **6**, 27–58.

Silva, C.N. (2000) Perú: Women in the Fisheries Sector. In: *Workshop on Gender and Coastal Fishing Communities in Latin America*. ICSF, Chennai, pp 111–113.

Singh, G.G., Cisneros-montemayor, A.M., Swartz, W., Cheung, W., Guy, J.A., Mcowen, C.J., Asch, R., Laurens, J., Wabnitz, C.C.C., Sumaila, R., Hanich, Q. and Ota, Y. (2018) A rapid assessment of co-benefits and trade-offs among Sustainable Development Goals. *Marine Policy* **93**, 223–231.

Soares, D., Castorena, L. and Ruiz, E. (2005) Mujeres y hombres que aran en el mar y en el desierto. *Frontera Norte* **17**, 67–102.

Soumare, A. (2006) Senegal Role of Women in a Model of Community Management of Fish Resources and Marine Environments, Cayar. Dakar.

Sowman, M. and Cardoso, P. (2010) Small-scale fisheries and food security strategies in countries in the Benguela Current Large Marine Ecosystem (BCLME) region: Angola, Namibia and South Africa. *Marine Policy* **34**, 1163–1170.

Srinivasan, U., Watson, R. and Sumaila, U. (2012) Global fisheries losses at the exclusive economic zone level, 1950 to present. *Marine Policy* **36**, 544–549.

Staeheli, L., Kofman, E. and Peake, L. eds (2004) *Mapping Women, Making Politics*, 1st edn. Routledge, New York and London.

Status of Women Canada (2018) What is GBA+? Available at: https://www.swc-cfc.gc.ca/gba-acs/index-en.html [Accessed December 21, 2018].

STECF (2017) *The 2017 Annual Economic Report on the EU Fishing Fleet (STECF 17-12)*. Publications Office of the European Union, Luxembourg.

Stiglitz, J.E., Sen, A. and Fitoussi, J.-P. (2010) *Mis-measuring our lives: why GDP doesn't add up*. The New Press, New York.

Sumaila, U.R., Cheung, W.W.L., Lam, V.W.Y., Pauly, D. and Herrick, S. (2011) Climate change impacts on the biophysics and economics of world fisheries. *Nature Climate Change* **1**, 449–456.

Sumaila, U.R., Khan, A.S., Dyck, A.J., Watson, R., Munro, G., Tydemers, P. and Pauly, D. (2010) A bottom-up re-estimation of global fisheries subsidies. *Journal of Bioeconomics* **12**, 201–225.

Sumaila, U.R., Marsden, a. D., Watson, R. and Pauly, D. (2007) A Global Ex-vessel Fish Price Database: Construction and Applications. *Journal of Bioeconomics* **9**, 39–51.

Sunde, J. (2002) On the brink: Traditional fishing communities in South Africa are struggling to find a secure future in the sector. *Yemaya* **11**, 2–3.

Sunde, J. (2010) WIF South Africa Workshop: Recasting the Net: Redefining a Gender Agenda for Sustaining Life and Livelihood in Small-scale Fisheries in South Africa. Lambertsbaai, South Africa.

Swartz, E. (2013) Women and the management of household food security in Paternoster.

Swartz, W., Sumaila, R. and Watson, R. (2012) Global Ex-vessel Fish Price Database Revisited: A New Approach for Estimating 'Missing' Prices. *Environmental and Resource Economics* **56**, 467–480.

Tai, T.C., Cashion, T., Lam, V.W.Y., Swartz, W. and Sumaila, U.R. (2017) Ex-vessel Fish Price Database: Disaggregating Prices for Low-Priced Species from Reduction Fisheries. *Frontiers in Marine Science* **4**, 1–10.

Teh, L.C.L. and Sumaila, U.R. (2013) Contribution of marine fisheries to worldwide employment. *Fish and Fisheries* **14**, 77–88.

Than Thi Hien (2008) Women in Fisheries and Community based Coastal Resource Management in Vietnam: Issues and Challenges. 17.

Thinh, H.B. (2009) Rural employment and life: Challenges to gender roles in Vietnam's agriculture at present. Rome.

Thomas, A.S., Mangubhai, S., Vandervord, C., Fox, M. and Thomas, A.S. (2018) Impact of Tropical Cyclone Winston on women mud crab fishers in Fiji. *Climate and Development*, 1–11.

Thorpe, A., Pouw, N., Baio, A., Sandi, R., Ndomahina, E.T. and Lebbie, T. (2014) "Fishing Na Everybody Business": Women's Work and Gender Relations in Sierra Leone's Fisheries. *Feminist Economics* **20**, 53–77.

Tickler, D., Meeuwig, J.J., Bryant, K., David, F., Forrest, J.A.H., Gordon, E., Larsen, J.J., Oh, B., Pauly, D., Sumaila, U.R. and Zeller, D. (2018) Modern slavery and the race to fish. *Nature Communications* **9**, 1–9.

Tsosie, R. (2010) Native women and leadership: an ethic of culture and relationship. In: *Indigenous Women and Feminism*. (ed and J.B. Cheryl Suzack, Shari M. Huhndorf, Jeanne Perreault). UBC Press, Vancouver, pp 29–42.

Udel, L.J. (2001) Revision and Resistance : The Politics of Native Women's Motherwork. *Frontiers: A Journal of Women's Studies* **22**, 43–62.

United Nations (2014) Composition of macro geographical (continental) regions, geographical subregions, and slected economic and other groupings. Available at: http://unstats.un.org/unsd/methods/m49/m49regin.htm [Accessed December 12, 2016].

United Nations (2016) Sustainable development goals. Available at: http://www.un.org/sustainabledevelopment/gen der-equality/ [Accessed December 8, 2016].

United Nations Development Programmme (2015) Human development reports. Available at: http://hdr.undp.org/en/composite/HDI [Accessed December 21, 2016].

United Nations Statistics Division (2018) Countries or areas / geographical regions. Available at: https://unstats.un.org/unsd/methodology/m49/ [Accessed December 15, 2018].

Valdez-Gardea, G.C. (2001) People's Response in a Time of Crisis: Marginalization in the Upper Gulf of California.

Velile Jiyane, G. and Fairer-Wessels, F. (2012) Dissemination of information on climate change : a case study of women mussel harvesters at KwaNgwanase in KwaZulu-Natal. *Mousaion* **30**, 19–38.

Vincent, A.C.J. and Harris, J.M. (2014) Boundless no more. *Science* **346**, 420–421.

Vunisea, A. (2004) The challenges of seafood marketing in Fiji. *SPC Women in Fisheries Information Buletin* **14**, 3–8.

Wade, A., Faye, A. and Korsrud, M. (1997) Senegal. In: *Globalization, Gender and Fisheries: Report of the Senegal Workshop on Gender Perspective in Fisheries*. (ed Sumadra Editorial), Women in F. International Collective in Support of Fishworkers, Chennai, pp 20–21.

Walker, B., Holling, C.S., Carpenter, S.R. and Kinzig, A. (2004) Resilience, Adaptability and Transformability in Social – ecological Systems. *Ecology and Society* **9**, 5.

Walker, B.L.E. and Robinson, M. (2009) Economic development, marine protected areas and gendered access to fishing resources in a Polynesian lagoon. *Gender, Place & Culture* **16**, 467–484.

Walter, C. (2006) Femmes et Coquillages: Vers une Gestion Participative de la Ressource. Brest.

Waring, M. (1988) *If Women Counted: A New Feminist Economics*. Harper & Row, San Francisco.

Waterfall, P. (Hilistis) (1993) Traditional Roles of Heiltsuk Women in Collective Decision-Making. Waglisla.

Weeratunge, N., Béné, C., Siriwardane, R., Charles, A., Johnson, D., Allison, E.H., Nayak, P.K. and Badjeck, M.-C. (2014) Small-scale fisheries through the wellbeing lens. *Fish and Fisheries* **15**, 255–279.

Weeratunge, N., Snyder, K. a and Sze, C.P. (2010) Gleaner, fisher, trader, processor: understanding gendered employment in fisheries and aquaculture. *Fish and Fisheries* **11**, 405–420.

Westermann, O., Ashby, J. and Pretty, J. (2005) Gender and social capital: The importance of gender differences for the maturity and effectiveness of natural resource management groups. *World Development* **33**, 1783–1799.

Westley, F.R., Tjornbo, O., Schultz, L., Olsson, P., Folke, C., Crona, B. and Bodin, Ö. (2013) A Theory of Transformative Agency in Linked Social-Ecological Systems. *Ecology and Society* **18**, 1–27.

Whyte, K.P. (2014) Indigenous Women, Climate Change Impacts and Collective Action. *Hypatia* **29**, 599–616.

Williams, M.J. (2008) Why Look at Fisheries through a Gender Lens? *Development* **51**, 180–185.

Williams, M.J., Gopal, N., Kusakabe, K., Nietes Satapornvanit, A. and Egna, H. (2018) Expanding Horizons: From Nurturing Fish to Nurturing Society. *INFOFISH* **5**, 28–32.

Williams, M.J., Nandeesha, M.C. and Choo, P.S. (2005) Changing Traditions: First Global Look at the Gender Dimensions of Fisheries. *NAGA, WorldFish Center Newsletter* **28**, 33–36.

Williams, M.J., Porter, M., Choo, P.S., Kusakabe, K., Vuki, V., Gopal, N. and Bondad-Reantaso, M. (2012) Gender in aquaculture and fisheries: Moving the agenda forward. *Asian Fisheries Science* **25**, 1–13.

Williams, S.B. (2002) Making each and every African fisher count: women do fish. WorldFish, Penang.

Williams, S.B. (2000) Economic Potentials of Women in Small-scale Fisheries in West Africa. In: *International Institute of Fisheries Economics and Trade Conference July 10-15, 2000*. IIFET, Corvallis, Oregon, p 6.

World Bank (2018) PPP Conversion Factor. Available at: https://data.worldbank.org/indicator/PA.NUS.PPP [Accessed January 3, 2019].

World Bank (2016) Worldwide governance indicators. Available at: https://datacatalog.worldbank.org/dataset/worldwide-governance-indicators [Accessed December 21, 2016].

World Bank (2013) Women, Business and the Law 2014. Washington, D.C.

World Bank (2010) Hidden Harvest: The Global Contribution of Capture Fisheries. Washington, DC.

World Bank (2005) Vietnam Fisheries and Aquaculture Sector Study Final Report. Hanoi.

World Economic Forum (2014) The Global Gender Gap Report 2014. Geneva.

Worm, B., Barbier, E.B., Beaumont, N., Duffy, J.E., Halpern, B.S., Jackson, J.B.C., Lotze, H.K., Micheli, F., Palumbi, S.R., Sala, E., Selkoe, K.A., Stachowicz, J.J., Watson, R., Worm, B., Barbier, E.B., Beaumont, N., Duffy, J.E., Folke, C., Halpern, B.S., Jackson, J.B.C., Lotze, H.K., Micheli, F., Palumbi, S.R., Sala, E. and Selkoe, K.A. (2006) Impacts of Biodiversity Loss on Ocean Ecosystem Services. *Science* **314**, 787–790.

Zeller, D., Booth, S., Davis, G. and Pauly, D. (2007) Re-estimation of small-scale fishery catches for U.S . flag-associated island areas in the western Pacific: the last 50 years. *US Fishery Bulletin* **105**, 266–277.

Zeller, D., Harper, S., Zylich, K. and Pauly, D. (2015) Synthesis of underreported small-scale fisheries catch in Pacific island waters. *Coral Reefs* **34**, 25–39.

Zhao, M., Tyzack, M., Anderson, R. and Onoakpovike, E. (2013) Women as visible and invisible workers in fisheries: A case study of Northern England. *Marine Policy* **37**, 69–76.

Appendix A Participation, catch, and landed value by country

Table A1. Participation by women in small-scale fishing activities as a participation rate and numbers estimated based on these rates and total number of small-scale fishers.

Country	Female participation rate SSF	# of female participants
Albania	0.08	276
Algeria	0.00	0
Angola	0.05	900
Antigua Barb	0.10	600
Argentina	0.24	2,178
Australia	0.13	4,480
Bahamas	0.10	2,794
Bahrain	0.02	950
Bangladesh	0.05	130,000
Barbados	0.10	2,483
Belgium	0.03	17
Belize	0.06	602
Benin	0.05	1,661
Brazil	0.45	495,000
Brunei	0.10	49
Bulgaria	0.02	4
Cambodia	0.10	15,573
Cameroon	0.05	1,500
Canada	0.14	2,565
Cape Verde	0.05	805
Chile	0.23	13,110
China	0.22	68,200
Colombia	0.24	24,200
Comoros Isl.	0.28	7,991
Congo, R. of	0.05	10,000
Congo (ex-Zaire)	0.05	255
Costa Rica	0.06	514
Côte d'Ivoire	0.05	367
Croatia	0.08	123
Cuba	0.25	250,000
Cyprus	0.02	15
Denmark	0.04	263
Djibouti	0.28	193
Dominica	0.10	228
Dom. Rep.	0.00	140

Table A1. Participation by women in small-scale fishing activities as a participation rate and numbers estimated based on these rates and total number of small-scale fishers.

Country	Female participation rate SSF	# of female participants
Ecuador	0.24	11,616
Egypt	0.03	16,750
El Salvador	0.15	3,040
Eq Guinea	0.05	380
Eritrea	0.28	1,075
Estonia	0.03	149
Fiji	0.46	17,020
Finland	0.03	1,181
France	0.03	300
Gabon	0.05	125
Gambia	0.05	1,560
Georgia	0.02	30
Germany	0.01	20
Ghana	0.03	300
Greece	0.07	321
Grenada	0.10	414
Guatemala	0.06	19
Guinea	0.05	4,127
Guinea-Bissau	0.05	4,178
Guyana	0.24	11,616
Haiti	0.10	31,040
Honduras	0.06	2,384
Hong Kong	0.18	1,418
Iceland	0.03	116
India	0.05	69,000
Indonesia	0.10	110,000
Iran	0.00	0
Ireland	0.03	51
Israel	0.02	22
Italy	0.08	2,160
Jamaica	0.06	5,400
Japan	0.13	31,200
Jordan	0.02	2
Kenya	0.28	744
Kiribati	0.35	8,050
Korea South	0.18	14,175
Kuwait	0.02	467

Table A1. Participation by women in small-scale fishing activities as a participation rate and numbers estimated based on these rates and total number of small-scale fishers.

Country	Female participation rate SSF	# of female participants
Latvia	0.03	59
Lebanon	0.02	233
Liberia	0.05	856
Libya	0.00	0
Lithuania	0.03	67
Madagascar	0.46	69,000
Malaysia	0.18	17,150
Maldives	0.03	480
Malta	0.08	15
Marshall Isl	0.31	1,595
Mauritania	0.05	1,460
Mauritius	0.28	1,791
Mexico	0.00	440
Micronesia	0.25	9,500
Morocco	0.00	0
Mozambique	0.28	12,600
Myanmar	0.10	41,853
Namibia	0.00	0
Nauru	0.31	123
Netherlands	0.05	135
New Zealand	0.13	550
Nicaragua	0.06	1,004
Nigeria	0.13	76,800
Norway	0.03	93
Oman	0.03	93
Pakistan	0.03	44,800
Palau	0.32	800
Panama	0.03	476
PNG	0.48	216,000
Peru	0.05	2,024
Philippines	0.10	28,227
Poland	0.02	90
Portugal	0.08	192
Qatar	0.02	40
Romania	0.02	460
Russian Fed	0.02	400
Saint Kitts & Nevis	0.10	352

Table A1. Participation by women in small-scale fishing activities as a participation rate and numbers estimated based on these rates and total number of small-scale fishers.

Country	Female participation rate SSF	# of female participants
Samoa	0.20	2,400
Sao Tome Prn	0.05	335
Saudi Arabia	0.00	0
Senegal	0.02	1,337
Seychelles	0.28	165
Sierra Leone	0.05	1,560
Singapore	0.10	749
Solomon Isl	0.42	3,234
Somalia	0.28	6,889
South Africa	0.20	5,800
Spain	0.09	630
Sri Lanka	0.03	2,336
St Vincent	0.10	248
St. Lucia	0.10	662
Sudan	0.03	180
Suriname	0.24	8,954
Sweden	0.03	59
Syria	0.02	10
Taiwan	0.18	12,775
Tanzania	0.09	4,455
Thailand	0.15	34,960
Togo	0.05	554
Tonga	0.17	816
Trinidad & Tob	0.10	11,381
Tunisia	0.10	1,100
Turkey	0.02	480
Ukraine	0.02	500
United Kingdom	0.02	240
Utd Arab Em	0.03	71
Uruguay	0.24	266
USA	0.09	21,620
Vanuatu	0.45	861
Venezuela	0.24	5,566
Vietnam	0.04	68,000
Yemen	0.02	767
Globally	**0.11**	**2,118,040**

Table A2. Estimated catch taken by women for all maritime fishing countries and entities of the world, including upper and lower bounds of 95% confidence interval, calculated using a Monte Carlo simulation, and the associated landed value of the catch in 2010 USD.

Country	Catch by women (t)	Lower (2.5%)	Upper (97.5%)	Landed value (2010 USD)
Albania	31	17	47	32,140
Algeria	0	0	0	0
American Samoa	12	6	18	50,880
Angola	11,500	6,020	16,900	29,820,000
Anguilla	164	86	242	1,063,000
Antigua Barb	390	206	577	1,258,000
Argentina	46,300	24,000	68,200	69,010,000
Aruba	20	10	29	92,880
Ascension Isl.	1	0	1	2,544
Australia	5,430	4,400	6,470	53,490,000
Azores Isl.	93	49	138	154,000
Bahamas	494	260	731	1,923,000
Bahrain	906	473	1,320	3,369,000
Bangladesh	41,600	29,700	53,400	32,750,000
Barbados	266	140	393	322,500
Belgium	0	0	0	204
Belize	398	208	586	676,200
Benin	3,400	1,790	5,000	3,765,000
Bermuda	61	32	90	405,500
Bonaire	30	16	44	108,000
Bosnia	4	2	6	5,844
Brazil	204,000	165,000	242,000	488,100,000
British Virgin Isl.	388	204	571	1,960,000
Brunei	1,230	643	1,800	2,053,000
Bulgaria	15	8	22	38,430
Cambodia	2,020	1,060	2,990	2,714,000
Cameroon	6,280	3,300	9,220	6,961,000
Canada	8,600	7,770	9,410	20,150,000
Cape Verde	400	211	595	1,059,000
Cayman Isl.	0	0	0	1,417
Channel Isl.	15	8	22	46,320
Chile	227,000	205,000	248,000	371,800,000
China	746,000	533,000	956,000	1,342,000,000
Christmas Isl.	3	1	4	16,110
Cocos (Keeling) Isl.	10	5	15	46,940
Colombia	3,650	1,920	5,390	7,104,000
Comoros	5,140	2,710	7,620	8,031,000

Table A2. Estimated catch taken by women for all maritime fishing countries and entities of the world, including upper and lower bounds of 95% confidence interval, calculated using a Monte Carlo simulation, and the associated landed value of the catch in 2010 USD.

Country	Catch by women (t)	Lower (2.5%)	Upper (97.5%)	Landed value (2010 USD)
Congo (ex-Zaire)	638	336	943	1,699,000
Congo, R. of	1,750	922	2,590	3,709,000
Cook Islands	125	65	184	552,900
Costa Rica	557	296	825	895,100
Cote D'Ivoire	2,600	1,380	3,850	3,500,000
Croatia	951	494	1,400	1,308,000
Cuba	6,670	5,410	7,950	15,920,000
Curacao	125	65	183	505,300
Denmark	1,320	1,070	1,570	2,641,000
Djibouti	564	294	828	1,255,000
Dominica	159	83	234	432,000
Dominican Republic	20	14	25	38,370
Ecuador	25,600	13,400	37,700	37,580,000
Egypt	956	502	1,410	1,878,000
El Salvador	2,510	1,790	3,220	2,326,000
Equatorial Guinea	447	236	662	1,208,000
Eritrea	1,100	569	1,600	1,551,000
Estonia	181	95	265	61,120
Faeroe Isl.	468	245	687	1,050,000
Falkland Isl.	1	1	2	2,288
Fiji	12,900	10,500	15,400	51,481,000
Finland	283	149	421	120,300
France	3,250	2,620	3,870	12,460,000
French Guiana	875	463	1,300	2,217,000
French Polynesia	2,880	2,340	3,440	13,190,000
Gabon	2,000	1,050	2,960	3,907,000
Gambia	4,130	2,180	6,110	3,122,000
Gaza Strip	40	21	59	96,350
Georgia	91	48	134	96,920
Germany	30	24	36	33,900
Ghana	6,190	3,290	9,200	7,002,000
Greece	6,600	5,260	7,940	36,570,000
Greenland	244	197	290	763,700
Grenada	242	127	357	469,800
Guadeloupe	1,100	575	1,610	2,432,000
Guam	8	4	12	40,920
Guatemala	1,670	878	2,460	2,118,000
Guinea	8,560	4,440	12,500	6,412,000

Table A2. Estimated catch taken by women for all maritime fishing countries and entities of the world, including upper and lower bounds of 95% confidence interval, calculated using a Monte Carlo simulation, and the associated landed value of the catch in 2010 USD.

Country	Catch by women (t)	Lower (2.5%)	Upper (97.5%)	Landed value (2010 USD)
Guinea-Bissau	1,750	916	2,580	2,721,000
Guyana	7,940	4,120	11,590	11,760,000
Haiti	2,510	1,310	3,680	4,167,000
Honduras	834	437	1,230	2,331,000
Hong Kong	643	341	954	1,083,000
Iceland	768	406	1,130	1,544,000
India	67,300	54,500	80,000	75,710,000
Indonesia	169,000	121,000	217,000	253,400,000
Iran	0	0	0	0
Iraq	112	58	164	305,600
Ireland	277	146	408	957,100
Israel	18	10	27	62,730
Italy	4,390	3,450	5,300	31,040,000
Jamaica	2,070	1,480	2,660	3,578,000
Japan	173,000	140,000	207,000	487,000,000
Jordan	4	2	6	7,593
Kenya	3,580	1,890	5,320	9,277,000
Kiribati	7,580	5,410	9,720	8,121,000
Korea (North)	30,800	16,200	45,600	26,660,000
Korea (South)	74,700	39,200	110,000	119,500,000
Kuwait	284	149	419	510,700
Latvia	194	101	285	78,380
Lebanon	125	66	185	231,500
Lord Howe Isl.	4	2	6	22,740
Liberia	1,290	676	1,900	1,592,000
Libya	0	0	0	0
Lithuania	28	15	41	18,850
Madagascar	52,300	37,700	67,700	98,040,000
Madeira Isl.	189	99	279	648,900
Malaysia	113,000	80,800	145,000	213,100,000
Maldives	2,010	1,040	2,940	4,560,000
Malta	61	32	90	241,300
Marshall Isl.	1,250	647	1,830	2,129,000
Martinique	703	373	1,050	2,025,000
Mauritania	10,100	5,300	14,800	9,044,000
Mauritius	1,350	709	1,990	2,863,000
Mayotte	660	346	972	3,175,000
Mexico	2,010	1,440	2,590	4,065,000

Table A2. Estimated catch taken by women for all maritime fishing countries and entities of the world, including upper and lower bounds of 95% confidence interval, calculated using a Monte Carlo simulation, and the associated landed value of the catch in 2010 USD.

Country	Catch by women (t)	Lower (2.5%)	Upper (97.5%)	Landed value (2010 USD)
Micronesia	2,430	1,740	3,120	9,717,000
Montenegro	34	17	49	50,900
Montserrat	6	3	9	20,280
Morocco	0	0	0	0
Mozambique	31,500	22,500	40,500	39,420,000
Myanmar	40,800	21,400	60,400	50,600,000
Namibia	0	0	0	0
Nauru	161	85	240	322,600
Netherlands	4	3	5	32,780
New Caledonia	2,460	1,230	3,630	12,090,000
New Zealand	13,200	9,440	16,900	31,110,000
Nicaragua	1,120	589	1,660	2,521,000
Nigeria	43,900	35,700	52,400	93,410,000
Niue	32	16	46	102,500
Norfolk Isl.	1	1	2	8,054
North Cyprus	10	5	15	61,150
North Marianas	20	10	30	61,890
Norway	8,380	6,780	9,980	21,130,000
Oman	5,800	4,690	6,890	12,430,000
Pakistan	17,500	9,190	25,700	16,180,000
Palau	758	542	975	2,886,000
Panama	883	634	1,139	2,653,000
Papua New Guinea	18,000	12,900	23,200	35,730,000
Peru	36,300	32,800	39,700	73,140,000
Philippines	62,100	32,600	91,600	95,310,000
Pitcairn	1	0	1	984
Poland	361	257	463	238,500
Portugal	6,260	3,310	9,310	12,920,000
Puerto Rico	78	41	115	269,100
Qatar	587	308	865	2,643,000
Réunion	125	66	185	593,100
Romania	20	10	29	44,110
Russian Federation	16,800	8,760	24,700	12,230,000
Saba & St Eustaius	32	17	46	298,300
Saint Helena	4	2	6	12,870
Saint Kitts & Nevis	170	89	251	717,300
Saint Lucia	141	74	209	274,300
Saint Pierre & Miq	33	18	49	87,080

Table A2. Estimated catch taken by women for all maritime fishing countries and entities of the world, including upper and lower bounds of 95% confidence interval, calculated using a Monte Carlo simulation, and the associated landed value of the catch in 2010 USD.

Country	Catch by women (t)	Lower (2.5%)	Upper (97.5%)	Landed value (2010 USD)
St Vin Grenadines	164	86	241	693,700
Samoa	2,760	2,230	3,280	5,415,000
Sao To. & Principe	447	236	661	831,000
Saudi Arabia	0	0	0	0
Senegal	9,080	7,370	10,800	16,000,000
Seychelles	1,510	792	2,220	2,186,000
Sierra Leone	13,000	6,850	19,200	8,185,000
Singapore	185	97	272	335,000
Sint Maarten	7	4	10	27,460
Slovenia	13	7	19	60,754
Solomon Is	9,200	6,550	11,770	23,410,000
Somalia	13,200	6,940	19,500	18,980,000
South Africa	9,020	7,300	10,700	32,360,000
South Cyprus	30	15	44	90,950
Spain	6,780	5,020	8,530	24,750,000
Sri Lanka	7,970	4,170	11,700	7,222,000
St Barthelemy	36	19	53	201,000
St Martin	80	42	118	460,500
Sudan	52	27	76	141,400
Suriname	9,200	4,850	13,500	13,820,000
Sweden	377	199	559	304,100
Syria	64	34	95	117,400
Taiwan	13,700	7,230	20,300	19,970,000
Tanzania	10,000	7,160	12,900	17,310,000
Thailand	114,000	81,500	146,000	170,300,000
Timor Leste	591	310	874	1,037,000
Togo	1,050	554	1,550	1,240,000
Tokelau	82	43	121	128,300
Tonga	722	584	858	1,323,000
Trinidad & Tobago	1,330	697	1,960	3,024,000
Tristan da Cunha Isl.	1	1	2	2,097
Tunisia	2,880	2,340	3,430	7,250,000
Turkey	3,830	2,740	4,910	9,473,000
Turks & Caicos Isl.	1,140	599	1,680	3,287,000
Tuvalu	288	152	427	301,200
UK	1,230	877	1,570	3,225,000
Ukraine	221	158	284	200,600
United Arab Em	2,130	1,120	3,140	7,307,000

Table A2. Estimated catch taken by women for all maritime fishing countries and entities of the world, including upper and lower bounds of 95% confidence interval, calculated using a Monte Carlo simulation, and the associated landed value of the catch in 2010 USD.

Country	Catch by women (t)	Lower (2.5%)	Upper (97.5%)	Landed value (2010 USD)
Uruguay	7,440	3,920	11,000	9,433,000
US Virgin Isl.	121	64	178	437,100
USA	71,900	51,600	92,600	334,100,000
USA (Alaska)	45,800	32,800	58,900	77,090,000
Vanuatu	3,090	1,620	4,550	3,933,000
Venezuela	52,500	27,100	76,500	120,630,000
Viet Nam	45,300	32,400	58,400	50,180,000
Wallis & Futuna Isl.	179	93	263	960,300
Yemen	6,290	3,310	9,310	6,575,000
Globally	**2,925,000**	**2,089,000**	**3,757,000**	**5,587,000,000**

Appendix B Country estimates, assumptions and uncertainty scores

1. Algeria

Marine fisheries in Algeria are dominated by industrial and artisanal sub-sectors, but also include some recreational and subsistence fisheries (Belhabib *et al.* 2016b). Fishing in Algeria is considered a male domain; therefore, women rarely participate in fishing activities. West African Fisheries expert, Dyhia Belhabib, who is also Algerian, indicates that “fishing is not regarded as a "noble" activity for a woman” and summarizes the following gender aspects of fisheries sector. There was one woman who operated a fishing vessel east of Algiers (Thalassa 2006) and another woman who fished commercially in the west, but neither is practicing today, with the latter now being a shipowner. The subsistence sector takes the form of men fishing with handlines from the beach.

Estimate and Assumptions: Participation by women in small-scale fishing activities is zero out of 10,000 small-scale fishers (Teh and Sumaila 2013). This estimate was based on personal communications from fisheries experts who indicated that participation by women in the fisheries activities is negligible.

Uncertainty: Estimates of female participation in fishing receives a score of 2 as there are several sources indicating women do not participate in fishing activities.

2. Angola

The marine fisheries sector in Angola consists mainly of industrial, artisanal, and subsistence sub-sectors, with a small recreational sub-sector (Belhabib *et al.* 2016a). Coastal communities in Angola rely on fishing and related activities as a key livelihood strategy, with both men and women participating in this sector (Raemaekers and Sunde 2015). Women are mostly involved in the post-harvest sub-sector, including buying fish from the boats when they come to shore, cleaning, and processing fish, as well as the sale of fresh, salted, and cooked fish. Some women are involved in subsistence fishing along the coast, but their numbers are not known (D. Belhabib, pers. comm. January 12, 2018).

Estimate and Assumptions: Participation by women in small-scale marine capture fishing activities is 0.5% out of approximately 18,000 small-scale fishers in Angola (Belhabib *et al*. 2015). This estimate assumed that participation by women in small-scale fishing activities was limited but not zero.

Uncertainty: The female participation rate receives an uncertainty score of 1 as there is a high degree of uncertainty with no quantitative estimate of female participation in fishing for this country.

3. Australia

The role of women in the Australian fishing industry and their contributions to fisheries output and productivity are poorly recognized (Aslin *et al.* 2000). With fisheries statistics for Australia being aggregated with other resource sectors and likely overlooking many of the informal work of women in running family fishing businesses (Shaw *et al.* 2015), the available data likely reflects only part of the picture. Fisheries Statistics presented by the Organization for Economic Development (OECD) provide employment numbers for Australia, disaggregated by sex for certain years with 2011 being the most recent estimate, indicating a female participation rate of approximately 12% for the fisheries sector (OECD 2015). Overall, the statistics collected and disseminated by the Government of Australia do not provide a clear picture of women in the fisheries sector, where they are involved, and in what numbers.

Estimate and Assumptions: Participation by women in coastal marine fishing activities is 12.8% out of a total of 5,050 people engaged in coastal harvest fisheries in 2013 (OECD 2015). The estimate is based on the annual average from the most recent three years (2009-2011) where the OECD employment data for Australia are disaggregated by sex for the category of Coastal Marine Fisheries. The total is based on a more recent estimate (2013), where the data have not been disaggregated by sex.

Uncertainty: The estimate for female participation in fishing receives an uncertainty score of 2. Although this estimate was based on national statistical data, it was likely not a comprehensive estimate, and it is unclear how these data were disaggregated from other sectors. Additionally, National statistics have been criticized for not properly reflecting women in the sector (Aslin *et al.* 2000).

4. Bangladesh

In Bangladesh, fishing has traditionally been considered a male occupation; however, today, women contribute to the fisheries economy in many ways, including the post-larvae shrimp collection and in processing and marketing seafood, among other fisheries-related activities (Sultana *et al.* 2002; Rabbanee and Yasmin 2011). The 2013 labour force survey for Bangladesh indicated that 1,970 of a total of 136,372 persons engaged in coastal and marine fisheries were women (Bangladesh Bureau of Statistics. 2015). However, if we consider participation by women in marine extractive activities more broadly and include the majority of the 450,000 seasonal shrimp fry collectors which are women (FAO 2014), female participation in fishing would be much higher.

Estimate and Assumptions: Participation by women in small-scale marine capture fishing activities is 5% out of a total 760,100 peoples (FAO 2014). The various sources consulted indicated vastly different estimates for the number and/or percentage of women working in fisheries. This is likely due to differences in survey methodology as well as discrepancies in definition of the types of fisheries and work included. A female participation rate of 5% was applied to a total participation in marine capture fishing of 310,100 persons plus 450,000 fry collectors. This is a conservative estimate, considering the majority of shrimp fry collectors are thought to be women; however, as there was no quantitative estimate given for female participation in fry fishing, a lower participation rate was assumed.

Uncertainty: This estimate had high uncertainty as the data were not clearly explained, and some conflicting estimates existed; therefore, Bangladesh received a score of 2.

5. Brazil

Women participate in the fisheries-related economy of Brazil in many ways, although their roles and activities are not necessarily recognized (Rocha and Pinkerton 2015; Ferrari 2016; Alonso-Población and Siar 2018). There are approximately one million registered artisanal fishers in Brazil, of which 45% are women (Ferrari 2016), with the majority located in the North and Northeast of the country (FAO 2010a). In the state of Bahia, over 20,000 women participate in shellfish collection as *marisqueiras*, while in the state of Maranhão, women capture shrimp from shore using small nets, a practice that also occurs in other Brazilian states (Diegues 2008). Women also participate in shrimp, crab, and mollusk fisheries in the south of Bahia (Di Ciommo 2007). On the Northeast coast of Brazil (Ponta do Turbarão), Venus clam (*Anomalocardia brasiliana*) harvesting is an activity dominated by women (i.e., two thirds of active clam harvesters were women, accounting for 80% of the registered clam harvest activity (Rocha 2013; Rocha and Pinkerton 2015). Men also participate in the harvest of Venus clams but only as a secondary fishing activity, when other target species were unavailable or in times of economic need.

Estimate and Assumptions: Participation by women in small-scale fishing activities is 45% out of a total of one million artisanal fishers (Ferrari 2016). This number reflects an expanded definition of fishing, which was then narrowed following legislation changes that occurred in 2015 (Ferrari 2016). However, I assumed that this was the most comprehensive estimate of fishing activities, accounting for the many women that participate in the direct extraction of marine resources as shellfish harvesters.

Uncertainty: The estimate of female participation in fishing activities receives an uncertainty score of 3 as this was based a recent estimate of national coverage that was inclusive of a range of fishing activities.

6. Cameroon

There is a distinct gender division of labour in Cameroon, with men fishing and women processing and marketing the fish (Ngo Som 1995). Smoking and drying are the most common processing techniques in Cameroon, and these are performed almost entirely by women, specifically the wives of artisanal fishermen (FAO 2007a). Brummett *et al*. (2010) describe a traditional women's fishery in freshwater bodies of southern Cameroon; however, accounts of female participation in marine fisheries were not found in the literature.

Estimate and Assumptions: Participation by women in small-scale marine capture fishing activities is 5% out of a total of 22,700 small-scale fishers (Belhabib *et al.* 2015). I assumed a participation rate in subsistence fishing activities similar to neighboring countries, so a rate of 5% was applied, based on the subregional average for West Africa.

Uncertainty: The uncertainty scores for fishing was 1, as there was very limited evidence for participation by women in fisheries for this country.

7. Canada

In Canada, fisheries sector participation is partially reflected in the National Census, which includes sex-disaggregated data on fisheries-related occupations (Statistics Canada 2016). The most recent census indicates that women represent approximately 13.5% of those working on fishing vessels as fishermen/women, as vessel masters and deckhands (Statistics Canada 2016). Census data present only part of the picture as they account only for certain categories of work and may not include all fishing activities and efforts, such as subsistence fishing activities. Indigenous communities across all three ocean coasts engage in fisheries for food, social, and ceremonial purposes in addition to participation in commercial fishing. Participation in these fisheries may not be identified as an occupation or enumerated in the census, and while Indigenous men might be more likely to work in commercial fisheries, Indigenous women from various communities across Canada are known to participate in subsistence fishing activities (Sloan *et al.* 2002; Turner 2003; Kafarowski 2006; Williams 2006). Given the large number of

Indigenous and coastal communities in Canada, the actual number of participants, both male and female, in fisheries, when considering both formal and informal activities, is likely much higher than the census data indicate. For example, on the Pacific coast in the Province of British Columbia, the census indicates that 350 of the 2,200 people that have identified their occupation as, 'fishermen/women', are female (Statistics Canada 2016). However, in the community of Bella Bella, which is one of many First Nations communities along the Pacific coast, approximately 400 of the 600 participants in the 2017 commercial herring spawn-on-kelp fishery were women (P. Waterfall, pers. comm., Heiltsuk Tribal Council, November 10, 2017). This suggests that the census data do not provide a complete picture of fisheries sector employment and participation by women.

Estimate and Assumptions: Participation by women in small-scale fishing activities is 13.5% (STATCAN, 2016) out of approximately 19,000 people involved in small-scale fisheries (Teh and Sumaila 2013). As Canada does not distinguish small- from large-scale fishing operations and employment, the overall estimate of participation by women in fisheries was applied to the total small-scale fisheries employment numbers from Teh and Sumaila (2013). The federal fisheries agency in Canada does not distinguish small- from large-scale sectors; however, I assumed that women are mostly engaged in small-scale fishing activities.

Uncertainty: A score of 3 was given for uncertainty. While the data are derived from census data, other sources suggest that these are not comprehensive in their inclusion of the types of work in fisheries that often involve women.

8. Chile

Women are an important part of the fisheries sector in Chile; however, the contributions by women in fisheries are only recently being recognized and accounted for in fisheries statistics. In 2004, efforts were made in Chiloe Province to make visible the formal and informal contributions by women to the fisheries sector (Araneda *et al.* 2005), and while this study suggests that in the past women have not been well accounted for in fisheries statistics, more recent efforts at enumeration likely better reflect the contributions by women in the fisheries

sector. The most recent fisheries census data from the National fisheries and aquaculture agency, SERNAPESCA, indicated that in 2017 women make up approximately 23% of artisanal fishers, a category which includes divers, shore collectors, algae harvesters, and artisanal shipowners in addition to more traditional definitions of fishing (Berazaluce Maturana *et al.* 2017).

Estimate: Participation by women in small-scale fishing activities is 23% out of a total of 86,056 marine coastal fishers (Berazaluce Maturana *et al.* 2017).

Uncertainty: The estimate of participation in fishing activities receives a score of 4, as the estimate was from a comprehensive survey with national coverage, was recent, and was from a robust source.

9. China

Gender roles in fisheries changed substantially in China when the state removed the prohibition on women going to sea in 1958 and with the economic reforms to the country which started in the late 1970s (Xu *et al.* 2012). As women started to occupy new economic spaces, many entered the fisheries workforce. Today, women are involved in all stages of small-scale fisheries production, including in fish processing, preservation, and marketing, but constitute a higher proportion of the labour force in fish processing and distribution (Wang and Zhou 2008). Women represent approximately 22% of the reported fishers in 2013 (e.g., 869,699 women out of a total of 3,906,874 traditional fishers in China; Fisheries and Fisheries Administration of the Ministry of Agriculture 2014). Estimates from a World Bank study that were similarly derived indicate a female participation rate in the fisheries workforce of 19% for China (World Bank 2010).

Estimate and Assumptions: Participation by women in small-scale marine capture fishing activities is 22% of 1,454,571 fishers (Fisheries and Fisheries Administration of the Ministry of Agriculture 2014). It was not clear whether the number of people included in the Fisheries Yearbook for China included all those included in the fisheries sector or just those involved in fishing. Also, this estimate likely includes those involved both in large and small-scale sectors

and in aquaculture. From the Fisheries Yearbook, approximately 60% of those involved in fisheries are in wild capture fisheries as opposed to aquaculture. A female participation rate of 22% was applied only to the portion of the fisheries that is considered small-scale.

Uncertainty: Fishing estimate receives an uncertainty score of 1 (high uncertainty), as although the estimate is based on national statistics, it is unclear how the data were collected, what exactly it includes/excludes, and whether this number refers only to fishing or also includes related activities.

10. Cuba

Women are an important part of the fisheries sector in Cuba with 6,331 women out of a total fisheries labour force of 37,635 (INFOPESCA 2018), i.e. 17%. Women participate in all activities with approximately 25% of primary fishing activities conducted by women (FAO 2015; Williams *et al.* 2017)

Estimate: Participation by women in small-scale fishing activities is 25% out of a total of 9,969 (FAO 2015)

Uncertainty: This estimate received an uncertainty scores of 2 as several sources indicate similar numbers.

11. Denmark

In Denmark, women represent approximately 3% of registered fishers, whereas their participation in the processing sector is much, higher with women representing approximately half of seafood processors (Salz *et al.* 2006; Döring *et al.* 2012; OECD 2015).

Estimate: Participation by women in small-scale fishing activities is 3.6% out of a total of 1891 coastal fishers (OECD 2015).

Uncertainty: The uncertainty estimate is 3, as multiple sources indicated similar numbers, but there was minimal explanation of how the data were collected. It is unclear how comprehensive these estimates are.

12. Dominican Republic

In the Dominican Republic, fishing is predominantly small-scale and boat-based activities are conducted almost exclusively by men (Herrera *et al.* 2011). According to the Latin American Network of Women working in the fisheries sector (NETWIF), there are two women who fish in the Laguna de Oviedo and two women with motorized yolas in the province of Samaná (INFOPESCA 2018). Women are more involved in shore-based activities that support the fishery sector, including processing and marketing of fish (Herrera *et al.* 2011). While it is not common for women to go fishing on boats, women often own fishing boats and gear (Grant 2004).

Estimate: Participation by women in small-scale fishing activities is 0.04% out of 10,000 small-scale fishers (FAO 2008a; INFOPESCA 2018)

Uncertainty: This estimate received an uncertainty score of 2, as data were limited.

13. El Salvador

In El Salvador, both men and women participate in fisheries but often take on different roles and activities (Gammage 1996; OSPESCA 2012). Men fish the open seas, while women fish along the shoreline and in estuaries, targeting marine fish, crustaceans, and mollusks. Some women accompany other family members on open sea trips to catch shrimp, but women focus mostly on activities close to shore or onshore where they are disproportionately involved in processing the catch (Gammage 1996). A 2011 fisheries census for Central America indicated that out of a total of 27,600 artisanal fishers in El Salvador, 4200 were women, which translates to a female participation rate of 15.2% (OSPESCA 2012). Previous census data indicated that 6-9% of fishers were female, but these data are criticized for a methodology that may have overlooked many female participants (Gammage 1996). The more recent estimate was, therefore, assumed to

be more accurate, although likely still underestimating the participation by women where census data often do not capture informal and unpaid labour contributions. For example, the many women involved in processing and marketing the catch at landing sites are not necessarily accounted for in the country's employment statistics (FAO 2005c).

Estimate: Participation by women in small-scale fishing activities is 15.2% out of all total of 27,600 artisanal fishers (OSPESCA 2012).

Uncertainty: This estimate received an uncertainty score of 2.

14. Federal State of Micronesia

In the Federated States of Micronesia, both men and women participate in inshore fishing activities for subsistence and artisanal purposes (Vali *et al.* 2014); However, there are clear distinctions in the gendered division of responsibilities, with women collecting crabs and other invertebrates that inhabit intertidal areas while men are responsible for catching fish and lobsters using spears or via free-diving and other boat-based fishing (Chapman 1987; Lambeth 2000). There is considerable variation between states in the participation by women in fisheries, with higher involvement by women in Kosrae and Chuuk and lower in Pohnpei and Yap (Lambeth *et al.* 2002). There is also variation within states with, for example, women in the outer islands of Yap being more likely to collect from the reef and fish using hand lines than women from the main group of Yap islands (Lambeth *et al.* 2002). In Yap, an estimated 20% of fishers are women, while in Chuuk 32% are women (Gillett 2016).

Fisheries participation data for FSM was not readily available. Fisheries employment statistics for FSM indicate that approximately 250 people formally employed in the fishing industry (Gillett 2016). This likely reflects only industrial sector participation. Formal employment in fisheries is quite limited with the majority of those involved, including women, working informally in the small-scale sector (FAO 2010b).

Estimate: Female participation in small-scale fishing activities is 25% out of a total of 38,000 small-scale fishers (Teh and Sumaila 2013).

Uncertainty: This estimate received a score of 3 as there were relatively robust data with some agreement among sources.

15. Fiji

Women in Fiji are involved in subsistence fishing and are increasingly becoming involved in the commercial fisheries sector (Lambeth *et al.* 2014). Women dominate the subsistence fishing sector, accounting for the majority of finfish catches for home consumption and representing almost half of small-scale fishers across Fiji (Kronen and Vunisea 2009; SPC 2013). Women are heavily involved in the mud crab fishery, which is an important income source for fishers in Bua Province (Thomas *et al.* 2018). More recently, women have become involved in the lucrative *bêche-de-mer* fishery as divers; however, a recent study found that women earn 47% less than men in this fishery (Purcell *et al.* 2018).

Estimate and Assumptions: Female participation in small-scale fishing activities is 46% out of a total of 12,000 small-scale fishers (SPC 2013; Gillett 2016). With fisher population estimates ranging from 12,000 to 40,000 people involved in artisanal and subsistence fishing either full or part-time, an estimate of 12,000 was used here to remain conservative.

Uncertainty: The estimate for fishing received a score of 2 as there was a considerable range in the cited number of the overall fisher population.

16. France

Fishing in France continues to be an activity dominated by men; however, some women fish by foot and on boats, and many more women contribute to the fisheries sector in a wide range of fisheries-related activities, including processing, marketing, accounting, management, research, and as boat owners (Frangoudes and Keromnes 2008; Quist *et al.* 2010; Villemur and Angouillant 2015). Estimates of female participation by women in extractive activities suggest that women represent 3% of the participants in fishing activities (Frangoudes and Keromnes

2008; OECD 2015). Looking specifically at small-scale and coastal fishing, there are 204 women out of a total of 11,670 with an additional 117 women out of 1,227 who fish on foot. Women are much more prevalent in the harvest of cultured shellfish. However here, I focus only on capture fisheries. The above numbers on partially represent the labour contributions by women in fishing operations, especially the wives of fishers who are often heavily involved in fishing operations on shore and at sea—work that is often unpaid.

In 1998, France introduced legislation that allowed fishermen's wives to voluntarily apply for *Collaborative Spouse Status*, which, in 2007 became mandatory (Frangoudes *et al.* 2008a). This provided legal status and benefits to fishermen's wives, who had long been providing inputs to family-fishing businesses without support or recognition. Throughout this struggle for recognition, women also organized themselves into fisheries unions and organizations, separate from those representing men (MacAlister Elliott and Partners LTD 2002). These women's organizations focused mainly on social issues, such as safety at sea and working conditions, while fisheries management and decision-making largely remained the domain of fishermen's organizations (Quist *et al.* 2010).

Estimate: Participation by women in small-scale fishing activities is 2.5% out of a total of 12,897 small-scale, coastal and foot fishers (Goupement Monfort-Baelde-Vouhe 2017).

Uncertainty: Although the level of detail available for this country far exceeds that of other countries, the sources indicate a high degree of uncertainty (Goupement Monfort-Baelde-Vouhe 2017); therefore, this estimate for female participation in fishing receives a score of 2.

17. French Polynesia

In French Polynesia, men dominate finfish fisheries while women participate more prominently in invertebrate fisheries (Kronen *et al.* 2008). Women typically fish close to shore, targeting the sheltered coastal reef habitats. While statistics on the number of people participating in fishing and fishing-related activities in French Polynesia were limited, the number of people employed in fisheries is estimated around 10,500 (Gillett 2016), with an estimated fisher population of

almost 4,000 in Moorea alone (Yonger 2002). In terms of female participation in fishing, an estimated 22% of small-scale fishers are women (SPC 2013).

Estimate and Assumptions: Female participation in small-scale fishing activities is 22% out of a total of 10,500 small-scale fishers (SPC 2013; Gillett 2016). The details provided in Gillett (2016) for total fisheries employment were taken to represent participation in small-scale fishing activities in French Polynesia.

Uncertainty: The estimate for participation in fishing receives a score of 3.

18. Gabon

Fishing in Gabon involves mostly men, while processing, marketing, and trading of fish is done mostly by women (Matthews *et al.* 2012). While the majority of fishing is done by men, women do participate in gleaning activities, collecting small fish and invertebrates from shore (Matthews *et al.* 2012) and catching shrimp in estuaries using small nets (FAO 2007b).

Estimate and Assumptions: Participation by women in small-scale marine capture fishing activities is 5% out of a total of 96,300 small-scale fishers (Belhabib *et al.* 2015). Female participation in fishing is assumed to be small but not zero as two sources indicate some level of extractive activity by women. As there was no available estimate for other countries in this subregion, female participation in fishing was assumed to be similar to neighboring countries, so the subregional average for West Africa of 5% was applied.

Uncertainty: This estimate received an uncertainty score of 1.

19. Germany

Women in Germany's fisheries sector are more concentrated in fishing-related work than in the productive aspects of fishing, representing 1% of small-scale fisher (Salz *et al.* 2006).

Estimate and Assumptions: Participation by women in small-scale fishing activities is 1% out of a total of 724 people in small-scale fishing (Salz *et al.* 2006; STECF 2017). A female participation rate in fishing of 1% from 2003 was applied to the estimated number of small-scale fishers in 2015, assuming female participation rates did not change considerably over that time period and assuming women involved directly in fishing activities participate mostly in the small-scale sub-sector.

Uncertainty: This estimate received an uncertainty score of 3 as the data were from more than a decade ago and likely only reflect permanent positions.

20. Ghana

Woman play important roles the Ghanian fisheries value chain, linking fishermen to consumers (Tetteh 2007). In Ghana, men go fishing and their wives and daughters process, transport, and market the fish. Strict rules and cultural beliefs prohibit women from setting foot in a canoe (Walker 2001; Failler *et al.* 2014). However, women at times fish by baskets and nets in lagoons (I. Issifu, pers. comm., May 1, 2019). Women dominate processing and marketing aspects of the fish value chain. Traditionally, men never assisted women in post-harvest activities; however, more recently some men are helping with processing, marketing, and distribution activities (Sasu 1999). Women are also key in financing fishing activities, raising capital by leveraging their social networks and status, and as owners of the means of production, such as fishing boats and processing equipment (Tetteh 2007; Gueye 2016). For example, in the Fanti town of Anomabo, 38% of canoes are owned by women (Walker 2002), while in the fishing village of Moree, an estimated 100 out of 400 canoes (25%) are owned by women (Overå 1992).

Estimate and Assumptions: Participation by women in small-scale marine capture fishing activities is estimated to be 2.5% out of approximately 12,000 small-scale fishers (Teh & Sumaila 2013). As there is evidence for women's participation in lagoon fishing, but quantitative data was unavailable at the time of the analysis, I assumed a female participation rate that is half that of the subregional average for western of 5%. However, this estimate will be updated with country-specific data as soon as it becomes available.

Uncertainty: This estimate receives an uncertainty score of 1 as it was based on an adjusted subregional average.

21. Greece

In Greece, the few women who work on fishing boats are there supporting their husbands as part of a family business (Quist *et al.* 2010). To become formally registered as fishers, men and women are required to have a diploma. In fisheries, women are much more prevalent in the processing sector with fish processing factories employing mainly women. In terms of unpaid work, women contribute substantially to the family-based fishing enterprise as spouses, mothers and sisters, looking after many important aspects of the fishing business including the financial management, communication with fishery administration, banks and book keepers, buying and delivering supplies to the boat and crew. By providing unpaid labour, these women aim to reduce business costs and to increase revenues as a way of contributing to the family, especially during times of financial crisis. Women also work in ancillary jobs associated with small-scale fisheries sector, such as making and repairing fishing gear (Quist *et al.* 2010).

In terms of recognition, women's work is partially captured in fisheries employment statistics where their roles are formalized. The most recent sex-disaggregated data on participation in fisheries was a 2006 EU fisheries sector employment report, which suggested that women represented 6% of fishing employment and 50% of fish processing sector employment in Greece (Salz *et al.* 2006). In 2016 there were 24,759 people employed in fishing activities, 79% of which were associated with the small-scale sub-sector (STECF 2017). This estimate assumes that women working in productive or extractive activities are mainly in the small-scale subsector.

Estimate and Assumptions: Participation by women in small-scale fishing activities is 6% out of a total of a total of 19,560 people employed in small-scale fishing (Salz *et al.* 2006; STECF 2017). This 6% female participation rate cited in Salz *et al.* (2006) was applied to the estimated number of small-scale fishers in 2016. This number would be higher if it were assumed that women were mostly participating in the small-scale sub-sector; however, for the purposes of this study, and to be conservative, the 6% was used.

Uncertainty: This estimate receives an uncertainty score of 3 as the estimate was derived using a combination of sources that were not all from within the last decade and a recent report highlighted data quality issues for Greece (STECF 2017).

22. Greenland

In Greenland, fishing is the primary industry supplying much of the employment to the island. Fishing is done mostly by men, with only 10 of the 2,716 commercial licenses held by women (Sloan *et al.* 2002). However, as in many other countries and contexts, women provide considerable support to fishing businesses and operations, with important social and economic roles in fishing communities (Ford and Goldhar 2012).

Estimate and Assumptions: Participation by women in small-scale fishing activities is 0.4% out of a total of 2,716 commercial fisheries licenses holders in 2003 (Sloan *et al.* 2002). License holders are roughly equivalent to the number of participants.

Uncertainty: Given the limited availability of data that is both recent and comprehensive in the categories it includes, the uncertainty score for this estimate is 2.

23. India

Women make significant contributions to the fisheries sector and related economy in India, occupying a range of roles (Ashaletha *et al.* 1995; Immanuel *et al.* 2003; Durai and Dhanalakshmi 2015). While roles may vary between fishing communities and regions depending on local culture, religious beliefs and other factors, in many parts of India women have traditionally been involved in the processing and marketing of the catch, in net making and repair, and in some cases in the operation of shore seines, the collection of shellfish and seaweed in tidal areas (Tietze *et al.* 2007). Women are also instrumental in the functioning of the fishing household, providing much of the unpaid labour necessary to run the household and family fishing operations, including tasks related to financial management, family welfare, provisioning for fishing trips, etc. (Ashaletha *et al.* 1995).

According to the 2010 Census from the Marine Fisheries Service in India, just over half of the fisherfolk engaged in fish seed collection in the mainland of India are female, and over 80% of fisherfolk engaged in marketing and processing of fish are women (Central Marine Fisheries Research Institute 2010). A separate census conducted for the Islands of Andaman & Nicobar and Lakshwadeep indicates that a quarter of seed collectors are women and over a third of fisherfolk engaged in allied fishing activities are women (Fishery Survey of India 2012). Estimates of those actively engaged in fishing are not disaggregated by sex and, while several sources indicate that women are not actively involved in fishing, some women have been observed actively fishing alongside male family members in the Middle Andaman's (S. Advani, pers. comm., February 10, 2018). Women participate in fish seed collection and the shore-based collection of invertebrates (Immanuel *et al.* 2003; Immanuel and Rao 2009; Durai and Dhanalakshmi 2015), but these activities are not necessarily considered "fishing"; however, I considered these to be extractive activities and included them in my estimate for small-scale fisheries. Some regional estimates of participation by women in shore-based gleaning activities include an estimated 1,200 women of a total of 5,500 people involved in mussel and oyster collection in the Vembanad estuary in Kerala (Koshy and Sharma 2007). It is not clear to what extent these fishing activities are included in the National Marine Fisheries census, but a recent study suggests improved census data collection is needed to highlight the many women in the fisheries sector than are overlooked in the current system (Gopal *et al.* 2017).

Estimate and Assumptions: Participation by women in small-scale marine capture fishing activities is 4.6% out of a total 1,021,851 people engaged in fishing, fish seed collection, and shellfish gleaning are women (Central Marine Fisheries Research Institute 2010; Fishery Survey of India 2012). The Marine Fisheries Census (2010) includes a note associated in the table of allied fishing activities, which describes the category 'other' as, "Includes persons engaged in auctioning, ice breaking, collection of bivalves, collection of other shells, collection of seaweed, collection of ornamental fish etc." This category was considered here as part of the marine capture fishing and was added to estimates of 'other', fish seed collectors, and active fishers for a more comprehensive estimate of participation in marine capture fishing activities.

Uncertainty: The estimates for female participation in fishing receives an uncertainty score of 3 as the data are from a relatively recent national census; however, it is very likely that the National Census (based on a frame survey) overlooks many of the informal and unpaid activities often dominated by women.

24. Indonesia

Fisheries in Indonesia are characterized by a gendered division of labour, where men focus on production and women focus on post-harvest activities (Siason *et al.* 2002). However, a closer look reveals that women are engaged throughout the fish value chain and that "the complex economic networks for catching, selling, distributing and processing of the fish products often involve the women" (Anna 2012). The contribution by women to the fisheries-related economy is substantial and complex but not well recognized, (i.e., the work by women in fisheries is not counted in national government census collections under fisheries related employment), with the exception of a few studies that have focused on highlighting these overlooked contributions by women (Glaeser and Glaser 2011; Anna 2012; Fitriana and Stacey 2012; Matthews *et al.* 2012). For example, women on the Pantar Islands participate, alongside men, in small-scale capture activities, such as gleaning for molluscs along the intertidal zone and trapping small-fish in nearshore waters either on foot or using small motorized boats (Fitriana and Stacey 2012). Whereas in Aceh, local taboos prevent women from participating in fishing activities (Matthews *et al.* 2012). In East Kalimantan, Bajau women collect and trade giant clams from nearshore marine habitats on the Berau coast for subsistence and commercial purposes (Máñez and Pauwelussen 2016).

The only quantitative data on participation by women in fisheries located was from a report on the informal employment sector in Indonesia, which gave estimates of men and women employed in fishing for the Provinces of Yogyakarta and Banten, which had female participation rates of 35% and 2%, respectively (Asian Development Bank 2011).

Estimate and Assumptions: Participation by women in small-scale marine capture fishing activities is 10% out of a total of 2,169,279 engaged in marine capture fisheries (Asian

Development Bank 2011; Fitriana and Stacey 2012). Assuming the estimates from the Asian Development Bank refer to fishing and not to post-harvest activities, such as processing and vending, which would fall under broader categories of employment, an average participation rate of 10% based on the survey of the two provinces is used as the estimate for female participation in marine capture activities

Uncertainty: For this estimate the robustness of the data and agreement were very low, meaning there is a high degree of uncertainty and, therefore, received a score of 1. The data used was from a survey of two provinces, with no clear definition of what was included in their definition of fishing.

25. Iran

In Iran, as in other conservative Islamic countries, the culture and the state restrict participation by women in work outside the home (Siason *et al.* 2002). Employment for women in Iran is very limited, and fisheries is not one of the few occupations that women participate in (Alaedini and Razavi 2005).

Estimate and Assumptions: Participation by women in small-scale marine capture fishing activities is zero out of a total of 42,000 people working in small-scale fisheries activities (Teh and Sumaila 2013). There was very limited information on participation by women in the fisheries sector of Iran. It was assumed that women do not participate in either fishing or post-harvest activities, as this type of work is not recognized as acceptable for women.

Uncertainty: For participation in fishing, the estimate receives an uncertainty score of three as multiple, reliable sources suggest women do not participate in fisheries.

26. Italy

Employment in fishing activities in Italy was estimated at 25,787 in 2015, with approximately 49% of this being in the small-scale sub-sector (STECF 2017). Female participation in fishing was estimated at 8% in 2003 (Salz *et al.* 2006; STECF 2018).

Estimate and Assumptions: Participation by women in small-scale fishing activities is 8% out of a total of 12,635 small-scale fishers (Salz *et al.* 2006; STECF 2017). The female participation rate in fishing of 8% from 2003 was applied to the estimated number of small-scale fishers in 2015, assuming female participation rates did not change considerably over that period and assuming women involved directly in fishing activities participate mainly in the small-scale sub-sector.

Uncertainty: The estimate for fishing gets a score of 3 as the data were from more than a decade ago and likely only reflect permanent positions.

27. Jamaica

Women are involved in various aspects of the fisheries-related economy of Jamaica, which is an important source of food and livelihood for many people on the Island. In 2015, of the estimated 23,786 reported fishers, an estimated 6% were female (FAO 2016). Women occupy formal and informal positions in fisheries-related sectors and activities including investing, processing, marketing, and distribution, while also participating in fisheries associations and cooperatives (Grant 2004). The 1998 Jamaican Fisheries Census included a gender breakdown of vessel ownership, indicating that approximately 4% of fishing vessels were owned by women, with proportion of female-owned vessels being highest for mechanized fiberglass vessels <35ft (Grant 2004).

Estimate: Participation by women in small-scale fishing activities is 6% of 23,786 total registered fishers (FAO 2016).

Uncertainty: This estimate receives an uncertainty score of 2 as there was no explanation given for how the data were collected.

28. Japan

The Japanese government provides detailed statistical records, available online in both Japanese and English, of the number of people participating in fisheries by gender and age (Ministry of Agriculture Forestry and Fisheries 2016). The most recent data indicate that in 2014 there were 22,580 women out of a total of 173,030 individuals engaged in coastal marine fisheries, which translates into a female participation rate of 13%. As there is no formal, legal definition of small-scale fisheries in Japan, these numbers have not been disaggregated into small- and large-scale sub-sectors. However, approximately 94% of the fisheries fleet in Japan are fishing boats smaller than 10 gross tons and are considered as small-scale vessels and fishers (Delaney and Yagi 2017). It is unclear as to whether the government statistics include all fisheries extraction activities, including Ama divers.

The ancient Japanese tradition of the Ama goes back at least 2,000 years, involving both men and women free diving for seaweed, shellfish, sea urchins, lobster, sea cucumber, oyster, octopus and abalone (Lim *et al.* 2012). The number of people who participate in this activity was estimated in 1989 at approximately 20,000, with a female participation rate of 41.2% (Lim *et al.* 2012).

Estimate and Assumptions: Participation by women in small-scale marine capture fishing activities is approximately 13% of 163,648 people engaged in small-scale marine capture fisheries. To disaggregate small- from large-scale fisheries, the fleet estimate of 94% was applied to the total number of people engaged in fishing, to represent participation in small-scale fisheries. To remain conservative, it was assumed that the fisheries census included Ama divers in the number of people engaged in fishing.

Uncertainty: The estimate for female participation in small-scale fisheries receives an uncertainty score of 3 as several sources indicate similar estimates of participation by women

and the data were from a robust source covering the entire country (i.e. a recent labour force survey); however, it is unclear whether these numbers include all marine fisheries extraction activities and whether the collection of data was done in a way to avoid gender bias.

29. Kiribati

In Kiribati, women have a significant role in fisheries, both in the subsistence and cash sectors (Taniera and Mitchell 1995). Women are involved in both fishing and in processing, making important contributions to food security and to household income (Fay *et al.* 2007). Fishing activities are mainly done by foot, gleaning the shore and reefs for invertebrates; however, some women also fish the outer islands from boats using gill nets, rods and lines, and traditional fish traps (Taniera and Mitchell 1995).

Estimate: Female participation in small-scale fishing activities is 35% out of a total of 23,000 small-scale fishers (Teh and Sumaila 2013; Amos 2014).

Uncertainty: The estimate for female participation in fishing activities receives a score of 3.

30. Libya

Participation by women in the fisheries sector is almost exclusively in processing (Reynolds *et al.* 1995). Of the approximately 11,500 fishers (FAO 2005b), there is no indication that any of these are women.

Estimate and Assumptions: Participation by women in small-scale marine capture fishing was assumed to be zero out of 11,500 fishers (FAO 2005b). Although no reference was found indicating that women are excluded from extractive fishing activities, Reynolds *et al.* (1995) indicate that women do not participate directly in fishing and are restricted to the processing sector; therefore, the assumed female participation rate in marine capture fishing is zero.

Uncertainty: This estimate receives a score of 1 as information on women in fisheries was almost non-existent for Libya with only one brief mention in Reynolds *et al.* (1995).

31. Madagascar

In Madagascar, women play a dominant role in exploiting the rich mangrove ecosystems, selling products from traditional fishing, and working in processing factories (Monfort 2015). Women are key players in the valuable octopus fishery, representing the majority of those involved in the capture of octopus. However, traditionally this fishery was almost exclusively done by women, whereas today both men and women target octopus for subsistence and artisanal purposes but often using different methods and operate in different habitats (Westerman and Benbow 2013). Women glean for octopus in intertidal areas, whereas men dive in subtidal areas. Women also collect other invertebrates through intertidal gleaning (Barnes and Rawlinson 2009).

Surveys conducted in the Velondriake region of Southwest Madagascar found that 97% of fishers were men, 98% of gleaners were women, and 95% of those practicing both fishing and gleaning activities were men (Barnes-Mauthe *et al.* 2013). While this study collected data from the Velondriake region, the sample was extrapolated to produce a national estimate of the number of small-scale fishers and gleaners for Madagascar, which were both approximately 122,000 individuals (see 'Supplementary Information' in Barnes-Mauthe *et al*. 2013). This same study indicated that the same number of people were engaged in fishing as in gleaning, while an additional 24,000 individuals participated in both fishing and gleaning activities (i.e., 20% of the number of fishers). Gleaners, which were predominantly women, target octopus, sea cucumber, shellfish, and crab, with an estimated annual catch volume of 57,300 tonnes (Barnes-Mauthe *et al.* 2013). Whereas, fishers, of which 3% were women, had a catch volume of over 297,000 tonnes in 2010.

Estimate: Participation by women in small-scale marine capture fishing activities is 46% of small-scale fishers when including fishers, gleaners, and fisher-gleaners, together estimated to be approximately 268,800 individuals.

Uncertainty: The studies used for this estimate indicated high uncertainty associated with the data, in part because the surveys were done in only one region of the country and extrapolated to a country-wide estimate. However, similar estimates for small-scale fishing activities from this peer-reviewed publication were also found in a more recent census conducted by Blue Ventures for the same region (R. Singleton, pers. comm., November 24, 217). Therefore, with medium agreement and medium robustness, the estimate for participation in fishing activities receives a score of 2.

32. Malaysia

Although traditions and superstitions in Malaysia limit the involvement of women in fisheries, women perform essential but underestimated roles in fisheries-related activities, such as unloading, sorting, gutting, net mending, processing, and distribution and marketing (Yahaya 2001). These roles vary by region; for example, in Peninsular Malaysia, women in the east coast states especially Kelantan, are more actively involved in the marketing of the catch than women in the west coast (Siason *et al.* 2002). In Sabah, East Malaysia, women glean during low tide and swim when the water is shallow to look for urchins and shellfish, which they either keep for home consumption or sell in small quantities at the market. Women also accompany their husbands out to sea for one to several nights to cook and help with boat tasks, and some of them also help with mending gear at home (L. Teh, pers. comm., March 13, 2018)

Women who participate in small-scale fisheries activities are often the wives or daughters of fishers and, in many cases, work to supplement family income or provide unpaid labour for home-based family businesses (Siason *et al.* 2002). There are instances where women do fish, with evidence from the east coast states of Kelantan and Terengganu and, to a lesser extent, Kedah on the west coast of Peninsular Malaysia. These "fisherwomen" fish mainly from the shore or in shallow protected waters using simple hand-operated gear, such as hooks and lines, scoop nets, or traps. The catch is used primarily for home consumption while surplus may be sold, traded, or gifted to local fish dealers, village retailers, friends, and relatives (Yahaya 2001).

In Malaysia, no census or documentation on the actual numbers of women involved in the various fishing activities has been carried out (Yahaya 2001). Participation by women in capture fishing is thought to be limited in Malaysia, with the exception of those using traditional small gear, such as the *bintoh* for catching crabs, fish traps, or *bubu* for catching fish, and some may accompany their husbands out to sea (Siason *et al.* 2002). Women fish from shore mainly for subsistence purposes.

Estimate: Participation by women in small-scale marine capture fishing activities is 17.5% out of a total of 51,480 coastal fishers (FAO 2009a).

Uncertainty: The estimate for female participation in fishing activities receives an uncertainty score of 1 as there was no quantitative data available that was specific to Malaysia, so a subregional average was used.

33. Mexico

In Mexico, fishing is culturally constructed as masculine work; however, women participate in various activities along the fish value chain, with the seafood industry relying heavily on temporary, part-time, and low-cost processing labour provided by women (Salazar and Castañeda 2002). A recent national census report suggested that approximately 10,500 women participate in fisheries in Mexico, mainly in processing and trade, representing 7% of total participation in fisheries (INEGI 2011). Additional sources highlight participation by women in the harvest of invertebrates (Mackenzie 2001; Valdez-Gardea 2001); however, quantitative details are rarely reported, except in Mackenzie (2001).

Estimate and Assumptions: Participation by women in small-scale fishing activities is 0.2% out of a total of 135,134 small-scale fishers (Harper *et al.* 2017). The only reference available regarding participation in direct marine capture activities was based on a regional study of cockle fishers (Mackenzie 2001). Several references point to minimal participation by women in direct capture activities; however, there is likely to be some additional participation by women in the collection of invertebrates from shore, as described in (Valdez-Gardea 2001).

Uncertainty: This estimate receives an uncertainty score of 1, due to extremely limited data sources and low agreement among sources.

34. Morocco

In the Moroccan fisheries sector, women work almost exclusively in processing activities (FAO 1994). Women do not participate in artisanal fishing and other economic activities as dictated by socio-cultural structure of the region (ArtFiMed 2009). The marine capture fisheries sector employs approximately 176,000 of which roughly 50,000 are in fishing-related jobs; however, there is no indication of women in direct fishing activities.

Estimate: Participation by women in small-scale marine capture fishing activities was assumed to be zero out of 115,000 fishers (FAO 2005a).

Uncertainty: This estimate receives an uncertainty score of 1, given the limited quantitative information available on female participation in fishing activities.

35. Mozambique

In the marine capture value chain of Mozambique, production activities mostly involve men, whereas women are more involved in post-harvest activities (Brugère and Maal 2014). Women bring fish from the landing sites to the markets, playing a key role in the distribution and sale of fish products as intermediaries (sometimes referred to as *maguevas* (Johnstone 2003; FAO 2008b). While the role of women as traders and vendors is more widely acknowledged, women also play a role in production through the inter-tidal collection of invertebrates for commercial and subsistence purposes (Johnstone 2003). Although women rarely go out fishing on boats, more and more women own boats, with 25% of the boatowners in the Bay of Maputo being women (Johnstone, 2003).

Fisheries landings from Mozambique's Exclusive Economic Zone are predominantly from the small-scale sub-sector, which includes subsistence catches taken by women (Jacquet *et al*. 2016).

In addition to the approximately 70,000 small-scale boat-based fishers in Mozambique (FAO, 2008), who are likely all male, there are approximately 52,777 shore-based collectors (Jacquet *et al.* 2010; Gervásio 2014), which includes women and children collecting invertebrates and small fish in the intertidal zone by hand, using spears, and with beach seines (Tietze *et al.* 2011).

Estimate and Assumptions: Participation by women in small-scale marine capture fishing activities is 28% out of small-scale 122,777 fishers including boat-based fishers and shore-based collectors. Assuming women are represented in the estimate of shore-based collectors described by Jacquet *et al.* (2010), this percentage of female collectors is assumed to similar to neighboring Tanzania (66%).

Uncertainty: This estimate receives a score of 1 for uncertainty. While several sources indicated that women participate in extraction activities, quantitative data were very limited.

36. Namibia

There is some evidence for participation by women in small-scale fishing activities in Namibia, using mosquito nets and collecting by hand from in flood plains, but these are likely only freshwater habitats (FAO 2007c). In terms of marine species, women collect shells along the Namibian coastline to make jewellery, known as *onyoka*. These are a traditional necklace made from mussel shells, commonly worn amongst the Oshiwambo speaking people. This activity has provided a means for many women to generate an income (Raemaekers and Sunde 2015). However, the collection of these shells is likely not considered under fisheries management as it involves only the empty shells. Nevertheless, this activity has an important socio-economic component that should be considered in overall economic assessments of marine resource extraction activities. However, since this is concerned with the removal of biomass from the ocean, here, female participation in fishing is zero.

Estimate and Assumptions: Participation by women in small-scale marine capture fishing activities is zero out of a total of 200 small-scale fishers. Assuming the description of women in

fisheries given in the FAO country profile applies to freshwater environments, evidence from local experts suggests women are not involved in marine capture extractive activities.

Uncertainty: This estimate received a score of 1 as there was very limited information on female participation in fishing.

37. New Zealand

In New Zealand's fisheries sector, men dominate the capture sub-sector, while women are concentrated in the seafood-processing sector. However, women play an active role in fishing operations and businesses, with an increasing number of women working with men, often as husband and wife teams on boats as crew and skippers (Lambeth *et al.* 2014). Quantitative estimates for participation of this sort, disaggregated by sex, were not located.

Estimate and Assumptions: Female participation in small-scale fishing activities is 12.8% out of a total of 4,300 people in small-scale fishing activities (Teh and Sumaila 2013). In the absence of available estimates of female participation in fishing activities for New Zealand, a benefit transfer approach was used with the estimate derived from neighboring Australia.

Uncertainty: This estimate received a score of 1 since it was based on data for another country.

38. Nigeria

In Nigeria, women are present throughout the fish value chain with crucial roles in fish production, processing, distribution, and marketing (Williams 1996; FAO 2007d; Nwabeze *et al.* 2013; Cliffe and Akinrotimi 2015). Women play a significant economic role in the fishing communities of Nigeria, making important contributions to family income and to nutritional security (Williams 1996; Williams *et al.* 2005; Nwabeze *et al.* 2013).
While both men and women participate in fishing activities in Nigeria, men work on large boats, fishing in large and deep-water bodies, and women fish from smaller boats and canoes, and wade along the shores collecting shellfish and seaweed (Nwabeze *et al.* 2013). Throughout Nigeria

women in fishing communities also use traps and nets to catch fish (Williams, 2006 *in* Okeowo *et al.* 2015). Women do not participate in deep sea fishing (Cliffe and Akinrotimi 2015), but they do participate in inshore fishing activities, including the brackish water canoe fishery that occurs in coastal creeks, lagoons, and mangroves in Nigeria. Species targeted in this fishery include catfish (*Arius* and *Chrysicthys* spp.), tilapia, mullet, and shellfish—such as shrimps (*Macrobrachium* spp.), crabs (*Callinectes* spp.), periwinkles, oysters and large quantities of the white shrimps, *Nematopalaemon hastatus*, commonly called "crayfish", and penaeid shrimps (FAO 2007d).

Several case studies highlight the diverse roles of women in both freshwater and marine fisheries; however, at the country level, data on the number of women in the fisheries sector was not readily available. Cliffe and Akinrotimi (2015) describe the role of women in fishing activities of Rivers State, Nigeria from a qualitative study of fisherwomen in 10 communities. The study indicated that of the 200 fisherwomen surveyed, 50% were involved in collecting shellfish, while 40% participated in setting traps in rivers and 10% setting traps in creeks. Over half of the women surveyed participated in marketing, 30% in active fishing, 15% acted as middlemen, and 10% were involved in processing (Cliffe and Akinrotimi 2015). While there is some recognition that women participate in fishing activities, their participation in on-shore activities associated with the fisheries sector is better acknowledged with high female participation in this part of the fisheries value chain (Nwabeze *et al.* 2013).

Estimate and Assumptions: Participation by women in marine capture fishing activities is 12.8% (average female participation in a survey of artisanal fishers in two communities in Lagos State, Nigeria (Okeowo *et al.* 2015). Total number of small-scale fishers in Nigeria is estimated at 168,000 (Belhabib *et al.* 2015). In the absence of a country-wide estimate of participation by women in marine harvest activities, the survey by Okeowo *et al.* (2015) of female participation in artisanal fisheries for Lagos State was used as the best available estimate for participation in small-scale fishing.

Uncertainty: This estimate receives a score of 3 as several sources indicate that women participate in fishing activities, and one source provided a quantitative estimate from a case study, which was then scaled up to a country-level estimate.

39. Norway

Fishing in Norway has long been considered a male domain; however, women are involved in many roles and activities but are often not acknowledged for their broader contributions to the fisheries economy (Gerrard 2018). Recent data from 2016 indicate that approximately 3.1% of registered fishers in Norway are women, but this estimate does not include the many additional informal and unpaid inputs women make to fisheries. For example, women often act as "the shore crew", providing support to fishing businesses and operations, and as household and community managers (Gerrard 2005). In the seafood processing sector, women represent a much higher percentage of the formal workforce. In 2011, there were approximately 813 women out of 2074 workers in the processing sector of Finnmark, which translates into a female participation rate of 39% (Neis *et al.* 2013). Overall, fishing and related jobs have decreased since the quota system was introduced in 1990, which has affected both men and women in the industry but with some gendered impacts that have resulted in further marginalization of women in the fishing industry (Munk-Madsen 1998; Gerrard 2006, 2018). While the rest of Norway is considered a hallmark for gender equality, the fishing industry lags in terms of both recognition and support of women in the industry.

Estimate: Participation by women in small-scale fishing activities is 3.1% out of 11,600 coastal fishers (OECD 2015; Gerrard 2018).

Uncertainty: This estimate received a score of 2 as this only includes formal employment/registered fishers, where there is additional, unaccounted for, participation in informal and unpaid activities.

40. Oman

Fisheries in Oman are almost entirely small-scale and involve both men and women; however, women are not well recognized for their contributions. A recent study brought attention to women in this sector, highlighting their role in the capture, processing, and marketing of marine species (Al Rashdi and McLean 2014). This study showed that women are engaged in activities, such as gathering, gleaning, and spear fishing, for gastropods, bivalves, sea cucumbers, cephalopods, and crustaceans along the coast. While national fisheries statistics do not include estimates of fisherwomen, the study of the Al-Wusta Governorate found that 9% of fisherfolk in the region were women (Al Rashdi and McLean 2014). The study acknowledged that the communities surveyed may not be representative of participation by women in other regions of the country where women may not be as involved in fishing activities.

Estimate and Assumptions: Participation by women in coastal marine fishing activities is 3% out of a total of 45,000 small-scale fishers in Oman (FAO 2013). This assumes that the national female participation rate is approximately one third of the rate found in the study of Al-Wusta.

Uncertainty: This estimate received a score of 3 as, although the data were rigorously collected, from a peer-reviewed source, they only covered a portion of the country so were scaled up, using some assumptions to produce a country-level estimate.

41. Palau

Women in Palau have always played an important role in the fisheries economy through their reef-gleaning activities (Lambeth *et al.* 2014). Women are particularly involved in the sea cucumber fishery, with most of the collection and processing activities being done by women (Pakoa *et al.* 2014). Palauan are also involved in other fisheries activities, including marketing of seafood and, more recently, some women also go out fishing in small boats (Lambeth 1999). The objective of fishing for women is often subsistence while men focus more on catching fish for commercial purposes (Fairbairn-Dunlop 2014).

Fisheries employment statistics for Palau estimate approximately 460 people in the primary sector; however, this estimate likely only accounts for formal employment and misses the many people, including women, involved informally in fishing and related activities. Added to this are at least another 933 subsistence fishers (Gillett 2016), which brings the estimate of fishers in 2008 to approximately 1400. An estimated 32% of small-scale fishers are women (SPC 2013).

Estimate: Female participation in small-scale fishing activities is 32% out of a total of 1,400 small-scale fishers (SPC 2013; Gillett 2016).

Uncertainty: This estimate receives a score of 3 as the data were relatively robust.

42. Panama

While the role of women in fisheries in many Central American countries is not well documented, evidence does exist suggesting that women contribute in important ways to the fisheries economy of Panama. For example, in Pedro Gonzales, Las Perlas Archipelago (Panama) women participate in cleaning, filleting, drying, and cooking fish, as well as collecting shells and cleaning mollusks (Raab and Roche 2005). Beyond shellfish collection, women rarely take part in fishing activities according to Raab and Roche (2005). However, a 2011 fisheries census for Central America indicated that out of a total of 20,300 artisanal fishers in Panama, 700 were women (OSPESCA 2012), which translates into a female participation rate of 3.4%.

Estimate: Participation by women in small-scale fishing activities is 3.4% out of a total of 20,300 artisanal fishers (OSPESCA 2012).

Uncertainty: The estimate for fishing received an uncertainty score of 2. Although this was a country-specific estimate, it was the only quantitative account for female participation in fisheries, and an explanation of the survey methodology was not given for the data source.

43. Peru

While the fisheries sector in Peru is often considered a male domain, women play an important role in the fisheries-related economy, but their work often goes unrecognized (Delgado-Gustavson 2011). The success of fishing businesses and operations in Peru relies heavily on the unpaid work that women perform to maintain the household and community networks (Delgado-Gustavson 2011). Women also participate directly in marine fisheries extraction through the collection of bait (Garcia 2000), invertebrates (Silva 2000), kelp, or small fish from shore. Rarely do women go out on boats and never for more than a day; the industrial vessels are almost entirely crewed by men. Women often work at landing sites doing the initial/primary processing of cleaning, gutting, and cutting fish (S. de La Puente, pers. comm., University of British Columbia).

A recent census, for the first time, provided quantitative estimates of female participation in the fisheries sector, with approximately 1,350 women engaged in artisanal fishing activities (representing just over 3% of artisanal fishers) and another 2,050 women as artisanal vessel owners (representing 16.5%: Instituto Nacional de Estadística e Informática 2012). The census also included sex-disaggregated data on species targeted and gear used by men and women. Women's participation in fisheries is concentrated in the south of Peru, mainly because of the migration of people from the Andes during political conflicts that took place in the late 1980s and 1990s. Artisanal vessels are often owned/registered under women's names, through joint-ownership (S. de La Puente, pers. comm., University of British Columbia).

Estimate and Assumptions: Participation by women in small-scale fishing activities is 4.6% out of a total of 44,161 artisanal fishers/shipowners (Instituto Nacional de Estadística e Informática 2012). Here, ship owners are included in estimates for participants in the primary sector; however, since shipowners might also be fishers, the potential overlap between the 1350 female fishers and the 2046 female ship owners was accounted for in the calculation. The female participation rate in small-scale fishing activities was estimated by dividing 2046 by the total number of small-scale fishers, assuming full overlap in the case of male fishers to be

conservative. Secondly, it was conservatively assumed that the female participation rate for the artisanal sub-sector was similar for the subsistence subsector.

Uncertainty: This estimate received an uncertainty score of 4, as this was from data collected recently as part of an artisanal fisheries census covering the entire country.

44. Papua New Guinea

Women's role in fishing is much larger than is generally acknowledged with one study indicating that women catch at least 25% of the subsistence catch, which is mostly invertebrates from shallow inshore areas (Lambeth *et al.* 2014). While there is limited information on subsistence production for PNG, the catch of invertebrates (e.g., *bêche-de-mer*, trochus and other shellfish), for both commercial and subsistence purposes is considered to exceed the catch of finfish (Lambeth *et al.* 2014). Women also play an important role in fishing-related activities, dominating the processing of small-scale fisheries catches and being involved in the marketing of fish (Gillett 2016).

In terms of the number of participants in the fishing industry, no recent estimates exist (Gillett 2016). Data collected in the 1990s and early 2000s continue to be used as a best estimate of the small-scale fisher population, with some recent work being done to estimate the gender composition of small-scale fishers (SPC 2013).

Estimate and Assumptions: Female participation in small-scale fishing activities is 48% out of a total of 120,000 people involved in subsistence fishing activities (SPC 2013; Gillett 2016). Estimates of small-scale fisher population for PNG ranged from several thousand to almost half a million, but to be conservative, the estimate of 120,000 people involved in direct fishing activities was used.

Uncertainty: This estimate received a score of 2 since the data used was not that recent.

45. Poland

In Poland approximately 60% of those employed in fishing are in the small-scale sector (STECF 2017). In terms of female participation, an estimated 2% of those employed directly in fishing are women (Salz *et al.* 2006).

Estimate and Assumptions: Participation by women in small-scale fishing activities is 2% out of a total of 1,397 people in small-scale fishing. The female participation rate of 2% from 2003 was applied to the estimated number of small-scale fishers in 2015, assuming female participation rates did not change considerably over that time period and assuming the women involved directly in fishing activities participated in the small-scale sub-sector.

Uncertainty: This estimate receives a score of 2 as the data were from more than a decade ago and likely only reflect permanent positions.

46. Russia

While it is mostly men that participate formally in fishing activities in Russia, women are involved in the informal and unpaid sectors (Zyalya Partal 2018).

Estimate and Assumptions: Participation by women in small-scale fishing activities is 2% out of a total of 20,000 small-scale fishers (Teh and Sumaila 2013). Given the very limited information on women in fisheries, the estimate of female participation rates in fishing was based on that of neighboring countries, assuming culturally similarities in terms of participation in the fisheries sector.

Uncertainty: This estimate received a score of 2, as it is based on a subregional average.

47. Samoa

Women in Samoa participate in subsistence fishing activities, such as gleaning along the shoreline, lagoon, and reefs at low tide. Traditionally women fish inshore with basic fishing gear,

targeting invertebrates and small finfish. Women make up between 17% and 22% of fishers in Samoa and catch roughly 23% of the total weight of seafood (Amos 2014; Lambeth *et al.* 2014). Fishers, both male and female targeting finfish, are mainly for the commercial market. While fishers of all genders target coastal reef and lagoon habitats, only men fish for pelagic species, in the open oceans and in mangroves. However, a few women fish the outer reefs. In terms of gendered division of labour in target species and habitats for invertebrate fisheries, women mainly target soft bottom species, whereas men collect clams, octopus, lobster, and *bêche-de-mer*, either gleaning or diving along reef tops and in mangrove areas (Gillett 2016). Of Total annual catch taken by women, including both finfish and invertebrates is estimated by (Tiitii *et al.* 2014) to be almost 3,000 $t \cdot year^{-1}$.

Estimate: Female participation in small-scale fishing activities is 20% out of a total of 12,000 small-scale fishers (Teh and Sumaila 2013; Amos 2014; Gillett 2016).

Uncertainty: This estimate receives a score of 3 as several, reliable sources indicated similar estimates.

48. Senegal

In Senegal, men dominate fish production activities while women control much of the post-harvest portion of the fish value chain (Soumare 2006). Most of the literature highlighting women in Senegalese fisheries has focused on post-harvest activities, where an estimated 90% of the approximately 40,000 seafood processors are women (Deme *et al.* 2012). However, women are also involved in production activities through the collection of invertebrates from shore for subsistence and/or artisanal purposes (Grandcolas 1997; Walter 2006). An estimated 1,350 women are involved in these shore-based fishing activities in Senegal, contributing an estimated 10,000 metric tonnes/year to the total national catch (Belhabib *et al.* 2014), valued as 30.5 million 2015 constant US dollars (Harper *et al.* 2017). Seven different species were identified as the target of women harvesting shellfish in mangrove estuaries: *Murex cornutus* (sea snail), *Cymbium senegalensis* (sea snail), *Pugilina morio* (whelk), *Senilia senilis* (blood cockle/clam),

Crassostrea gasar (mangrove oyster), *Tagelus adansonii* (razor clam), *Callinectes sapidus* (blue crab); (Carney 2017).

Estimate: Participation by women in small-scale marine capture fishing activities is 2.3% out of a total of approximately 58,150 small-scale fishers (Belhabib *et al.* 2015).

Uncertainty: This estimate receives a score of 3 as several sources indicate participation by women in fishing activities with one providing a quantitative estimate from a peer-reviewed source.

49. Solomon Islands

In the Solomon Islands, women make up a large proportion of the workforce in tuna and coastal fisheries supply chains; however, there is little or no data available to measure the extent of their engagement. In addition to processing activities, women also participate directly in fishing activities and as support for men's fishing activities, including food, trade, and financial backup (Buga and Vuki 2012; Krushelnytska 2015). There is considerable variation between communities and from one province to another in terms of female participation in fishing activities where, in some communities, participation by women is high, while it is low in others (Kruijssen *et al.* 2015).

In 2004 there were an estimated 5,114 people formally employed in fishing (IMF, 2005). However, there are many more (including many women) who are not accounted for in this estimate because they were engaged informally in fishing and related activities. There are no comprehensive estimates of female participation in the fisheries sector or the ratio of men to women in the sector, which includes formal and informal sectors as main and secondary activities (Krushelnytska 2015). Overall in the Pacific Island region, women are responsible for over half of small-scale fisheries catches, contributing significantly to food and to livelihood security (Harper *et al.* 2013), with women in the Solomon Islands providing much of the seafood for home consumption (Pacific Community 2018).

Estimate and Assumptions: Female participation in small-scale fishing activities is 42% out of a total of 7,700 small-scale fishers (Teh and Sumaila 2013; Amos 2014). The female participation rate of 42% was applied to the total number of small-scale fishers estimated by Teh and Sumaila (2013), which was considered a conservative estimate as Gillett (2016) suggests as many as 175,000 people are likely involved in subsistence fishing activities when both men and women are included.

Uncertainty: This estimate receives a score of 2, as the estimate was derived by combining several data sources.

50. South Africa

Both men and women in South Africa are involved in various fisheries related activities, but data describing participation in these activities are limited (Harper *et al.* 2017). Participation by women in fishing activities is highlighted in a detailed study by Branch et al. (2002), which suggests that 20% of small-scale fishers in South Africa are women. Women mainly target oysters (*Striostrea margaritacea* and *Saccostrea cucullata*), mussels (*Perna perna*), and limpets (*Patella* spp and *Fissurella* spp) using knives, files, hoes and axes for subsistence and commercial purposes (Branch *et al.* 2002).

Estimate: Participation by women in small-scale marine capture fishing activities is 20% out of a total of 29,233 small-scale fishers (Branch *et al.* 2002).

Uncertainty: This estimate received a score of 3 as, although the data source was a detailed peer-reviewed study, it was done over a decade ago.

51. Spain

Nation-wide, Spain's fisheries labour force includes approximately 92,800 individuals, with roughly 27% of these being women (Frangoudes *et al.* 2008a). Looking closer at the composition

of this sector, there are 1200 women in fishing jobs, which overall represents 2% of the total number of fishers but would be higher if only considering the small-scale sector.
At the local level, women in Galicia have gained some recognition for their prominent role in the shellfish fishery as important actors throughout the shellfish value chain from harvesting to processing and marketing (Meltzoff 1995; Frangoudes *et al.* 2008b). Women are thought to represent approximately 90% of shellfish harvesters in Galicia, yet until very recently, their work was not formally recognized (Frangoudes *et al.* 2008a). Fisheries statistics for Galicia indicated that in 2015, out of a total of 8,460 (wild capture) shellfish harvesters, approximately were 469 women, while a much higher number of women were involved in the harvest of cultured shellfish (OCUPESCA 2017).

Estimate and Assumptions: Participation by women in small-scale fishing activities is 9% based on 1,200 out of 7,902 small-scale fishers (Goupement Monfort-Baelde-Vouhe 2017; STECF 2017). Assuming the participation rate of 2% cited in the literature was based on total fisheries employment, the rate of 9% was calculated based on the number of women cited in the literature related to the total participation in the small-scale sub-sector.

Uncertainty: This estimate received a score of 3 as the data were considered rigorous with several sources providing similar estimates.

52. Tanzania

Fishing in Tanzania is generally considered a male domain and, while very few women go out in boats, they participate in a dominant way in the pre- and post-harvest sectors and in fishing activities from shore (Matthews *et al.* 2012; Fröcklin *et al.* 2013, 2014; de la Torre-Castro *et al.* 2017). In the past, octopus fishing in Tanzania was an activity dominated by women and children. However, as the demand for octopus increased in the 1990s and the fishery became more profitable, men began participating in this fishery, displacing women (Guard and Mgaya 2002; Porter *et al.* 2008). As shore-fishers in mangroves, estuarine, and other nearshore areas, women collect sea cucumbers, crustaceans, and bivalves by foot using their hands or a wooden stick, while men use harpoons and spears (Marshall *et al.* 1999; Jiddawi and Öhman 2002; Silva

2006). Using a shore fishing catch rate of 0.97 $t \cdot year^{-1}$ (Jiddawi and Öhman 2002), approximately 4,000 tonnes of subsistence catch per year can be attributed to women.

Estimate and Assumptions: Participation by women in small-scale marine capture fishing activities is 8.7% out of a total of 49,500 small-scale fishers including shore-based and boat-based fishers. Based on sources that indicate that shore-based fishing activities are most often performed by women and that women dominate marine invertebrate harvesting from shore (Marshall *et al.* 1999; Guard and Mgaya 2002; Jiddawi and Öhman 2002; Silva 2006; de la Torre-Castro *et al.* 2017), participation by women in this fishery sub-sector was assumed to be 66% of collectors in Tanzania and Zanzibar (see Jacquet *et al.* 2010; Bultel *et al.* 2015). The number of shore-based fishers was calculated from a shore-based fisher to population ratio presented in Bultel *et al.* (2015). The result was a total of 6,500 shore-based fishers, which was added to the approximately 43,000 artisanal fishers, assumed to be boat-based fishers described in Jiddawi and Öhman (2002).

Uncertainty: This estimate received a score of 2, as quantitative data were limited, and the participation estimate was derived using a combination of sources.

53. Thailand

Fishing in Thailand has typically been considered a male occupation; however, women participate in fishing activities but may not refer to themselves as fishers (Poonnachit-Korsieporn 2000). A fisheries census conducted in 2000 indicated that out of a total 80,538 people engaged in the marine capture fisheries sub-sector, 12,242 were women (National Statistical Office 2001), which translates into a female participation rate of 15.2%. This number likely underestimates female participation in fishing activities, which has been found to be higher in some regions. For example, a study of the Adaman Coast of Thailand found that one third of fisherfolk in the bay of Phang-nga were women. However, this study does not provide detailed descriptions of the roles and activities of female participants (Seilert and Sangchan 2001).

Estimate and Assumptions: Participation by women in small-scale coastal marine fishing activities is 15.2% out of a total of 69,665 people in small-scale coastal marine fishing activities based on census data. FAO (2009b) suggests that there are 800,000 people involved in the primary sector in fisheries. To disaggregate small and large-scale sectors, the estimate that 86.5% of fisherfolk are small-scale from Poonnachit-Korsieporn (2000) was used.

Uncertainty: This estimate receives a score of 2 as it was based on limited data which lacked detail on how numbers were estimated (not clear how comprehensive/gender inclusive). Additionally, data were from over a decade ago.

54. The Netherlands

In the Netherlands, women are thought to represent between 1-5% of fishers, while representing 39-43% of processing sector employment (MacAlister Elliott and Partners LTD 2002; Frangoudes *et al.* 2008a). However, these estimates overlook the many additional contributions by women to the fisheries-related economy through their shore-based work in running family-based fishing enterprises, in managing their households and in supporting the community while men are at sea fishing, often for an extended time period (Quist 2008; Quist *et al.* 2010). In the early 2000s, a network of fishermen's wives came together to address various issues including sustainability in fisheries, community wellbeing, and better recognition of the role of women in the sector (Quist 2008). This women-in-fisheries network, known as *VinVis*, has been advocating, alongside other similar networks across Europe, for greater recognition and legal status for the unpaid labour contributions of women in the fishing industry (Frangoudes *et al.* 2008a). Despite some progress in gaining status and recognition, the role of women in fisheries is still absent in Dutch fishery statistics (Quist *et al.* 2010), reflecting a broader lack of recognition and enumeration of the informal, unpaid work done, in large part, by women, that is not captured by National accounts across all economic sectors, including fisheries.

Estimate: Participation by women in small-scale fishing activities is 5% out of a total of 1,200 coastal fishers in 2013 (MacAlister Elliott and Partners LTD 2002; OECD 2015).

Uncertainty: This estimate receives a score of 2 since the data used was from more than 10 years ago.

55. Tonga

In Tonga, both women and men exploit reef and lagoon resources, but they do so in different ways with women and children gathering seaweed and invertebrates by hand and using simple tools, such as spears and traps, whereas men fish use spears, hooks, nets, and traps (Malm 2009). Tonga differs somewhat from the rest of the Pacific Island countries in that women only participate in the collection of invertebrates, while men participate in both finfishing and invertebrate collection (Fairbairn-Dunlop 2014). Children play a significant role in fisheries, with both girls and boys involved from an early age in the harvest of marine resources, mainly for home consumption, but also for income generation (Kronen 2004). Sea cucumbers, collected by women from intertidal and shallow subtidal areas, are an increasing source of income for women in Tonga (Purcell *et al.* 2016).

Women collect substantial volume of seafood through their reeftop gleaning activities every year with average annual catch rates, for example in Lofanga, of approximately 600 kg fisher^{-1} year^{-1} (Kronen and Malimali 2009). The activities of Lofongan fisherwomen contribute to the high per capita consumption of invertebrates and to household income through their fishing, processing, and marketing octopus and giant clams (Kronen and Malimali 2009).

Estimate and Assumptions: Female participation in small-scale fishing activities is 17% out of a total of 4,800 small-scale fishers (Teh and Sumaila 2013; Gillett 2016). With estimates of the fisher population of Tonga ranging from 1,000 to over 10,000 a female participation rate of 17% was applied to the small-scale fisher population of 4,800 from Teh and Sumaila (2013).

Uncertainty: This estimate receives a score of 3 as several sources indicated similar numbers.

56. Tunisia

In Tunisia, the participation by women in fishing activities focuses on the intertidal harvest of wild clams (ArtFiMed 2009; Gueye 2016; Ogden 2017). The clam production sector in Tunisia employs more than 4,000 women at 17 different harvest sites, primarily from two coastal areas – Gabès and Sfax, with an average annual production of 700 tons mostly directed for export (FAO 2017). The species targeted is *Ruditapes decussatus*, the Mediterranean wild clam. Women are also involved in the processing of the clams at facilities, which prepare the product for export to Europe (Gueye 2016), but estimates of the number of women participating in this aspect of the value chain were not found in the literature.

Estimate: Participation by women in small-scale marine capture fishing activities is 10% (this is based on 4,000 women out of a total of 41,270 small-scale fishers in Tunisia with the total number of fishers taken from an FAO estimate of the number of participants in the artisanal coastal fishery and the lagoon and foot-based fisheries) (FAO 2005d).

Uncertainty: This estimate receives a score of 3 as several references indicate that women are strong participants in the clam fishery, citing estimates, while the robustness of the estimate is considered medium as the source is reliable but from more than 10 years ago.

57. Turkey

Women make important contributions to fisheries in Turkey, but their recognition as sectoral participants is relatively new with Turkish fisheries statistics (TÜİK) adding fisherwomen as a category only in 2012. According to TÜİK (2015), the female participation rate in fishing activities is approximately 1% for the entire country. However, focused studies have shown this proportion to be higher in some regions, i.e., 4.2% in the Southern Aegean (Göncüoğlu and Ünal 2011) and as high as 20% on the Datça-Bozburun peninsula (Göncüoğlu *et al.* 2015). Moreover, Göncüoğlu and Ünal (2011) indicated that only 38% of fisherwomen in the Aegean region are registered, which suggests that the actual number of women participating in fishing activities may be much higher than national statistics indicate. Women participate mainly in small-scale

fishing activities, often as crew on boats with their husbands (Göncüoğlu and Ünal 2011) but are also extensively involved in post-harvest activities such as processing.

Estimate and Assumptions: Female participation rate in marine capture fishing activities is 2% out of a total 37,747 people employed in coastal marine fisheries. The female participation rate was derived from an average between the two rates cited in the literature and under the assumption this was for the small-scale subsector.

Uncertainty: This estimate has a high degree of uncertainty and therefore received a score of 2. Although the estimate was taken from census data and was supported by peer-reviewed literature, the sources themselves identify gaps in accounting.

58. Ukraine

Fishing in the Ukraine is a male-dominated economic activity, while processing is a female-dominated activity (Libanova *et al.* 2012).

Estimate and Assumptions: Participation by women in small-scale fishing activities is 2% out of a total of 25,000 in fishing activities (Teh and Sumaila 2013). As there were no available data on female participation in fishing activities, a benefit transfer approach was used, applying the estimate from Poland.

Uncertainty: This estimate receives a score of 2 as the data was from a neighboring country.

59. United Kingdom

Women in the United Kingdom (UK) are involved in the fisheries-related economy in a variety of roles and activities, which are not necessarily visible or reflected in fisheries employment statistics (Zhao *et al.* 2013, 2014). A report on Women in European fisheries indicated that less than 1% of those participating directly in fishing were women (MacAlister Elliott and Partners LTD 2002). Similarly, Zhao *et al.* (2013), in their interviews of fisheries sector participants,

found that only a handful of women went out fishing on boats or harvested cockles from shore, whereas many more women were involved in other fisheries-related activities.

Estimate and Assumptions: Participation by women in small-scale fishing activities is 1% out of a total of 11,800 (Zhao *et al.* 2013; Teh and Sumaila 2013). For this estimate, a female participation rate of 1% was used as there was evidence for women participating in this sector but qualitative descriptions indicate their involvement is limited.

Uncertainty: The estimate for female participation in fishing gets a score of 2.

60. United States

While numerous sources indicate that fishing in the United States is mostly a male domain, especially in terms of activities on the water, women are involved in the broader fisheries-related economy in important ways, particularly in terms of shore-based support to fishing operations and businesses (Reedy-Maschner 2009; Calhoun *et al.* 2016). In many parts of the United States small fishing businesses have long relied on women providing logistical support to fishing operations, e.g., cooking for the crew, distributing paychecks, picking up parts, and taking care of the financial side of the business (Calhoun *et al.* 2016). While the role of the fishermen's wife has long been recognized, in terms of contributions to the economy, these roles are rarely captured in census and statistical accounts of labour contributions, as these are not necessarily formal or paid positions but contribute substantially to the fisheries sector. Some activities, such as bookkeeping in small fishing businesses, is often done by women and is simply considered a family responsibility, while in other cases, women may run bookkeeping businesses and may charge a fee for this service (Howell 2002).

Overall, women are thought to represent a very small proportion of on-the-water fisheries sector participation, with some estimates indicating that women represent less than 1% of commercial fishermen; however, there is likely considerable regional variation; for example more women go out fishing on the US west coast fisheries than on the east coast (Howell 2002), and in Alaska, it

is not uncommon for women to work as commercial fishermen and observers on boats (Laukitis 2017).

Census data in the United States does not provide the level of detail necessary to determine the number of women involved in small-scale marine capture fishing activities and in fisheries-related activities, such a fish processing. The best available estimate of female participation rates in the fisheries sector is the percentage of women in the occupation category, 'fishing, farming and forestry'. It is possible to exclude agricultural work from this estimate to get an overall female participation rate for fishing, forestry and hunting, which in 2016 was 9.4% (U.S. Census Bureau 2016a). This is the closest available approximation for participation by women in fisheries at a National level. The only other estimate of relevance is from the National survey of fishing, hunting and other wildlife-related recreation, which indicated that, in 2016, approximately 27% of recreational anglers in the US were female, and there were an estimated 8.3 million recreational saltwater anglers across the United States (US Census Bureau 2016b).

Estimate and Assumptions: Participation by women in small-scale fishing activities is 9.4% (US Census Bureau 2016a) out of a total of 29,000 fishers and related fishing workers (US Bureau of Labor Statistics 2017). In the absence of data disaggregated by sector, the female participation rate for the aggregated category 'fishing, hunting and forestry' from census data as representative of female participation in fishing was used.

Uncertainty: This estimate receives a score of 2 as it was based on a broad census category that included other sectors that may not have a similar gender composition as for fisheries.

61. Vietnam

Fishing households in Vietnam are characterized by a gendered division of labour, with men going out to sea to fish while women engage in selling and processing fish (World Bank 2005). Approximately 1 million people engage directly in fishing activities (Than Thi Hien 2008). While there is evidence that women participate in marine capture fisheries (e.g., fishing from boats in lagoons and collecting invertebrates by foot from shore (World Bank 2005; Lentisco and

Phuong Thao 2013), these activities are not well documented or accounted for. Than Thi Hien (2008) estimates that roughly 40,000 women are involved in marine capture fisheries, which translates into a female participation rate of 4% (Harper *et al.* 2017).

Estimate and Assumptions: Participation by women in coastal marine fishing activities is 4% out of approximately 1 million (Than Thi Hien 2008). The female participation rate cited in Than Thi Hien (2008) was assumed to represent participation in the small-scale sector, as several sources indicated that women do not participate in large-scale fishing activities.

Uncertainty: This estimate receives an uncertainty score of two as, although the numbers used to derive the estimate were from a peer-reviewed publication, the original source of the data was from an unpublished source.

62. Yemen

In Yemen, women are not actively involved in fishing or marketing of fish but participate formally in the fisheries economy by way of seafood processing (Bonfiglioli and Hariri 2004).

Estimate: Participation by women in small-scale marine capture fishing activities is zero out of a total of 60,000 people actively engaged in small-scale fishing (Bonfiglioli & Hariri 2004).

Uncertainty: This estimate received an uncertainty score of 2, given the limited information.

Literature cited in Appendix B

Alaedini, P. and Razavi, M.R. (2005) Women's Participation and Employment in Iran: A Critical Examination. *Critique: Critical Middle Eastern Studies* **14**, 57–73.

Alonso-Población, E. and Siar, S. V. (2018) Women's participation and leadership in fisherfolk organizations and collective action in fisheries. Rome.

Amos, M. (2014) Growing and empowering women in fisheries: Work in the Pacific region. *SPC Women in Fisheries Information Bulletin* **25**, 3–5.

Anna, Z. (2012) The Role of Fisherwomen in the Face of Fishing Uncertainties on the North Coast of Java, Indonesia. *Asian Fisheries Science* **25S**, 145–158.

Araneda, D., Salas, J., Pinto, A. and Alvarez, M. (2005) Questioning invisibility. *Yemaya* **19**, 6–7.

ArtFiMed (2009) Diagnostique initial des sites de pêche artisanale du Maroc et de Tunisie. Malaga.

Ashaletha, S., Ramachandran, C., Immanuel, S., Diwanj, A.D. and Sathiadhas, R. (1995) Changing Roles of Fisherwomen of India: Issues & Perspectives. Kochi.

Asian Development Bank (2011) The Informal Sector and Informal Employment in Indonesia. Asian Development Bank, Mandaluyong City.

Aslin, H.J., Webb, T. and Fisher, M. (2000) Fishing for women: understanding women's roles in the fishing industry. Canberra.

Bangladesh Bureau of Statistics. (2015) Labour Force Survey 2013. Available at: http://203.112.218.65:8008/WebTestApplication/userfiles/Image/LatestReports/LabourForceSurvey.2013.pdf [Accessed February 2, 2018].

Barnes-Mauthe, M., Oleson, K.L.L. and Zafindrasilivonona, B. (2013) The total economic value of small-scale fisheries with a characterization of post-landing trends: An application in Madagascar with global relevance. *Fisheries Research* **147**, 175–185.

Barnes, D.K.A. and Rawlinson, K.A. (2009) Traditional coastal invertebrate fisheries in south-western Madagascar. *Journal of the Marine Biological Association of the United Kingdom* **89**, 1589–1596.

Belhabib, D., Divovich, E. and Pauly, D. (2016a) Angola. In: *Global Atlas of Marine Fisheries: A Critical Appraisal of Catches and Ecosystem Impacts*. (eds D. Pauly and D. Zeller). Island Press, Washington, DC, p 187.

Belhabib, D., Koutob, V., Sall, A., Lam, V.W.Y. and Pauly, D. (2014) Fisheries catch misreporting and its implications: The case of Senegal. *Fisheries Research* **151**, 1–11.

Belhabib, D., Pauly, D., Harper, S. and Zeller., D. (2016b) Algeria. In: *Global Atlas of Marine Fisheries: A Critical Appraisal of Catches and Ecosystem Impacts*. (eds D. Pauly and D. Zeller). Island Press, Washington, DC, p 186.

Belhabib, D., Sumaila, U.R. and Pauly, D. (2015) Feeding the poor: Contribution of West African fisheries toemployment and food security. *Ocean and Coastal Management* **111**, 72–81.

Berazaluce Maturana, P., Burgos González, J. and Bordas Coddou, A. (2017) Mujeres y hombres en el secto Pesquero y Acuicultor de Chile 2017. Santiago.

Bonfiglioli, A. and Hariri, K.I. (2004) Small-scale Fisheries in Yemen: Social Assessment and Development Prospects. Washington, DC.

Branch, G.M., May, J., Roberts, B., Russell, E. and Clark, B.M. (2002) Case studies on the socio-economic characteristics and lifestyles of subsistence and informal fishers in South Africa. *South African Journal of Marine Sciences* **24**, 439–467.

Brugère, C. and Maal, B. (2014) Study of fisheries and aquaculture value chains in Mozambique. Oslo.

Brummett, R., Youaleu, J., Tiani, A.-M. and Kenmegne, M. (2010) Women's traditional fishery and alternative aquatic resource livelihood strategies in the Southern Cameroonian Rainforest. *Fisheries Management and Ecology* **17**, 221–230.

Buga, B. and Vuki, V. (2012) The people of the artificial island of Foueda, Lau Lagoon, Malaita, Solomon Islands: Traditional fishing methods, fisheries management and the roles of men and women in fishing. *SPC Women in Fisheries Information Bulletin*, 42–44.

Bultel, E., Doherty, B., Herman, A., Le Manach, F. and Zeller, D. (2015) An update of the reconstructed marine fisheries catches of Tanzania with taxonomic breakdown. In: *Fisheries catch reconstructions in the Western Indian Ocean, 1950–2010.*, Vol. 23 (2). (eds F. Le Manach and D. Pauly). The University of British Columbia, Vancouver, pp 151–161.

Calhoun, S., Conway, F. and Russell, S. (2016) Acknowledging the voice of women: implications for fisheries management and policy. *Marine Policy* **74**, 292–299.

Carney, J. (2017) "The mangrove preserves life": Habitat of African survival in the Atlantic world. *Geographical Review* **107**, 433–451.

Central Marine Fisheries Research Institute (2010) Marine Fisheries Census 2010. New Delhi.

Chapman, M.D. (1987) Women's fishing in Oceania. *Human Ecology* **15**, 267–288.

Di Ciommo, R.C. (2007) Pescadoras e pescadores: a questão da equidade de gênero em uma reserva extrativista marinha. *Ambiente & sociedade* **10**, 151–163.

Cliffe, P. and Akinrotimi, O. (2015) Role of Women in Fishery Activities in some coastal communities of Rivers State, Nigeria. *International Journal of Agricultural Research* **10**, 24–32.

de la Torre-Castro, M. De, Fröcklin, S., Börjesson, S., Okupnik, J. and Jiddawi, N.S. (2017) Gender analysis for better coastal management – Increasing our understanding of social-ecological seascapes. *Marine Policy* **83**, 62–74.

Delaney, A. and Yagi, N. (2017) Implementing the Small-Scale Fisheries Guidelines: Lessons from Japan. In: *The Small-Scale Fisheries Guidelines*. (eds S. Jentoft, R. Chuenpagdee, M. Barragán-Paladines and N. Franz), MARE Publi. Springer, Cham, Switzerland.

Delgado-Gustavson, V. (2011) Fishing Communities: Gender, Economic Life, and Welfare Regimes. Master's Thesis. Universitas Bergensis.

Deme, M., Thiao, D., Fambaye, N.S., Sarre, A. and Diadhiou, H.D. (2012) Dynamique des Populations de Sardinelles en Afrique du Nord-Ouest: Contraintes Environnementales, Biologiques et Socio Economiques. Narragansett, RI.

Diegues, A.C. (2008) Marine protected areas and artisanal fisheries in Brazil. Chennai.

Döring, R., Carvalho, N. and Virtanen, J. (2012) Scientific, Technical and Economic Committee for Fisheries (STECF) Economic Performance of the EU Fish Processing Industry Sector. Luxembourg.

Durai, J.A. and Dhanalakshmi, J. (2015) Role of women in fishery sector in Tamil Nadu. *International Journal of Application or Innovatioin in Engineering and Management* **4**, 9–13.

Failler, P., Beyens, Y. and Asiedu, B. (2014) Value chain analysis of the fishery sector in Ghana with focus on quality, environmental, social, sustainable, food safety, organic requirements and its compliance infrastructure. Accra.

Fairbairn-Dunlop, T.P. (2014) A Pacific Way of Counting. In: *Counting on Marilyn Waring: New Advances in Feminist Economics*. (eds M. Bjornholt and A. McKay). Demeter Press, Bradford, pp 119–133.

FAO (2014) Bangladesh. Available at: http://www.fao.org/fishery/facp/BGD/en [Accessed February 2, 2018].

FAO (2010a) Brazil. Available at: http://www.fao.org/fishery/facp/BRA/en [Accessed May 1, 2018].

FAO (2007a) Cameroon. Available at: http://www.fao.org/fishery/docs/DOCUMENT/fcp/fr/FI_CP_CM.pdf [Accessed December 19, 2017].

FAO (2015) Cuba. Available at: http://www.fao.org/fishery/facp/CUB/es [Accessed April 16, 2018].

FAO (2008a) Dominican Republic. Available at: http://www.fao.org/fishery/facp/DOM/en [Accessed April 16, 2018].

FAO (2017) FAO project supports women clam collectors in Tunisia. Available at: http://www.fao.org/in-action/women-in-agrifood-value-chains/fao-project-supports-women-clam-collectors-in-tunisia/en/ [Accessed December 13, 2017].

FAO (2007b) Gabon. Available at: http://www.fao.org/fishery/docs/DOCUMENT/fcp/fr/FI_CP_GA.pdf [Accessed December 19, 2017].

FAO (2016) Jamaica. Available at: http://www.fao.org/fishery/facp/JAM/en [Accessed April 16, 2018].

FAO (2005a) Le Royaume du Maroc. Available at: http://www.fao.org/fishery/docs/DOCUMENT/fcp/fr/FI_CP_MA.pdf [Accessed December 18, 2017].

FAO (2005b) Libya. Available at: http://www.fao.org/fishery/docs/DOCUMENT/fcp/en/FI_CP_LY.pdf [Accessed December 18, 2017].

FAO (2009a) Malaysia. Available at: http://www.fao.org/fishery/facp/MYS/en [Accessed February 12, 2018].

FAO (2008b) Mozambique. Available at: http://www.fao.org/fishery/docs/DOCUMENT/fcp/en/FI_CP_MZ.pdf [Accessed January 9, 2018].

FAO (2007c) Namibia. Available at: http://www.fao.org/fishery/facp/NAM/en [Accessed January 12, 2018].

FAO (2007d) Nigeria. Available at: http://www.fao.org/fishery/facp/NGA/en [Accessed December 13, 2017].

FAO (2010b) The Federated States of Micronesia. Available at: http://www.fao.org/fishery/facp/FSM/en [Accessed July 5, 2018].

FAO (2009b) The Kingdom of Thailand. Available at: http://www.fao.org/fishery/facp/THA/en [Accessed January 31, 2018].

FAO (2005c) The Republic of El Salvador. Available at: http://www.fao.org/fishery/docs/DOCUMENT/fcp/es/FI_CP_SV.pdf [Accessed April 15, 2018].

FAO (1994) The role of women in Agriculture. Available at: http://www.fao.org/docrep/V8195E/v8195e01.htm#TopOfPage [Accessed December 18, 2017].

FAO (2013) The Sultanate of Oman. Available at: http://www.fao.org/fishery/facp/OMN/en [Accessed February 1, 2018].

FAO (2005d) Tunisia. Available at: http://www.fao.org/fishery/facp/TUN/fr [Accessed December 13, 2017].

Fay, L., Vuki, V., Sauni, S. and Tebano, T. (2007) Anadara fishing supports urban households in Tarawa, Kiribati and Suva, Fiji. *SPC Women in Fisheries Information Buletin* **17**, 19–26.

Ferrari, B. (2016) Fighting invisibility: Fisherwomen in Brazil demand to be heard on their right to social security and decent work. *Yemaya* **52**, 4–5.

Fisheries and Fisheries Administration of the Ministry of Agriculture (2014) *China Fisheries Yearbooks, 2008-2014*. China Fishery Yearbook Publishing House.

Fishery Survey of India (2012) Marine Fisheries Census 2010: Union Territories of Andaman & Nicobar and Lakshadweep Islands. New Delhi.

Fitriana, R.I.A. and Stacey, N. (2012) The Role of Women in the Fishery Sector of Pantar Island, Indonesia. *Asian Fisheries Science Special Issue* **25S**, 159–175.

Ford, J.D. and Goldhar, C. (2012) Climate change vulnerability and adaptation in resource dependent communities: A case study from West Greenland. *Climate Research* **54**, 181–196.

Frangoudes, K., Carrol, M., Holmyard, N., Marcianiak, B., Cristina, M., Pascual-Fernandez, J., Marugan Pintos, B., Ronn, C. and Quist, C. (2008a) The role of women in the sustainable development of European Fisheries Areas. Brussels.

Frangoudes, K. and Keromnes, E. (2008) Women in Artisanal Fisheries in Brittany, France. *Development* **51**, 265–270.

Frangoudes, K., Marugán-Pintos, B. and Pascual-Fernández, J.J. (2008b) From open access to co-governance and conservation: The case of women shellfish collectors in Galicia (Spain). *Marine Policy* **32**, 223–232.

Fröcklin, S., de la Torre-Castro, M., Håkansson, E., Carlsson, A., Magnusson, M. and Jiddawi, N.S. (2014) Towards improved management of tropical invertebrate fisheries: including time series and gender. *PloS one* **9**, 1–12.

Fröcklin, S., de la Torre-Castro, M., Lindström, L. and Jiddawi, N.S. (2013) Fish traders as key actors in fisheries: gender and adaptive management. *Ambio* **42**, 951–62.

Gammage, S. (1996) The tattered net of statistics. *SAMUDRA Report* **16**, 36–40.

Garcia, A. (2000) Perú: Gender Issues in the Fisheries Sector. In: *Workshop on Gender and Coastal Fishing Communities in Latin America, 10 to 15 June 2000, Prainha do Canto Verde, Ceara, Brazil*. ICSF, Chennai, pp 97–110.

Gerrard, S. (2005) Research Relations and Globalization: Feminist Reflections on the Informant-Researcher Relationship. In: *Changing Tides: Gender, Fisheries and Globalization*. (eds B. Neis, M. Binkley, S. Gerrard and M.C. Maneschy). Fernwood Publishing, Halifax, pp 215–228.

Gerrard, S. (2018) Then and Now—Women in Norway's Fisheries. *Yemaya* **56**, 7–10.

Gerrard, S. (2006) Women, men and fishing quotas. *Yemaya* **22**, 1–2.

Gervásio, H.F. (2014) Governing the intertidal subsistence fisheries in Mozambique: Vulnerability, marginalization and policy mismatches Case study of the district of Palma (The Province of Cabo Delgado).

Gillett, R. (2016) *Fisheries in the Economies of Pacific Island Countries and Territories*. Pacific Community, Noumea.

Glaeser, B. and Glaser, M. (2011) People, fish and coral reefs in Indonesia: A contribution to social-ecological research. *Gaia* **20**, 139–141.

Göncüoğlu, H. and Ünal, V. (2011) Fisherwomen in the Turkish fishery, southern Aegean Sea. *Journal of Applied Ichthyology* **27**, 1013–1018.

Göncüoğlu, H., Ünal, V. and Kızılkaya, Z. (2015) Supporting Fisherwomen in Small-Scale Fisheries in Turkey. In: *First Regional Symposium on Sustainable Small-Scale Fisheries in the Mediterranean and Black Sea*. (eds A. Srour, N. Ferri, D. Bourdenet, D. Fezzardi and A. Nastasi). Rome, pp 447–451.

Gopal, N., Sruthi, P., Jayalal, L., Meenakumari, B., Rajaratnam, S. and McDougall, C. (2017) Gender Baselines in Fisheries and Aquaculture Value Chain in India: A Systematic Review. In: *Gender in Aquaculture and Fisheries*. Asian Fisheries Society, Kerala.

Goupement Monfort-Baelde-Vouhe (2017) La place des femmes dans les secteurs pêche et aquaculture en France. Paris.

Grandcolas, D. (1997) Les femmes et la collecte des huitres dans le Saloum (Senegal). Dakar.

Grant, S.C. (2004) Caribbean women in fishing economies. In: *Proceedings of the Fifty Fifth Annual Gulf and Caribbean Fisheries Institute Conference*. pp 68–77.

Guard, M. and Mgaya, Y.D. (2002) The Artisanal Fishery for Octopus cyanea Gray in Tanzania. *Ambio* **31**, 528–536.

Gueye, G. (2016) Voices from African Artisanal Fisheries. Stockholm.

Harper, S., Grubb, C., Stiles, M. and Sumaila, U.R. (2017) Contributions by Women to Fisheries Economies: Insights from Five Maritime Countries. *Coastal Management* **45**, 91–106.

Harper, S., Zeller, D., Hauzer, M., Pauly, D. and Sumaila, U.R. (2013) Women and fisheries: contribution to food security and local economies. *Marine Policy* **39**, 56–63.

Herrera, A., Betancourt, L., Silva, M., Lamelas, P. and Melo, A. (2011) Coastal fisheries of the Dominican Republic. In: *Coastal fisheries of Latin America and the Caribbean*. (ed A.C. and J.C.S. Salas, R. Chuenpagdee). FAO, Rome, pp 175–217.

Howell, L.A. (2002) Perspectives on women in fisheries in North America. In: *Global Symposium on Women in Fisheries: Sixth Asian Fisheries Forum*. (eds M.J. Williams, N.H. Chao, P.S. Choo, Matics, K., Nandeesha, M.C., Shariff, M., Siason, I., Tech, E. and Wong, J.M.C.). ICLARM-The World Fish Center, Kaohsiung, pp 183–188.

Immanuel, S., Pillai, V.N., Vivekanandan, E., Kurup, K.N. and Srinath, M. (2003) A Preliminary Assessment of the Coastal Fishery Resources in India - Socioeconomic and Bioeconomic Perspective. Penang.

Immanuel, S. and Rao, G.S. (2009) The Status of Fisherwomen in Andhra Pradesh. *Indian Journal of Gender Studies* **16**, 411–423.

INEGI (2011) Pesca y acuicultura: Censos Económicos 2009. Aguascalientes.

INFOPESCA (2018) Red Latinoamericana de las Mujeres del Sector Pesquero [Latin American Network of Women working in the fisheries sector]. Available at: http://www.mujeres.infopesca.org/ [Accessed April 16, 2018].

Instituto Nacional de Estadística e Informática (2012) Perú - I Censo Nacional de la Pesca Artesanal del Ámbito Marítimo 2012 [Peru- First National Census of Artisanal Fishers]. Lima.

Jacquet, J., Fox, H., Motta, H., Ngusaru, A. and Zeller, D. (2010) Few data but many fish: Marine small-scale fisheries catches for Mozambique and Tanzania. *African Journal of Marine Science* **32**, 197–206.

Jiddawi, N.S. and Öhman, M.C. (2002) Marine Fisheries in Tanzania. *AMBIO: A Journal of the Human Environment* **31**, 518–527.

Johnstone, R. (2003) A More Central Role. *Yemaya* **14**, 7–8.

Kafarowski, J. (2006) Valuing local knowledge in the Canadian Arctic: How the involvement of local peoples results in relevant resource management decisions. In: *Global Symposium on Gender and Fisheries*. (eds P.S. Choo, S.J. Hall and M.J. Williams). WorldFish Center and Asian Fisheries Society, Penang, Malaysia, pp 169–173.

Koshy, N. and Sharma, C. (2007) Shoring Up. *SAMUDRA Report* **48**, 17–21.

Kronen, M. (2004) Alu toutai - Na laki qoli - Fun or duty: School children's involvement in subsistence fisheries in Tonga and Fiji. *SPC Women in Fisheries Information Buletin* **14**, 9–17.

Kronen, M., Friedman, K., Pinca, S., Chapman, Lindsay Awiva, R., Pakoa, K., Vigliola, L., Boblin, P. and Magron, F. (2008) Pacific Regional Oceanic and Coastal Fisheries Development Programme French Polynesia Country Report. Noumea.

Kronen, M. and Malimali, S. (2009) The octopus fishery on Lofanga, Kingdom of Tonga. *SPC Women in Fisheries Information Bulletin* **19**, 11–16.

Kronen, M. and Vunisea, A. (2009) Fishing impact and food security – Gender differences in finfisheries across Pacific Island countries and cultural groups. *SPC Women in Fisheries Information Buletin*, 3–10.

Kruijssen, F., Albert, J., Morgan, M., Boso, D., Siota, F., Sibiti, S. and Schwarz, A.-M. (2015) Livelihoods, markets, and gender roles in Solomon Islands: Case studies from Western and Isabel Provinces. *SPC Women in Fisheries Information Bulletin* **26**, 24–36.

Krushelnytska, O. (2015) Toward Gender-Equitable Fisheries Management in Solomon Islands. Washington, DC.

Lambeth, L. (2000) An Assessment of the Role of Women in Fisheries in Pohnpei, Federated States of Micronesia. Noumea.

Lambeth, L. (1999) An Assessment of the Role of Women within Fishing Communities in the Republic of Palau. Noumea.

Lambeth, L., Hanchard, B., Aslin, H., Fay-Sauni, L., Tuara, P., Des Rochers, K., Vunisea Source, A. and Wong, J. (2014) An overview of the involvement of women in fisheries activities in Oceania. *SPC Women in Fisheries Information Bulletin* **25**, 21–33.

Lambeth, L., Hanchard, B., Aslin, H., Fay-Sauni, L., Tuara, P., Rochers, K.D. and Vunisea, A. (2002) An overview of the involvement of women in fisheries activities in Oceania. Noumea.

Laukitis, E. (2017) *Ocean notes: A book of seafaring women*. Salmon Sisters, Bristol Bay.

Lentisco, A. and Phuong Thao, H.T. (2013) Strengthening livelihoods: A Vietnamese fisheries programme helps. *SPC Women in Fisheries Information Bulletin* **23**, 45.

Libanova, E., Makarova, O., Gerasymenko, G., Aksyonova, S., Maidanik, I., Tkachenko, L., Lysa, O., Reut, A. and Otkydach, M. (2012) Analytical Research on Women's Participation in the Labour Force in Ukraine. Kyiv.

Lim, C.P., Ito, Y. and Matsuda, Y. (2012) Braving the Sea: The Amasan (Women Divers) of the Yahataura Fishing Community, Iki Island, Nagasaki Prefecture, Japan. *Asian Fisheries Science* **25S**, 29–45.

MacAlister Elliott and Partners LTD (2002) Summary of the report "The Role of Women in Fisheries." Luxembourg.

Mackenzie, C.L. (2001) The Fisheries for mangrove cockles, Anadara spp., from Mexico to Peru, with descriptions of their habitats and biology, the fishermen's lives, and the effects of shrimp farming. *Marine Fisheries Review* **63**, 1–39.

Malm, T. (2009) Women of the coral gardens: The significance of marine gathering in Tonga. *SPC Traditional Marine Resource Management and Knowledge Information Bulletin* **25**, 2–15.

Máñez, K.S. and Pauwelussen, A. (2016) Fish Is Women's Business Too: Looking at Marine Resource Use Through a Gender Lens. In: *Perspectives on Oceans Past*. (eds K.S. Máñez and B. Poulsen). Springer, Dordrecht, pp 193–211.

Marshall, N.T., Milledge, S.A.H. and Afonso, P.S. (1999) Stormy seas for marine invertebrates: trade in sea cucumbers, sea shells and lobsters in Kenya, Tanzania and Mozambique. Nairobi.

Matthews, E., Bechtel, J., Britton, E., Morrison, K. and McClennen, C. (2012) A Gender Perspective on Securing Livelihoods and Nutrition in Fish-dependent Coastal Communities. Bronx, NY.

Meltzoff, S.K. (1995) Marisquadoras of the Shellfish Revolution: The Rise of Women in Co-management on Illa de Arousa. *Journal of Political Ecology* **2**, 20–38.

Ministry of Agriculture Forestry and Fisheries (2016) The 90th Statistical Yearbook of Ministry of Agriculture Forestry and Fisheries Japan 2014/2015. Tokyo.

Monfort, M.C. (2015) The role of women in the seafood industry. GLOBEFISH Research Programme, Rome.

Munk-Madsen, E. (1998) The Norwegian fishing quota system: Another patriarchal construction? *Society & Natural Resources* **11**, 229–240.

National Statistical Office (2001) The 2000 Intercensal Survey of Marine Fishery. Bangkok.

Neis, B., Gerrard, S. and Power, N.G. (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**, 64.

Ngo Som, J. (1995) Women's role in Cameroon fishing communities: the cases of Limbe and Kribi. IDAF Programme Report: Report of the working group on women's key role and issues related to gender in fishing communities. Rome.

Nwabeze, G., Ifejika, P., Tafida, A., Ayanda, J., Erie, A. and Belonwu, N. (2013) Gender and Fisheries of Lake Nainji, Nigeria: A review. *Journal of Fisheries and Aquatic Sciences* **8**, 9–13.

OCUPESCA (2017) Enquisa sobre a poboación ocupada nos sectores da pesca e da acuicultura mariña en Galicia. Santiago de Compostela.

OECD (2015) OECD Review of Fisheries: Country Statistics 2014. OECD Publishing. Geneva.

Ogden, L.E. (2017) Fisherwomen-The uncounted dimension in fisheries management. *BioScience* **67**, 111–117.

Okeowo, T., Bolarinwa, J. and Ibrahim, D. (2015) Socioeconomic Analysis of Artisanal Fishing and Dominant Fish Species in Lagoon Waters of EPE and Badagry Areas of Lagos State. *International Journal of Research in Agriculture and Forestry* **2**, 38–45.

OSPESCA (2012) Encuesta Estructural de la pesca artesanal y la Acuicultura en Centroamérica: 2009-2011. Antiguo Cuscatlán.

Overå, R. (1992) Fish Mammies. The Role of Women in the Artisanal Fisheries Sector of Ghana. Master's Thesis. University of Bergen.

Pacific Community (2018) Gender analysis of the fisheries sector - Solomon Islands. Noumea.

Pakoa, K., Simpson, R., Demei, L., Olsudong, Downette Salong, C., Rechelluul, P. and Fisk, D. (2014) The status of sea cucumber fisheries resources and management for Palau. Noumea.

Poonnachit-Korsieporn, A. (2000) Coastal fishing communities in Thailand. Bangkok.

Porter, M., Mwaipopo, R., Faustine, R. and Mzuma, M. (2008) Globalization and Women in Coastal Communities in Tanzania. *Development* **51**, 193–198.

Purcell, S.W., Lalavanua, W., Cullis, B.R., Cocks, N. and Purcell, S.W. (2018) Small-scale fishing income and fuel consumption: Fiji's artisanal sea cucumber fishery. *ICES Journal of Marine Science* **75**, 1758–1767.

Purcell, S.W., Ngaluafe, P., Aram, K.T. and Lalavanua, W. (2016) Variation in postharvest processing of sea cucumbers by fishers and commercial processors among three Pacific Island countries. *SPC Bêche-de-mer Information Bulletin* **36**, 58–66.

Quist, C. (2008) VinVis: The women in fisheries network. *Yemaya* **27**, 5–7.

Quist, C., Frangoudes, K. and O'Riordan, B. (2010) ICSF-AKTEA WIF 2010 Strengthening the voice of women of fishing communities in Europe. Brest.

Raab, D. and Roche, D. (2005) A preliminary assessment of the artisanal fishery in the town of Pedro González, Archipelago of Las Perlas, Panama.

Rabbanee, F.K. and Yasmin, S. (2011) Role of Women in Processing and Marketing of Dry Fish from Coastal Bangladesh – An Exploratory Study. *East West Journal of Business and Social Studies* **2**, 39–62.

Raemaekers, S. and Sunde, J. (2015) Women in fisheries in Africa. *Yemaya* **50**, 10–11.

Al Rashdi, K.M. and McLean, E. (2014) Contribution of Small-Scale Fisheries to the Livelihoods of Omani Women: A Case Study of the Al Wusta Governorate. *Asian Fisheries Science* **27S**, 135–149.

Reedy-Maschner, K. (2009) Chercher Les Poissons: Gender Roles in an Aleut Indigenous Commercial Economy. In: *Gender, Culture and Northern Fisheries*. (ed J. Kafarowski). CCI Press, Edmonton, pp 3–28.

Reynolds, J., Abukhader, A. and Abdallah, A. (1995) The marine wealth sector of Libya: A development planning overview. Tripoli/Rome.

Rocha, L.M. (2013) "Ecologia Humana Manejo Participativo Da Pesca Do Búzio Anomalocardia brasiliana (Gmelin, 1791)(Bivalvia: Veneridae) Na Reserva De Desenvolvimento Sustentável Estadual Ponta Do Turbarão (RN)." Master's Thesis. Universidade Federal Do Rio Grande Do Norte.

Rocha, L.M. and Pinkerton, E. (2015) Comanagement of clams in Brazil: a framework to advance comparison. *Ecology and Society* **20**, 7.

Salazar, H. and Castañeda, I. (2002) Background paper: Mexico-Women in Fisheries. In: *Workshop on Gender and Coastal Fishing Communities in Latin America: 10 to 15 June 2000, Prainha do Canto Verde, Ceara, Brazil*. International Collective in Support of Fishworkers, Chennai, pp 45–96.

Salz, P., Buisman, E., Smit, J. and de Vos, B. (2006) Employment in the fisheries sector: current situation (FISH/2004/4). Brussels.

Sasu, L. (1999) Breaking through culture. *Yemaya* **1**, 4–5.

Seilert, H. and Sangchan, S. (2001) Small-scale fishery in Southeast Asia: A case-study in Southern Thailand. Bangkok.

Shaw, J., Stocker, L. and Noble, L. (2015) Climate change and social impacts: women's perspectives from a fishing community in Western Australia. *Australian Journal of Maritime & Ocean Affairs* **7**, 38–51.

Siason, I.M., Tech, E., Matics, K.I., Choo, P.S., Shariff, M., Heruwati, E.S., Susilowati, T., Miki, N., Shelly, A.B., Rajabharshi, K.G., Ranjit, R., Siriwardena, P.P.G.N., Nandeesha, M.C., Sunderarajan, M. (2002) Women In Fisheries in Asia. In: *Global Synposium on Women in Fisheries*. (eds Williams, M.J. Chao, N.H., Matics, K.I., Nandeesha, M.C., Shariff, M., Siason, I., Tech, E. and Wong, J.M.C.). The World Fish Center, Penang, Malaysia, pp 21–48.

Silva, C.N. (2000) Perú: Women in the Fisheries Sector. In: *Workshop on Gender and Coastal Fishing Communities in Latin America*. ICSF, Chennai, pp 111–113.

Silva, P. (2006) Exploring the Linkages between Poverty, Marine Protected Area Management, and the Use of Destructive Fishing Gear in Tanzania. New York.

Sloan, L., Kafarowski, J., Heilmann, A., Karlsdóttir, A., Udén, M., Angell, E. and Erlandsen, M.M. (2002) Women's participation in decision-making processes in Arctic fisheries resource management, Arctic Council 2002-2004. Norfold.

Soumare, A. (2006) Senegal Role of Women in a Model of Community Management of Fish Resources and Marine Environments, Cayar. Dakar.

SPC (2013) Status report: Pacific Islands reef and nearshore fisheries and aquaculture 2013. Noumea.

Statistics Canada (2016) Occupation - National Occupational Classification (NOC) 2016 (693A). Available at: http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/index-eng.cfm [Accessed April 16, 2018].

STECF (2018) *Economic report of the EU fish processing sector 2017*. Publications Office of the European Union, Luxembourg.

STECF (2017) *The 2017 Annual Economic Report on the EU Fishing Fleet (STECF 17-12)*. Publications Office of the European Union, Luxembourg.

Sultana, P., Thompson, P.M. and Ahmed, M. (2002) Women-led fisheries management - A case study from Bangladesh. Penang.

Taniera, T. and Mitchell, J. (1995) Notes from Kiribati. In: *Fishing for Answers: Women and Fisheries in the Pacific Islands*. (ed E. Matthews). Women and Fisheries Network, Suva, pp 29–32.

Teh, L.C.L. and Sumaila, U.R. (2013) Contribution of marine fisheries to worldwide employment. *Fish and Fisheries* **14**, 77–88.

Tetteh, A.S. (2007) Women's activities in the Ghanaian fishery; The role of social capital. Master's Thesis. University of Tromsø.

Thalassa (2006) *Fatma, la femme pêcheur du port de Zemmouri*. Daily Motion, Algerie.

Than Thi Hien (2008) Women in Fisheries and Community based Coastal Resource Management in Vietnam: Issues and Challenges. 17.

Thomas, A.S., Mangubhai, S., Vandervord, C., Fox, M. and Thomas, A.S. (2018) Impact of Tropical Cyclone Winston on women mud crab fishers in Fiji. *Climate and Development*, 1–11.

Tietze, U., Lee, R., Siar, S., Moth-Poulsen, T. and Båge, H.E. (2011) Fishing with beach seines. Rome.

Tietze, U., Siar, S., Upare, S.M. and Upare, M.A. (2007) Livelihood and micro-enterprise development opportunities for women in coastal fishing communities in India: Case studies of Orissa and Maharashtra. Rome.

Tiitii, U., Sharp, M. and Ah-Leong, J. (2014) Samoa socioeconomic fisheries survey report 2012/2013. Noumea.

Turner, N. (2003) “Passing on the News”: Women’s Work, Traditional Knowledge and Plant Resource Management in Indigenous Societies of North-western North America. In: *Women & Plants: Gender Relations in Biodiversity Management & Conservation*. (ed P.L. Howard). Zed Books Ltd., London, pp 133–149.

US Bureau of Labor Statistics (2017) Women in the labor force: a databook. Available at: https://www.bls.gov/cps/demographics.htm#women [Accessed April 26, 2018].

US Census Bureau (2016a) American Community Survey: Table B24010, Sex by occupation by employed population 16 years or older. Available at: https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml [Accessed April 26, 2018].

US Census Bureau (2016b) National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. Available at: https://wsfrprograms.fws.gov/subpages/nationalsurvey/nat_survey2016.pdf [Accessed April 26, 2018].

Valdez-Gardea, G.C. (2001) People’s Response in a Time of Crisis: Marginalization in the Upper Gulf of California. PhD Dissertation. University of Arizona.

Vali, S., Rhodes, K., Au, A., Zylich, K., Harper, S. and Zeller, D. (2014) Reconstruction of Total Fisheries Catches for the Federated States of Micronesia (1950-2010). *Fisheries Centre Working Paper Series*. Vancouver.

Villemur, M. and Angouillant, V.-P. (2015) *Femmes de Mer: 42 Portraits de femmes travaillant dans les secteurs de la pêche et l’aquaculture*. Ministère de l’écologie, du développement durable et de l’énergie, Paris.

Walker, B.L.E. (2002) Engendering Ghana’s Seascape: Fanti Fishtraders and Marine Property in Colonial History. *Society & Natural Resources* **15**, 389–407.

Walker, B.L.E. (2001) Sisterhood and Seine-Nets: Engendering Development and Conservation in Ghana’s Marine Fishery. *Professional Geographer* **53**, 160–177.

Walter, C. (2006) Femmes et Coquillages: Vers une Gestion Participative de la Ressource. Brest.

Wang, Q. and Zhou, Y. (2008) Contributing significantly. *Yemaya* **28**, 5–7.

Westerman, K. and Benbow, S. (2013) The Role of Women in Community-based Small-Scale Fisheries Management: The Case of the South West Madagascar Octopus Fishery. *Western Indian Ocean Journal of Marine Science* **12**, 119–132.

Williams, J. (2006) *Clam Gardens: Aboriginal Mariculture and Canada's West Coast*. New Star Books, Vancouver.

Williams, J., Rife, A. and Smith, S. (2017) Securing women's rights and livelihoods. In: *NAAFE Forum 2017: Designing rights-based management systems to achieve social objectives in fisheries*. NAAFE, La Paz.

Williams, S.B. (1996) Economic role of women in fishing communities: a case study of Koko, Nigeria. *Technical Report No. 94*. Cotonou.

Williams, S.B., Hochet-Kibongui, A.-M. and Nauen, C.E. (2005) Gender, fisheries and aquaculture: Social capital and knowledge for the transition towards sustainable use of aquatic ecosystems. *ACP – EU Fisheries Research Report* 16. Brussels.

World Bank (2010) Hidden Harvest: The Global Contribution of Capture Fisheries. Washington, DC.

World Bank (2005) Vietnam Fisheries and Aquaculture Sector Study Final Report. Hanoi.

Xu, S., Xu, Y., Huang, Y. and Zheng, F. (2012) Women's roles in the construction of new fishing villages in China, as shown from surveys in Zhejiang Province. *Asian Fisheries Science* **25**, 229–236.

Yahaya, J. (2001) Women in small-scale fisheries in Malaysia. In: *International Symposium on Women in Asian*, Vol. 17. (eds M.J. Williams, M.C. Nandeesha, V.P. Orral, E. Tech and C. Poh Sze), Fisheries: Asian Fisheries Society, Chiang Mai, pp 46–48.

Yonger, M. (2002) Approche de la pêcherie récifo-lagonaire de Moorea (Polynésie française): évaluation de la production halieutique et de la population de pêcheurs. Papeete.

Zhao, M., Tyzack, M., Anderson, R. and Onoakpovike, E. (2013) Women as visible and invisible workers in fisheries: A case study of Northern England. *Marine Policy* **37**, 69–76.

Zhao, M., Tyzack, M., Anderson, R. and Onoakpovike, E. (2014) Women in English Fisheries: Roles, Contributions, Barriers and Prospects. In: *Social Issues in Sustainable Fisheries Management*. (eds J. Urquhart, T. Acott, D. Symes and M. Zhao). Springer Netherlands, Dordrecht, pp 233–254.

Zyalya Partal (2018) How the struggle for women's rights contributes to biodiversity. Available at: http://greenbelarus.info/articles/07-03-2018/kak-borba-za-prava-zhenshchin-sposobstvuet-podderzhaniyu-bioraznoobraziya [Accessed January 12, 2019].