

Full length article

The importance of qualitative social research for effective fisheries management



Kate Barclay^{a,*}, Michelle Voyer^a, Nicole Mazur^b, Anne Maree Payne^a, Senoveva Mauli^c, Jeff Kinch^d, Michael Fabinyi^{e,f}, Graeme Smith^g

^a Faculty of Arts and Social Sciences, University of Technology Sydney, PO Box 123 Broadway, NSW 2007, Australia

^b ENVision Environmental Consulting, 118 Mackenzie Street, Hackett, ACT 2602, Australia

^c Solomon Islands Community Conservation Partnership, PO Box 2378, SIDT Building, Chinatown, Honiara, Solomon Islands

^d National Fisheries College, PO Box 239, Kavieng, New Ireland, Papua New Guinea

^e Australian Research Council Centre of Excellence for Coral Reef Studies, James Cook University, QLD 4811, Australia

^f WorldFish, Batu Maung Bayan Lepas, 11900 Penang, Malaysia

^g State Society and Governance in Melanesia (SSGM), Coral Bell School of Asia Pacific Affairs, College of Asia and the Pacific, Australian National University, Acton, ACT 2601, Australia

ARTICLE INFO

Article history:

Received 15 February 2016

Received in revised form 28 July 2016

Accepted 7 August 2016

Available online 31 August 2016

Keywords:

Social evaluation

Human dimensions

Qualitative methods

Wellbeing

Interactive governance

Gender

ABSTRACT

Over recent decades it has become widely accepted that managing fisheries resources means managing human behaviour, and so understanding social and economic dynamics is just as important as understanding species biology and ecology. Until recently, fisheries managers and researchers have struggled to develop effective methods and data for social and economic analysis that can integrate with the predominantly biological approaches to fisheries management. The field is now growing fast, however, and globally, researchers are developing and testing new methods. This paper uses three divergent case studies to demonstrate the value of using qualitative social science approaches to complement more conventional quantitative methods to improve the knowledge base for fisheries management. In all three cases, qualitative interview and document review methods enabled broad surveying to explore the research questions in particular contexts and identified where quantitative tools could be most usefully applied. In the first case (the contribution of commercial fisheries to coastal communities in eastern Australia), a wellbeing analysis identified the social benefits from particular fisheries, which can be used to identify the social impacts of different fisheries management policies. In the second case (a gender analysis of fisheries of small islands in the Pacific), analysis outlined opportunities and constraints along fisheries supply chains, illuminated factors inhibiting community development and identified ecological factors that are typically overlooked in conventional fisheries management. In the third case (sea cucumber fisheries in Papua New Guinea), an interactive governance analysis assessed how well fisheries management tools fit the ecological, social and economic reality of the fishery and the trade in its products, including market influences and stakeholder values. The qualitative approach adopted in these three case studies adds a new dimension to understanding fisheries that is not possible with a focus solely on quantitative data. With the development of new policies on release programs (stock enhancement, restocking) and artificial reefs, and the momentum to use these interventions from recreational fishing groups, the qualitative approach will provide an important contribution to understanding their wider costs and benefits.

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* Corresponding author.

E-mail addresses: kate.barclay@uts.edu.au (K. Barclay), michelle.voyer@uts.edu.au (M. Voyer), nickimazur@grapevine.net.au (N. Mazur), annemaree.payne@student.uts.edu.au (A.M. Payne), smauli@siccp.org (S. Mauli), jkinch@fisheries.gov.pg (J. Kinch), michael.fabinyi@jcu.edu.au (M. Fabinyi), graeme.smith1@unimelb.edu.au (G. Smith).

1. Introduction

Managing fisheries resources means managing human behaviour, so social and economic understandings are important considerations as well as the understanding of biological and ecological factors (Fulton et al., 2011). The question is how can we effectively integrate social, economic and biological knowledge into effective decision- and policy-making? Progress has been

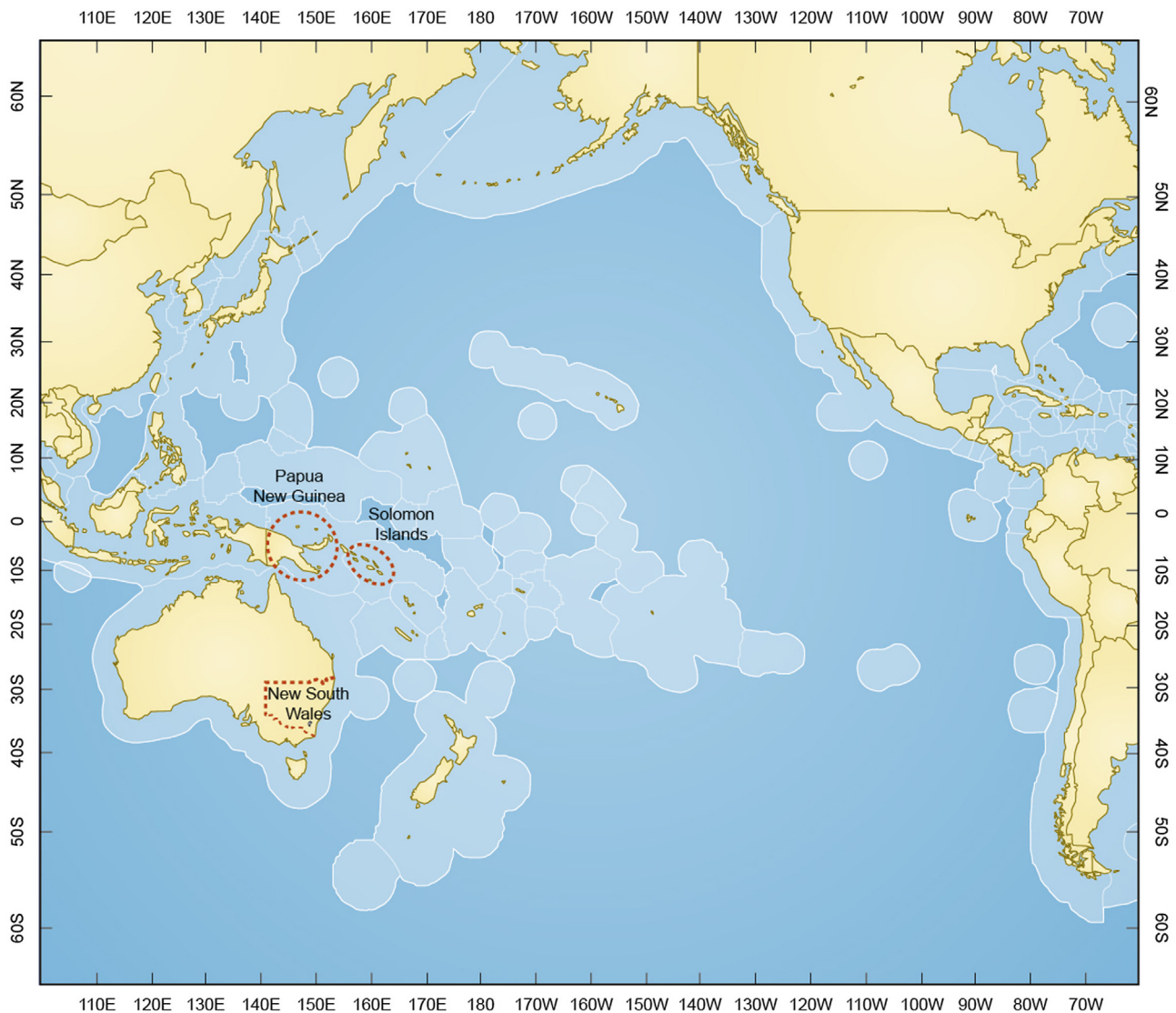


Fig. 1. Map of Oceania.

made bringing economic and biological methods together with fisheries economics and bio-economic methods, but research into the social aspects of fisheries management has lagged behind (Barclay, 2012). The field of the social evaluation of marine resource use and conservation is, however, growing fast. Researchers the world over are developing ways of assessing social aspects of natural resource management and testing them in the field, and government agencies are thinking about what kinds of social indicators can be used for planning (Triantafillos et al., 2014). In the field of stock enhancement and restocking fisheries through the release of cultured juveniles (Bell et al., 2008), emphasis has been placed on understanding the effectiveness of the release programs and their associated costs and benefits (Blankenship and Leber, 1995; Lorenzen et al., 2010). As yet, the focus of these types of evaluation has focused on quantitative analyses, which may not capture the broader impacts of releases. This paper overviews three recent projects: 1) an evaluation of the social and economic contributions of commercial fisheries in New South Wales (NSW), Australia using a wellbeing approach; 2) a gender analysis of coastal fisheries and tuna processing in Solomon Islands; and 3) an interactive governance analysis of a new fishery management plan for sea cucumbers and the *bêche-de-mer* (BDM) trade in Papua New Guinea (PNG) (see Fig. 1).

The aim of this paper is to encourage those working on the biological side of fisheries and aquaculture research to consider the social aspects of their work, and to consider collaborating with social researchers to improve the outcomes of research informing the management of people who fish. This research is particularly relevant to release programs in Australia, which since the development of government policies have attracted significant interest from recreational fishing groups (Loneragan et al., 2013). We argue that insights from qualitative research can help illuminate why fisheries operate as they do in particular contexts, and thus improve the understanding of responses to fisheries management measures, including the impasse that occurs when scientific recommendations about fisheries management are rejected in favour of politically palatable solutions.

1.1. Qualitative social science contribution to fisheries governance

It has been broadly recognized for some decades that more than biological expertise is needed to understand key issues relevant for fisheries management (Fulton et al., 2011; Mcgoodwin, 1990). Fisheries management is, after all, managing the behavior of people, not fish. Nevertheless, much work remains to be

done in order to understand human behavior around fisheries to achieve the desired state of fisheries governance as envisaged in the FAO Ecosystem Approach to Fisheries (FAO, 2003) – whereby fisheries function well socially, economically and biologically. There are many different ways social science can contribute to the knowledge base for fisheries management. Bio-economic modeling can help work out how to allocate fishery resources so as to give the best economic return to society (Seijo et al., 1998). Questionnaires and statistical analysis can measure values and perceptions around fisheries issues, which is useful for governments in understanding what the electorate wants for policies regarding fishing and seafood production, and for industry in strategizing communication in relation to their social license to operate (Mazur et al., 2014). Economics and quantitative social research methods, however, can be usefully complemented by qualitative methods. That is, methods that do not involve mathematical analysis, but take data in the form of spoken words, observations of behavior, visual representations, and/or written text and analyse it in light of theories about society. Examples of qualitative social research approaches that have been used to inform fisheries management include: the sustainable livelihoods approach (Allison and Ellis, 2001); human rights based approaches as embodied in the 2015 FAO Guidelines for Securing Sustainability in Small-Scale Fisheries (FAO, 2015); assessing the social impacts of management decisions (Bradshaw et al., 2001); and qualitative forms of social-ecological resilience appraisal (Blyth, 2015).

The usefulness of qualitative research methods for addressing social, economic and policy questions has been established in the methodological literature for some decades (Creswell, 1998; Mertens, 2015). One of the useful applications of qualitative methods is for exploring a new field of research. Quantitative methods are deep and narrow, working with pre-identified factors to measure them. Qualitative methods can be used to work out what the research topic means for particular communities, and to generate criteria to then measure quantitatively (Johnson, 2012; Mertens and Hesse-Biber, 2013). Qualitative approaches have also been found to be useful for ‘explanatory causation’, for understanding the mediating and moderating processes around causation, to complement the ‘descriptive causation’ established by quantitative methods (Johnson and Schoonenboom, 2016). With the more rounded, connected knowledge that qualitative social science can produce, it is possible to understand more about what the likely consequences of policies before they are implemented (Levontin et al., 2011). Qualitative methods are also useful for identifying and analyzing the relative perspectives of people with different values and interests regarding the topic (Voyer et al., 2015).

Much biological and quantitative science comes from an objectivist or positivist perspective that holds that there is one truth out there to be scientifically discovered (Crotty, 1998; Mertens, 2015). People persist, however, in holding different systems of knowledge, so for practical purposes in managing people there are multiple salient truths. People do not all come to accept the scientific view, leading to ‘push-back’ against policies based mainly on biodiversity conservation considerations (Coffey and O’toole, 2012; Gill et al., 2009; Voyer et al., 2012). Some qualitative research methods explicitly address the differences in perspectives and knowledge systems among stakeholders and aim to reach agreement through consultative and democratic processes, and through assessing social justice values in decision-making (Mertens, 2013). Qualitative social research can also be the basis for more efficient consultation processes leading to more effective outcomes in terms of the social acceptability of policies (Andre et al., 2006; Larson and Dahal, 2012; Sayce et al., 2013).

Fisheries governance scholar Svein Jentoft has proposed that qualitative social science can bring together different types of knowledge and comprehend them in an interconnected way in

order to work out how to proceed with more effective governance of marine resources (Jentoft, 2006). The groundbreaking work *Fish For Life* (Kooiman et al., 2005) introduced the concept of ‘interactive governance’ to fisheries and aquaculture management evaluation. Governance includes all of the factors influencing decision-making in a fishery, including fisheries management but also market influences, cultural factors, and the activities of conservation organizations. Jentoft (2006) argues that the starting point for improving fisheries governance is to recognize the fundamental methodological differences that exist between qualitative social science and the natural sciences, and to appreciate what qualitative social science can add to the field.

Decisions about what to do with our natural resources are inherently and unavoidably political decisions. There are always trade-offs that benefit some people more than others, or are based on particular sets of values. Do we try to preserve our natural world or do we try to use our natural world for economic gain? Or both? Where will the boundaries of protected areas fall? What kinds of economic or cultural activities will be prioritized? Decisions about the natural world should be based on science, but they should also be based on political, as well as economic and cultural considerations. The question is how to integrate these disparate perspectives well to achieve policy outcomes that are biologically and economically sustainable and broadly accepted as fair and reasonable. Qualitative social scientists can knit together scientific knowledge with experienced-based knowledge of fishers, the values of conservationists and the various political and economic interests involved in a way that can make resource management more pragmatic, more feasible, and less likely to be derailed by opposition (Jentoft, 2006).

The case studies of the application of the qualitative approach have been chosen to cover a wide range of fisheries, fishers and coastal communities. The first case study took a wellbeing approach to better understand the contribution of commercial fisheries to coastal communities of New South Wales on the east coast of Australia. The aim was to go beyond the Gross Value of Production (GVP) and uncover broader community perceptions of and values around commercial fishing. The second study involved a gender analysis of coastal fisheries and tuna processing in the small island state of Solomon Islands, to uncover the roles of women in fisheries value chains, and the opportunities and constraints they face. The third study was a governance analysis of the sea cucumber fishery and trade in *bêche-de-mer* in Papua New Guinea, so as to illuminate market and social factors affecting governance of the fishery, as well as assess the fit of management instruments to those market and social factors.

2. New South Wales fisheries—wellbeing analysis

The research question for this project was to identify and measure the social and economic contributions of professional fishing to communities. The coast of New South Wales (NSW, Australia) is a desired location for housing, tourism, and recreational activities such as fishing, swimming and surfing (Sweeney Research, 2014). In NSW, recreational fishers have long perceived that professional fishing ‘takes all the fish’ and some have lobbied to restrict it (Clark, 2016). In addition, marine protected areas have been established, greatly restricting the access of commercial fishers so that now only nine out of the most productive 24 estuaries along the coast remain fully open to professional fishing (Stephens et al., 2012). The professional fishing industry feels they are a much lower priority in the minds of policy makers and government than conservation, recreational fishing and tourism, because of the poor understanding of the social and economic importance of seafood production to coastal NSW communities. This research aimed to

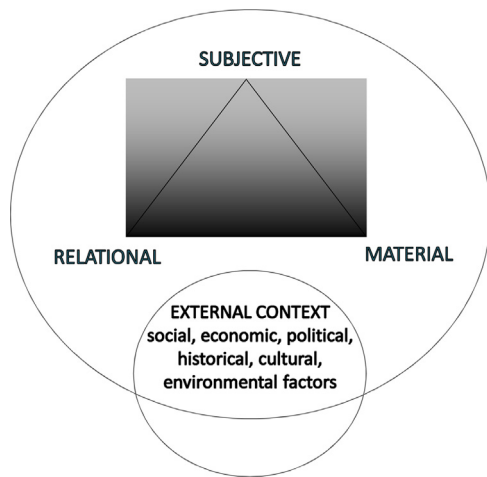


Fig. 2. The three dimensions of wellbeing.

improve knowledge about the social and economic impacts of professional fishing in coastal communities with a mixed methods approach including: 1) qualitative interviews and document reviews; 2) questionnaires measuring the values of various stakeholder groups regarding the contributions of professional fishing to communities; and 3) a quantitative regional economic analysis (for further details see Voyer et al., 2016).

2.1. Wellbeing approach

'Wellbeing' is the overarching framework for the methodology in this project. The concept of wellbeing has gained prominence in policy circles in recent years because of the deficiencies in the methods governments have been using to measure social progress—Gross Domestic Product (GDP) growth per capita (Stiglitz et al., 2009). Governments around the world are adopting the terminology of wellbeing for reporting, including for fisheries. The notion of wellbeing underpins the 2015 FAO *Guidelines for Securing Sustainable Small-Scale Fisheries*. In Australia, the concept of human wellbeing, including national socio-economic wellbeing and community wellbeing, is used in the *Environmentally Sustainable Development Assessment Manual for Wild Capture Fisheries* (Fletcher et al., 2003). Use of the wellbeing framework thus positions the work to be easily communicated to government for industry to make their case about why it is important to prioritize professional fishing as well as conservation and other human uses of the NSW coastal zone.

Wellbeing assessments often use mixed methods. Quantitative tools are used for measuring wellbeing, but qualitative methods, particularly interviews, are vital for understanding what constitutes wellbeing for particular communities and to generate criteria to be measured (Mcgregor et al., 2015). For wellbeing assessments questionnaires should also be validated using qualitative methods with relevant stakeholders to ensure what is being measured is perceived as useful information by the people whose wellbeing is being measured (Mcgregor et al., 2015).

The wellbeing approach is sometimes called '3D wellbeing' because it fleshes out more than just the material standard of living. The approach builds on research into measuring quality of life, including factors such as income, housing, standards of education and access to healthcare (Nussbaum et al., 1993). In the second half of the twentieth century, recognition grew that the subjective and relational aspects of quality of life were also important (Stiglitz et al., 2009). In the 3D wellbeing approach, the factors to consider are divided into material, relational, and subjective (or cognitive) (Coulthard et al., 2011) (Fig. 2). A person may have a good material

standard of living, but if they are alienated within society (relational), or if they feel dissatisfied with their life (subjective), they do not have wellbeing.

How are these three factors measured and integrated into an analysis of overall wellbeing? The methods used vary according to the questions being asked and specific conditions of field sites.¹ Measuring material wellbeing is fairly straightforward; i.e. income, assets, educational and health status. Often government statistics can provide some of this information and questionnaires can provide whatever else is needed. Relational wellbeing may be determined through an analysis of the social relationships people have that enable them to pursue their livelihoods—'social capital' (Brooks, 2010), or through psychological questionnaires about satisfaction with important relationships (Coulthard, 2012). Subjective wellbeing is the quality of life people perceive themselves as achieving, including the meanings they give to the goals they achieve and the processes in which they engage. It has been measured by tools such as the Global Person Generated Index (GPGI) (Britton and Coulthard, 2013).

In this case study, we started with ideas from the literature about implementing wellbeing as a methodology, and a search to find any existing data for analysing social contributions, such as Australian Bureau of Statistics data. From this, we identified the new data we would need to conduct a wellbeing evaluation. We started gathering data with open-ended interviews, asking fishers and non-fishers, such as members of local councils and community groups, what kinds of social benefits they saw arising from the fishing industry in their communities. After we had conducted around half of our intended interviews for the first round of fieldwork we analyzed them via coding using NVivo software (Bazeley and Jackson, 2013) to draw out perceptions of the main social contributions. We compared the interview data with literature on assessing wellbeing and quality of life (Himes-Cornell et al., 2013; Kasperski and Himes-Cornell, 2014; OECD, 2013; Partridge et al., 2011; New Zealand Quality Of Life Project, 2007; Stiglitz et al., 2009). From there we identified areas of community wellbeing that were significant in NSW coastal towns (see Table 1).

Wellbeing may be used to establish a baseline and track social progress in general (Mcgregor et al., 2015), and it has been used to understand the wellbeing of particular fishing communities (Britton and Coulthard, 2013). Our question was slightly different; how commercial fishing contributes to the wellbeing of the broader community. Table 1 shows how we adapted the method in our first stage of analysis. Once we had established the areas of community wellbeing relevant for NSW coastal towns (top row), we developed interview questions around those areas, to structure our interviews in the next round of fieldwork. Then we analyzed all of the interviews together—a total of 164 made up of 110 fishers and 54 non-fishers to identify the ways in which commercial fishing in NSW may contribute to broader community wellbeing (see bottom row Table 1). Once we had established these indicators of contribution, we mapped out the interview data on the material/relational/subjective aspects of these indicators, existing government and industry data, and the economic part of the project, and designed questionnaires to measure some elements.

2.2. The qualitative value-add

The key findings from this research arose directly from the integrated use of qualitative and quantitative methods, and would not have been arrived at with the use of quantitative methods alone. One such finding is that the normal discourse pitting recreational

¹ For an online toolkit for use in 3D wellbeing assessments see: <http://www.welldev.org.uk/research/methods-toobox/toolbox-intro.htm>.

Table 1
Contributions of Professional Fishing to Community Wellbeing in New South Wales.

Dimensions of community wellbeing	Health and safety	Education and knowledge generation	Healthy environment	Integrated, diverse and vibrant communities	Cultural heritage and community identity	Leisure and recreation
Resilient local economy						
Contributions of professional fishing to community wellbeing						
Revenue	Producing nutritious food	Skills training, formal and practical	Environmental stewardship	Cultural and religious celebrations and events	Historical heritage of fishing, tangible and intangible	Public infrastructure (eg, wharves, jetties, slipways)
Employment	Search and rescue	Transfer of environmental knowledge (eg to government, to younger generation)	Engagement in catchment management, research, planning	Contributing to community life (eg, sponsorships, donations)	Sense of place in coastal towns (eg, this is a fishing village)	Bait for recreational fishers
Connections to service industries, post-harvest sector, tourism						

fishing against professional fishing in NSW is mistaken. In this discourse it is argued that since NSW's seafood production sector is relatively small and the recreational fishing sector is very large, recreational fishing brings more money into the economy than professional fishing, and thus it is appropriate to prioritize recreational fishing over commercial fishing in the allocation of public resources in the form of fishing access. Our research found that this framing of the problem of coastal resource conflict in NSW is mistaken for two main reasons.

First, interviews with business owners and local government representatives in coastal areas revealed that the viability of coastal communities is based on a diversity of economic activities, and the loss of any one sector has serious impacts. While recreational fishing may bring tourist money into coastal towns, it tends to be seasonal, whereas most professional fishing generates economic activity year-round. Furthermore, professional fishing offers employment opportunities not otherwise available in those communities, including for socially disadvantaged men, many of whom have low levels of schooling.

Second, recreational fishing is not a standalone activity separate from professional fishing, but is deeply interdependent with it. Our interviews identified that recreational fishers prefer locally caught bait, which comes from the professional fishing industry, and prefer to buy locally caught seafood for their own consumption. Bait is not usually included in economic analyses of NSW fisheries, but when it emerged as potentially significant in the interviews, we included the bait market in our economic analysis. Our questionnaires then confirmed that recreational fishers were more likely than the general population to want to buy locally produced seafood when at home and when on holiday, and the reason they most often gave for this was because they want to support local industries. Our interviews identified that recreational fishers rely on boating and fuel infrastructure in place to service the professional fishing industry, and they value professional fishing knowledge about fishing conditions. Furthermore, in the questionnaire, over 70 percent of recreational fishers in the sample agreed with a statement that the professional fishing industry can be trusted to act sustainably, and over 80% disagreed with a statement that the professional fishing industry should not be allowed to continue because its environmental costs outweigh its social and environmental benefits.² Despite a widespread perception among recreational fishers in NSW that recreational fishing catches are better if professional fishing is excluded, our data clearly shows that if professional fishing were to disappear from areas of the coast, the utility of recreational fishers would be negatively impacted. The use of qualitative with quantitative methods revealed interdependen-

cies between the sectors, and illuminated that recreational fishers also highly value professional fishing. The integrated use of qualitative and quantitative methods offered similarly deep insights into synergies with the tourism sector, and into the complexity of the professional fishing sector's social license to operate in NSW.

In this research, qualitative methods enabled exploration of a new topic area – the contributions of professional fishing to community wellbeing – providing explanations to enrich the economic analysis, including community interpretations of the meaning of economic contributions to their wellbeing. The qualitative data and analysis enabled us to target the questionnaire part of the project to measure values and perceptions around the wellbeing impacts identified. This knowledge will enable ongoing decision-making to be more accurately socially informed. Importantly, the exposure of interdependencies between different sectors using resources should enable a shift from an 'us versus them' mentality that has led some stakeholders to argue for the exclusion of professional fishing, towards a vision for the sustainable use of fisheries resources by a mix of sectors including professional fishing for the benefit of coastal communities and the recreational fishers and other tourists who visit.

3. Solomon Islands fisheries—gender analysis

Solomon Islands is a small island state situated north east of Australia. It has a population of around half a million people, and scores low on many development indicators, such as access to health services, levels of education, levels of unemployment and GDP per capita (United Nations Development Programme, 2015a). On the other hand, customary tenure arrangements and a strong Indigenous culture means that the 80% of the population living in rural areas has food security and somewhere to live, and poverty is mostly confined to urban areas. Ninety-four percent of the population lives within five kilometers of the coast with the majority relying on smallholder activities, producing and marketing their own food and other commodities (SINSO, 2009).

Reef ecosystems outside urban areas are mostly healthy, but with increasing population pressures there are concerns for food security in the future (Bell et al., 2009). Coastal fisheries are largely unregulated, as although bills and ordinances for regulation are in place, they are not enforced. Some overfished species of shells and *bêche de mer* are subject to periodic export bans. There are industrial tuna fisheries, and a canning factory in Noro in Western Province has employed up to 3000 people since the early 1990s, including many women on the production lines (Barclay, 2008). The Secretariat for the Pacific Community (SPC) assists the Solomon Islands government to monitor and report on catches in industrial tuna fisheries to the Western and Central Pacific Fisheries Commission (WCPFC).

² The total sample for this questionnaire was 1423, of whom 37% identified as recreational fishers.

Gender relations in the Solomon Islands are relatively inequitable. The Solomon Islands is ranked 157th out of 188 in the world in both the UNDP Gender-related Development Index (measuring health, education and income levels between men and women) and the Gender Inequality Index (measuring outcomes for women in reproductive health, representation in parliament, secondary education, and labor force participation) (United Nations Development Programme, 2015a). There are high rates of gender-based violence (SPC, 2012) and strong cultural expectations about male and female roles, with household duties and gardening being seen as the preserve of women (Bennett et al., 2014). Women are understood predominantly to be nurturers, caregivers and supporters of their husbands and families (JICA, 2010).

3.1. Gender analysis in fisheries management

The impetus for this gender analysis came about through funding being extended by the World Bank for coastal fisheries in Solomon Islands as part of a regional Pacific Regional Ocean-scape Project (PROP) package. The World Bank requires that a gender analysis be done as part of the preparation for such projects. International commitments to improve gender relations and the position of women under the United Nations Convention on the Elimination of all forms of Discrimination Against Women (CEDAW) have also extended into the Solomon Islands national government, with each Ministry having a gender strategy and gender ‘focal point’ staff members responsible for instituting gender awareness within the work of Ministries (SPC, 2012). There was, however, no strong sense within the Ministry of Fisheries and Marine Resources (MFMR) of what a gender analysis might add to coastal fisheries management. As one staff member told us, fisheries managers find it hard to understand how looking at women is relevant to their work, because fishing boats are a ‘men’s world’, a common attitude in fisheries management internationally (Lentisco and Alonso, 2012).

Why is gender analysis useful for fisheries management? First, the perception that only men fish leads to inaccuracies in measuring fishing and understanding the extent to which ecologies are affected by fishing, largely because gleaning in the intertidal zone is elided (Kleiber et al., 2014; Schwarz et al., 2014). Second, the usual focus on men in fisheries projects leads to fisheries development projects misfiring. For example, projects in the Pacific target male household heads for funding and training for projects. The lack of involvement of women in these activities has contributed to project failure (Ram-Bidesi, 2008). Other problems can arise from the way income from development activities is used. Increased income in the hands of men in the Pacific tends to be used mainly for beer and other recreational activities (UN Women, 2014). If projects lead only to increased income used in this way, and not to improvements in access to health care, education, clean water and sanitation then ‘development’ has not been achieved. Internationally and in the Pacific when women have control over increased income, these kinds of benefits are much more likely to occur (Chaaban and Cunningham, 2011; UN Women, 2014). Gender inequality poses a critical obstacle to food security and climate change adaptation in coastal and freshwater areas (Geheb et al., 2008; Leduc et al., 2012) and impedes economic and social progress in rural food producing areas (Balakrishnan et al., 2005).

So if gender analysis is important for fisheries management, how is it done? Gender analysis is about looking at gender norms and the relations between men and women and how they affect fisheries management and development outcomes. Research has highlighted that for sustainable outcomes from development programs to be achieved the programs must be based on understanding of gender dynamics, the differing motivations of men and women, and how decisions are made at the household level (Kronen and

Vunisea, 2009; Ride, 2014). One of the key points for gender-aware approaches to fisheries research is that the focus needs to broaden out from the narrow lens of what men do on boats. Whole supply chains, whole households and/or whole businesses are the relevant units of analysis. Women’s role in support of men’s fishing activities is vital to fisheries businesses, through providing food for fishing men and their families, and financial backup (Harper et al., 2013). Small-scale fisheries and aquaculture are often whole-of-family enterprises (The World Bank, 2009). There are multifaceted relationships between men and women as boat owners, processors, sellers, family members, community members and co-workers (FAO, 2012). The fishery sector starts to look like a female sphere if you account for gleaning, trading, processing and aquaculture as well as capture fisheries (Weeratunge et al., 2010).

Methodologically a gender analysis may be approached in many different ways, from in-depth, interview-based qualitative examinations of gender norms, to economics and statistical quantitative investigations of household income and expenditure, and labour and remuneration patterns. The objective for this study was to take a supply chain approach to understanding the opportunities and constraints for women in coastal fisheries and in tuna processing. There were pockets of existing work to draw on for this – on women in tuna processing and in marketing activities, and on gender relations in coastal resource management – but these had not been pulled together before, nor looked at from a supply chain perspective. An exploratory approach was therefore required to give an overview of tuna and coastal fisheries supply chains, the gendered division of labour within those chains, the gender relations and norms giving rise to that gendered division of labour, and the consequent opportunities and constraints for women. A qualitative approach using interviews and a review of published literature and technical reports was thus appropriate for this stage of the research. A small amount of quantitative analysis was possible using staffing statistics in tuna processing and the Household Income and Expenditure Survey about women’s situation in the overall economy. Further quantitative data collection and analysis was beyond the scope of this particular project, but the findings indicated where quantitative methods could be fruitfully applied in further research.

Interviewees were recruited via ‘convenience’ and ‘snowball’ sampling. That is, interviewees were sought from relevant organizations, such as the Ministry of Fisheries and Marine Resources, and by turning up to relevant locations, such as markets, and interviewing people available there on that day. These interviewees then suggested further interviewees. They included: 19 people selling fish and other marine products in markets; 14 people from fishing villages; 14 people from government and 10 from non-government organizations (NGO) working on gender, conservation and fisheries management; 15 employees and managers from two tuna companies; 4 community representatives from the town of Noro, which has a large tuna processing factory, and 7 people from villages around Noro. Interviewees were approached if they worked in areas related to coastal fisheries or tuna processing, lived in fishing villages or around the tuna processing company, or worked in organizations focused on gender relations. In this kind of fieldwork interviewees are not excluded as such. No claims to generalizability are made, rather, respondents from relevant stakeholder groups are sought until ‘saturation’ is reached, meaning adequate depth and breadth has been achieved in the sample relative to the research questions and no new data is being generated (O’Reilly and Parker, 2013). The themes covered in the interviews included: 1) what are the respective roles of women and men in coastal fisheries and tuna supply chains; 2) what are the reasons behind gendered divisions of labour in these supply chains, including constraints on women moving into new roles; 3) what levels of income and types of livelihoods does this work provide; 4) what kinds of issues do women

face in this work, including gender-based violence, norms about appropriate activities for women, and subordination by men; and 5) what changes to work environments could result in improved conditions and opportunities for women.

In addition to the interview fieldwork, we undertook an extensive literature review. We started with reports and publications suggested to us by interviewees (especially important for the 'grey' technical literature not available through internet-based searching) and also searched the scientific and technical literature. We searched for pieces on gender in fisheries, fish processing, seafood marketing and aquaculture, especially in the Pacific, but also other developing countries, and also in agriculture. We also searched for pieces on gender relations in the Pacific, especially to do with economic activities. This was not a systematic review with exclusion criteria, but was similar to the interview method – anything fitting the terms above was included until we ceased finding new information. The literature was organized using EndNote software, with points from each piece relevant to our research questions included in the entries, producing a large annotated bibliography.

Qualitative analysis of the interview and literature material followed an inductive process, as is usual in qualitative research (Creswell, 1998). We manually worked with the data in a similar way as may be done with NVivo software. We identified themes from the interview notes and the literature annotations that addressed and explained the issues involved in the research questions. In this process information from interviews was compared and contrasted with similar points from other interviews, and triangulated against the literature. This formed the basis of the analysis. The findings were validated by eliciting comments on a draft from key informants in fisheries management, gender in fisheries, coastal conservation, and tuna processing. Outputs of the analysis included a table summarizing the gendered division of labour along supply chains (see Table 2 for part of this summary).

3.2. The qualitative value-add

Qualitative methods enabled this gender analysis to be exploratory, bringing together information from the different fields of gender studies, development and fisheries management to give an overview showing the connections within society that cause fisheries supply chains to operate the way they do. The open-ended interview method contributed to the exploratory approach through drawing from participants themselves their perspectives on the opportunities and constraints for women in fisheries, revealing causal factors that the researchers could not have elicited through the more closed data collection involved in quantitative methods. For example, one reason women market fresh fish is to make sure money from sales goes to the family – when men fishers sold their own catch they sometimes used the money for beer, rather than bringing the money home. These connections shed light on the human dimensions of fisheries. Relevant human activities are not restricted to the activities of men on boats, but include the activities of women on boats, women in the intertidal zone, and what families do in accommodating fishing activities, non-fishing livelihoods to compensate when fishing declines, and what men and women do in markets, processing, and seafood consumption.³

The range of species to be monitored and managed as coastal resources was identified by the gender analysis as a gap in existing resource monitoring. Hitherto the lists of inshore resources of interest have tended to cover tunas, reef fish and invertebrates sold for export—including sea cucumbers, gold- and black-lip oysters, trochus, and giant clams (see for example: Richards et al.,

³ For the sake of brevity here we mention gaps related to coastal fisheries only. For further details on findings regarding tuna processing see Krushelnytska (2015).

1994; Brewer, 2013, 2011). Since 2012, the MFMR has also been working towards monitoring reef fish stocks through market data from Honiara and Gizo (Pomeroy and Yang, 2014). Interviews with women in fishing communities and observing markets, however, revealed a much wider range of species being collected for food and sale, and perceptions of overharvesting of some of these and associated environmental degradation. These included mud crabs, clams gleaned from mangroves and sandy areas, mangrove seeds used as a vegetable, mangrove firewood, and shells used for customary shell money and jewelry for domestic markets. Women are heavily involved in the harvesting, use and sale of these resources so their absence from the usual discourse about species of concern could be an example of the gender blindness preventing fisheries science from considering the full range of ecosystem impacts (Kleiber et al., 2014). The qualitative overview tying together open-ended interview material with a literature review across several related topic areas brought this gap to light in the Solomons' context.

Another gap was revealed in government support for community based resource management (CBRM), in terms of uneven awareness by key stakeholders about how to engage communities in a gender-aware manner. That is, engaging communities such that the different perspectives men and women have on resource access and use are understood, and improving gender-equity in processes of decision-making about resources. In Solomon Islands the majority of coastal resources are under customary tenure, and CBRM is specified as the national government's main strategy for managing coastal fisheries resources (Solomon Islands Government, 2010). This is in line with regional frameworks for coastal fisheries management in Pacific island countries (MSG, 2014; SPC, 2015). Some Solomon Islands coastal communities, in collaboration with conservation organizations, have established CBRM (Cohen et al., 2015). Awareness of the social norms and processes within communities that shape resource use and access, including gender, is foundational knowledge for effective engagement on resource management. Internationally, it is a major policy challenge in fisheries and aquaculture to ensure that all stakeholder groups are able to influence decision making in community-level resource management (The World Bank, 2009). Effective engagement is thus challenging in practice and requires groundwork with communities to develop culturally appropriate ways to support the inclusion of women and other marginalized groups in discussions about resource use and community development (Cohen et al., 2014; Schwarz et al., 2014). There are documented examples of redressing gender imbalances in village level production and resource management in Solomon Islands for coastal CBRM (Hilly et al., 2012; WorldFish, 2013) and agricultural development (World Bank, 2015). These insights, however, were not visible in MFMR approaches to CBRM in either our interviews or the reports reviewed for this project. We concluded that although MFMR has a Gender Strategy in place and a Gender Focal Point on staff, further capacity building and collaboration is needed to embed gender awareness into CBRM approaches (Krushelnytska, 2015).

4. Papua New Guinea *bêche-de-mer*—governance analysis

Papua New Guinea (PNG) lies to the north of Australia with a population of eight million. Mining, oil and natural gas, and logging have brought great wealth into the country, but this has not 'trickled down' to the majority of the population. Papua New Guinea's development statistics put it in the lowest quartile internationally, with education rates, income levels and life expectancy having improved steadily but slowly since independence in 1975 (United Nations Development Programme, 2015b). It has around 800 different language groups and strong Indigenous cultures. The majority of the population live on their own land under officially recognized cus-

Table 2
Solomon Islands Coastal Fisheries and Aquaculture Fish Chain (Production to Marketing Only)—Key Gendered Characteristics and Issues.

Key elements of the chain	Actors	Activities	GDL	Overarching issues	Gender-based constraints	Gender-based opportunities
Production & harvesting ↓	<ul style="list-style-type: none"> Fishers Gleaners Divers 	<ul style="list-style-type: none"> Gleaning from intertidal zone Fishing from shore or boat Diving for shells, béche de mer, spear fishing Cultivating corals, clams for aquarium trade 	Z	<ul style="list-style-type: none"> Béche de mer & shells stocks depleted Some reef areas depleted of food fish High transport costs & lack of ice make fishing for fresh fish markets unviable in many areas 	<ul style="list-style-type: none"> Women's fishing not assisted in development projects Women excluded from decision making about resource use 	<ul style="list-style-type: none"> Scale out WorldFish gender-transformative lessons learned to improve women's inclusion/participation in fisheries development activities & decision making
	<ul style="list-style-type: none"> Aquaculturists 	<ul style="list-style-type: none"> Cultivating tilapia for village food Cultivating seaweed for export 	Z	<ul style="list-style-type: none"> Aquarium trade limited viability Seaweed production high labor & low profit 	<ul style="list-style-type: none"> Unknown 	<ul style="list-style-type: none"> Support WorldFish gender-transformative work in Malaita, scale out Investigate opportunities regarding seaweed
Manufacture	<ul style="list-style-type: none"> Shell money makers in Langalanga Lagoon Seafood cooks for markets & restaurants 	<ul style="list-style-type: none"> Turn shells into beads Make strings of beads Combine strings into finished products (many varieties) Families use own labor Larger scale operators pay others to make for them Buying fish or use previous day's catch Cook fish 	Y	<ul style="list-style-type: none"> Shell stocks depleted Shell money is a low income activity Langalanga Lagoon ecosystem already depleted, increasing population pressure Lack of alternative livelihoods 	<ul style="list-style-type: none"> Lack of water supply some villages meaning women must paddle long distances for water daily Lack of modern energy for cooking means women cut mangroves Lack of food gardens for some villages (distance for others) puts heavy burden on women 	<ul style="list-style-type: none"> Improve village livelihoods through gender-sensitive CBRM (interlinked problems of resource depletion, livelihoods, sanitation, water, energy, food supplies) Investigate improvements to marketing arrangements Increased opportunity for entrepreneurial women to do larger scale manufacturing
Marketing ↓	<ul style="list-style-type: none"> Fish vendors 	<ul style="list-style-type: none"> Selling raw fish in municipal markets around the country Selling cooked fish – fish & chips – various traditional styles of cooking 	X & Z	<ul style="list-style-type: none"> Unhygienic market conditions (lack of toilets & clean water, wooden benches, dogs roaming) Limited banking facilities Lack of facilities (storage, seating, shelter from sun & rain, quality of flooring) Lack of coordination among vendors to push for improvement 	<ul style="list-style-type: none"> Women's greater risk of violence/harassment in robbery or family taking cash Shell money: difficult for women & families to spend long periods in Honiara to sell 	<ul style="list-style-type: none"> Support UN Women M4C initiatives for women fresh and cooked seafood sellers
		<ul style="list-style-type: none"> Sell at road side stalls 	?	<ul style="list-style-type: none"> Unknown 	<ul style="list-style-type: none"> Likely to be similar to other market/business constraints 	<ul style="list-style-type: none"> Requires investigation
		<ul style="list-style-type: none"> Selling to restaurants 	?	<ul style="list-style-type: none"> Unknown 	<ul style="list-style-type: none"> Likely to be similar to other market/business constraints 	<ul style="list-style-type: none"> Increased opportunity for women seafood traders
	<ul style="list-style-type: none"> Shell money vendors 	<ul style="list-style-type: none"> Sell in Honiara Central Market or bulk sales 	X	<ul style="list-style-type: none"> As above for market conditions Need to stay in Honiara for weeks 	<ul style="list-style-type: none"> Family difficulties with women away in Honiara for long periods Low income relative to effort 	<ul style="list-style-type: none"> Investigate alternative marketing options
<ul style="list-style-type: none"> Exporters of béche de mer, shells, aquarium animals, seaweed 	<ul style="list-style-type: none"> Logistics Complying with regulations 	Z	<ul style="list-style-type: none"> Depleted stocks of béche de mer & shells Difficulties exporting live aquarium animals 	<ul style="list-style-type: none"> Unknown 	<ul style="list-style-type: none"> Increased opportunity for women marine commodity exporters 	

Key: GDL – gendered division of labor; X = predominantly/exclusively male; Y = predominantly/exclusively female; Z = shared/joint tasks; ? = unknown.
NA – information not available, beyond the scope of this report.

tomary tenure arrangements. The cash earning opportunities are extremely limited in villages far from transport routes because it is very expensive to bring inputs in and send goods out.

Boiled and dried sea cucumbers called *bêche-de-mer* (BDM), along with dried shark fin and shells such as trochus, have long been an important source of cash incomes for PNG coastal communities (Kinch, 2002). Tropical BDM have for hundreds of years been a delicacy throughout southern China and South East Asia as a prestige dish for special occasions, and as a health food (Akamine, 2005). Around 30 species of sea cucumber have been traded commercially in PNG (Kinch et al., 2008).

The market for BDM has grown and prices have increased over the last three decades with economic growth in China. As traditional sources dried up, traders have sought new supplies throughout the world, resulting in serial stock depletions (Eriksson and Byrne, 2013). From the late 1990s, the PNG the BDM fishery shifted from low-volume, high-value to high-volume low-value species due to the higher value species being fished out and increased demand (Kinch et al., 2008).

In the 2000s, sea cucumber stocks collapsed and in 2009 the PNG government instituted a moratorium on the fishery, banning exports (Kinch et al., 2008). Fisheries in PNG are managed by the National Fisheries Authority (NFA), which is well-resourced through fees paid for access to PNG's rich tuna fishing grounds. There had been a sea cucumber fishery management plan centred on regulation of exports, with Total Allowable Catches (TACs) and annual closed seasons, but it failed to prevent overfishing. The TACs were routinely exceeded without penalty and additional amounts leaked out through loopholes in the regulatory system and illegal trade (Kinch et al., 2007). Sea cucumber fisheries in most places around the world are not sustainably managed, in part due to the high value of and large demand for the commodity, creating strong incentives to continue fishing despite stock declines (Purcell et al., 2013). Since the moratorium started in 2009, the NFA has worked on stock assessments revising the fishery management plan to make the fishery sustainable when it reopens, possibly in the near future. The aim of this project was to conduct a governance analysis to assess how effective the new fishery management plan will be in making PNG's sea cucumber fishery sustainable.

4.1. Fish chain interactive governance analysis

This research employed the conceptual framework of fish chains within the interactive governance understanding of fisheries (Jentoft and Chuenpagdee, 2015). The interactive governance approach is broader than simply government regulation of a particular sector. It involves: 1) *diverse* actors and institutions, including state and non-state (such as markets or cultural institutions), human and non-human; 2) inherently *complex* or 'wicked' problems that require multi-disciplinary analysis; 3) situations that are interactive and *dynamic*; and 4) as operating across various *scales* from the local to the global. These four system properties – diversity, complexity, dynamics and scale – are a key part of the interactive governance approach. In interactive governance analysis, the unit of analysis is the fishery itself as a natural and social system-to-be-governed, and also the entire supply chain through to consumers, called a 'fish chain'. The interactive governance approach posits five goals for fisheries governance: 1) food security; 2) community wellbeing; 3) economic livelihood viability; 4) social justice; and 5) environmental sustainability. Since the first major publication on interactive governance, *Fish For Life* (Kooiman et al., 2005), it has been applied as an analytical tool to many different fisheries internationally (Bavinck et al., 2013; Jentoft and Chuenpagdee, 2015).

Quantitative biological, economic and sociological methods have been used in interactive governance analyses, as have qual-

itative geographical and anthropological methods (Bavinck et al., 2013). Previously, the 'fish chain' had not been described for the PNG BDM fishery. It was therefore appropriate for this study to take an exploratory approach, to map out the field and draw together existing discrete bodies of knowledge about the fishery as it operated on the ground, management by government, the trade in PNG, the trade in China, and regional and international governance structures. The study was thus based on interviews and a desktop review.

A total of 62 interviews were conducted with fishers and customary resource owners, exporters in PNG, importers, wholesalers and retailers in China, key informant BDM researchers and staff of relevant government agencies in PNG (NFA, Customs, Provincial Fisheries Officers and other Provincial Government officials, and Local Level Government representatives). We interviewed anyone available from relevant stakeholder groups and stopped when we ceased finding new information (i.e. reached saturation). We used a semi-structured interview format, with targeted questions for each stakeholder group. Interviewees were asked open-ended questions about: their role in the supply chain; prospects for making the sea cucumber fishery sustainable; their relationships with other stakeholders (relations between fishers and buyers/exporters, relations between exporters and government agencies, and so on). Government interviewees were asked how well the management system functioned, and about articulations between government agencies involved in managing the BDM trade. Fishers were asked about whether exporters funded their fishing or provided equipment or training in processing, and prospects for community-based resource management. Exporters were asked about their business models, their interest in making the industry sustainable, changing margins over the years, how they raised capital, how they learned about the market and how they established relations with importers.

A key part of the desktop review portion of the study was a close examination of the new management plan, the old management plan, and reports about issues with the old plan, with further follow up questions in the interviews. The literature review also involved mining for information and ideas about factors affecting: the operation and management of sea cucumber fisheries; the effectiveness of CBRM; the trade in BDM; Chinese market shifts towards sustainability; and Chinese government seafood importing regulations. The literature review included anything we found through informants and through searching on these topics, until we stopped finding new information. In addition, the project was conducted in tandem with a sister project being conducted by conservation organization, EDO NSW, providing a desktop review of the legal and policy framework of fisheries management for BDM in PNG. In a process similar to that followed for the other two case studies discussed above, the material from the interviews, literature review and legal review was analysed by searching for themes addressing the research question. Ideas arising from interviews were compared and contrasted with similar material in other interviews, legislation and policy documents, and triangulated with the literature. Findings were validated at the draft stage by seeking feedback from stakeholders via presentations by the lead author to NFA staff, and to fishing villagers in Manus Province.

4.2. The qualitative value-add

The study gave rise to three main findings about: 1) the development potential for sea cucumber fisheries for coastal villages; 2) the goodness of fit of the new management plan to the fishery and trade in BDM; and 3) the importance of addressing the relationships between stakeholders as well as technical solutions in fisheries management tools. The benefit in using qualitative methods for the study was in giving an overview of all the factors affecting governance – government and non-government, at different scales –

Table 3
Village Node of a Multi-Scale Assessment of Governing Systems Performance against Governance Goals.

Scale	Government Measures/Instruments	Potential Governance Effects
Village	Local level government (LLG) resource management plans	Minimal resources/capacity to develop resource management plans, implement & enforce them. Weak potential to improve +FS, LV, ES without government or other assistance. Gender & intersectional distributive and decision-making justice (+CW, SJ) may be addressed if LLGs interested.
	NFA Communication Strategy	Potential to improve awareness of regulations at village level, and possibly compliance (+FS, LV, ES).
	LLG Management Advisory Committees	Weak potential to improve +FS, LV, ES without addressing lack of resources/capacity. Gender & intersectional distributive and decision-making justice addressed by women and youth representation, impact (+CW, SJ).
	Village Courts & Local Land Courts	Could be used to enforce LLG-based management plans and/or CBRM (+ES).
Non-Government Measures/Influences		Potential Governance Effects
Conservation NGO/Foundation-supported CBRM		Does not exist in most BDM fishing communities, externally supported CBRM cannot be scaled out to cover the whole fishery Potential to improve +FS, LV ES Gender & intersectional distributive and decision-making justice (+CW, SJ) addressed if communities and NGO partners interested. Eg. Manus Endras case has women & youth representation in governance structure CBRM only exists to date with external support
Independent CBRM Strong need for cash, dearth of other cash earning opportunities		Strong incentive to keep fishing unsustainably (-ES) Food production and other income earning opportunities neglected during fishing season (-FS CW SJ)
High prices offered by buyers/exporters Distribution of income & expenditure patterns		Strong incentive to keep fishing unsustainably (-ES) Brings significant income into villages (+FS CW LV) Problems with young men controlling much of the income, using mostly for recreational purposes (-CW SJ)

Key: a) Existing measures/instruments/influences in red. Blue is for potential measures foreshadowed in the new management plan or raised by interviewees.

b) Interactive governance goals: food security (FS); community wellbeing (CW); livelihood viability (LV); social justice (SJ); and environmental sustainability (ES).

c) '+' indicates a positive effect on the governance goal, '-' a negative effect.

pulling things together in a new way to highlight the interactions between different aspects of governance. Table 3 is the village part of a longer table summarizing the overview, assessing management measures and other influences on governance in terms of the five goals of governance—environmental sustainability, livelihood viability, community wellbeing, social justice and food security. The full version of this table carries the analysis through to PNG provincial and national levels, regional, international, and then Hong Kong and China for the market end of the chain (see Barclay et al., 2016).

NFA fisheries managers, when presented with the findings, said they found the overview aspect of the findings useful in two main ways. First, it provided evidence supporting the approach of the new management plan. In this research, interview material and literature was used to describe the whole BDM supply chain as a system-to-be-governed, then the new management plan was analysed in terms of its fit with that system. For example, the management plan centres on regulating and monitoring the export node of the chain, and not the fisheries node. The sea cucumber fishery in PNG is extensive, conducted from all coastal and island areas in the country, where there is virtually no management. The vessels used are not licensed, catches are not monitored and incomes are informal. It is much more feasible, therefore, to regulate the export node of the chain, which occurs in provincial capitals and the national capital, where there are Fisheries and Customs offices. Exporting businesses are formal, requiring licenses, which can be removed when transgressions occur. The product is consolidated by exporting businesses, so it is efficient to collect information on species and volumes of catches from the export node of the chain. Basing regulation and monitoring at the export node of the chain, therefore, is a

good fit of the management tool with the system-to-be-governed. Second, plotting the management plan against the system-to-be-governed description highlighted the importance of enforcement and compliance. When the project findings were presented to them NFA staff said the study reminded them that the success of the plan rests on its implementation. They had been concentrating on refining the content of the plan, but said as a result of the study they now intended engage their colleagues from the departments for Monitoring Control and Surveillance and Licensing regarding their responsibilities for carrying out the new plan.

Findings were also presented to a fishing community, the Mwanus Endras Resource Development Network (MEnAR), of the Titan tribal network in southern Manus. MEnAR members found the overview nature of the analysis useful because it gave them an evidence-based assessment of ways to pursue their goal of development through community-based management of fisheries resources. The MEnAR aimed to secure a BDM export license and set up an exporting business, believing they would achieve a better return by 'cutting out the middle man' and selling their product direct to overseas importers. This approach to fisheries development has been fostered over decades in the Pacific, whereby donor support has been provided to turn fishing activities into businesses (Barclay and Kinch, 2013). Our report provided several pieces of information relevant for assessing the viability of this approach: 1) a review of projects in the island Pacific supporting fishers to enter business without developing track record first (showing high failure rates); 2) interview-based information about what is involved in the export business, including the large amounts of capital required for buying and the years needed to learn mar-

kets and build relationships with importers; and 3) interview- and literature-based analysis of what kinds of activity amount to 'development' (improvements in food security, livelihood viability, community wellbeing and social justice) versus simply increased income. These varied sources of information were synthesized into an alternative model of development to consider in parallel with the conventional model of seeking external support to set up an export business. The evidence-based alternative model involves: 1) working at a community level to ensure increased income leads to development; 2) actively developing expertise in seafood trading and business management, including through partnerships with established businesses; and 3) pursuing ownership of export businesses as a long term goal after building track record and access to capital.

5. Conclusion

The case studies discussed in this paper show different ways qualitative social science can be used to help tie together the complexity of fisheries as social systems for improved governance. They cover some of the myriad ways in which social relations affect fisheries management – the interdependence of resource user groups (NSW), specific sets of social relations, such as gender, affecting natural resource use and post-harvest activities (Solomon Islands), and the interplay of factors along a whole market chain affecting fisheries governance (PNG).

Social research on fisheries may be thoroughly applied and practical in nature. Each of these case studies was commissioned by a stakeholder organization, for purposes specifically related to fisheries management. In NSW the project was requested by industry to assist in negotiations with government and used a wellbeing approach. In Solomon Islands it was a donor body wanting to tailor its engagement in coastal fisheries institutional strengthening incorporating a gender approach. For PNG, a conservation organization wanted to know how to best target its work in supporting a new fisheries management plan and adopted a "fish chain" approach to fisheries governance.

The wellbeing approach may be used to assess social impacts in a fishing community, and the ways in which fishing contributes to the wellbeing of the wider community. It addresses shortcomings in measuring only material standards of living, in covering also social relationships and subjective aspects of wellbeing. Gender analysis, as used in the Solomon Islands case study, should be part of any social evaluation of fisheries, since gender norms and gender relations fundamentally shape the ways fisheries and post-harvest activities operate, the ways natural resources are used, and the community development outcomes of projects. The interactive governance approach applied to BDM in PNG was developed as a way to tackle the complex interrelations fishing activities have with the natural world and non-fishing social and economic world. The potentially broad coverage and exploration possible with qualitative approaches enables researchers to uncover aspects of their topics they would not otherwise be able to see, providing depth and contextual understanding for quantitative findings. These three case studies highlight the value of qualitative approaches to complement other approaches used more consistently in fisheries and would add a significant dimension to understanding the broader implications of release programs.

Interviews are a key element of qualitative research fisheries scientists may incorporate to improve understanding of why fisheries operate as they do, and what the effects of policy changes are likely to be. This means going beyond the fishers and managers themselves, to interview people with a wide range of perspectives on the fishery. Gaining useful and reliable information from interviews is a complex research skill—it takes training and years of experience

to do well. Fisheries scientists may invest in developing that skill themselves, or collaborate with qualitative social researchers.

Acknowledgements and disclaimer

The views expressed here are those of the authors and not those of the bodies who funded the research. We gratefully acknowledge the assistance provided by: the Fisheries Research and Development Corporation (NSW); the World Bank (Solomon Islands); and the David and Lucile Packard Foundation (PNG). All three funding bodies had some input into study design, but not into analysis or writing up.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.fishres.2016.08.007>.

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