The Importance of Qualitative Social Research for Effective Fisheries Management

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

21 policies. In the second case (a gender analysis of fisheries of small islands in the
22 Pacific), analysis outlined opportunities and constraints along fisheries supply chains,
23 illuminated factors inhibiting community development and identified ecological
24 factors that are typically overlooked in conventional fisheries management. In the
25 third case (sea cucumber fisheries in Papua New Guinea), an interactive governance
26 analysis assessed how well fisheries management tools fit the ecological, social and
27 economic reality of the fishery and the trade in its products, including market
28 influences and stakeholder values. The qualitative approach adopted in these three
29 case studies adds a new dimension to understanding fisheries that is not possible
30 with a focus solely on quantitative data. With the development of new policies on
31 release programs (stock enhancement, restocking) and artificial reefs, and the
32 momentum to use these interventions from recreational fishing groups, the
33 qualitative approach will provide an important contribution to understanding their
34 wider costs and benefits.
35

36 1. Introduction

37 Managing fisheries resources means managing human behaviour, so social and
38 economic understandings are important considerations as well as the understanding
39 of biological and ecological factors (Fulton et al., 2011). The question is how can we
40 effectively integrate social, economic and biological knowledge into effective
41 decision- and policy-making? Progress has been made bringing economic and
42 biological methods together with fisheries economics and bio-economic methods,
43 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 *béche-de*-mer (BDM) trade in Papua New Guinea (PNG) (See Figure 1).

[INSERT FIGURE 1 MAP NEAR HERE]

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

68 government policies have attracted significant interest from recreational fishing
69 groups (Loneragan et al., 2013). We argue that insights from qualitative research
70 can help illuminate why fisheries operate as they do in particular contexts, and thus
71 improve the understanding of responses to fisheries management measures,
72 including the impasse that occurs when scientific recommendations about fisheries
73 management are rejected in favour of politically palatable solutions.
74

75 ## 1.1 Qualitative Social Science Contribution to Fisheries Governance

76 It has been broadly recognized for some decades that more than biological expertise
77 is needed to understand key issues relevant for fisheries management (Fulton et al.,
78 2011, McGoodwin, 1990). Fisheries management is, after all, managing the behavior
79 of people, not fish. Nevertheless, much work remains to be done in order to
80 understand human behavior around fisheries to achieve the desired state of fisheries
81 governance as envisaged in the FAO Ecosystem Approach to Fisheries (FAO, 2003) –
82 whereby fisheries function well socially, economically and biologically. There are
83 many different ways social science can contribute to the knowledge base for
84 fisheries management. Bio-economic modeling can help work out how to allocate
85 fishery resources so as to give the best economic return to society (Seijo et al.,
86 1998). Questionnaires and statistical analysis can measure values and perceptions
87 around fisheries issues, which is useful for governments in understanding what the
88 electorate wants for policies regarding fishing and seafood production, and for
89 industry in strategizing communication in relation to their social license to operate
90 (Mazur et al., 2014). Economics and quantitative social research methods, however,
91 can be usefully complemented by qualitative methods. That is, methods that do not

92 involve mathematical analysis, but take data in the form of spoken words,
93 observations of behavior, visual representations, and/or written text and analyse it
94 in light of theories about society. Examples of qualitative social research approaches
95 that have been used to inform fisheries management include: the sustainable
96 livelihoods approach (Allison and Ellis, 2001); human rights based approaches as
97 embodied in the 2015 FAO Guidelines for Securing Sustainability in Small-Scale
98 Fisheries (FAO, 2015); assessing the social impacts of management decisions
99 (Bradshaw et al., 2001); and qualitative forms of social-ecological resilience appraisal
100 (Blyth, 2015).
101
102 The usefulness of qualitative research methods for addressing social, economic and
103 policy questions has been established in the methodological literature for some
104 decades (Creswell, 1998, Mertens, 2015). One of the useful applications of
105 qualitative methods is for exploring a new field of research. Quantitative methods
106 are deep and narrow, working with pre-identified factors to measure them.
107 Qualitative methods can be used to work out what the research topic means for
108 particular communities, and to generate criteria to then measure quantitatively
109 (Johnson, 2012, Mertens and Hesse-Biber, 2013). Qualitative approaches have also
110 been found to be useful for 'explanatory causation', for understanding the mediating
111 and moderating processes around causation, to complement the 'descriptive
112 causation' established by quantitative methods (Johnson and Schoonenboom, 2016).
113 With the more rounded, connected knowledge that qualitative social science can
114 produce, it is possible to understand more about what the likely consequences of
115 policies before they are implemented (Levontin et al., 2011). Qualitative methods

116 are also useful for identifying and analyzing the relative perspectives of people with
117 different values and interests regarding the topic (Voyer et al., 2015).
118
119 Much biological and quantitative science comes from an objectivist or positivist
120 perspective that holds that there is one truth out there to be scientifically discovered
121 (Crotty, 1998, Mertens, 2015). People persist, however, in holding different systems
122 of knowledge, so for practical purposes in managing people there are multiple
123 salient truths. People do not all come to accept the scientific view, leading to 'push-
124 back' against policies based mainly on biodiversity conservation considerations
125 (Coffey and O'Toole, 2012, Gill et al., 2009, Voyer et al., 2012). Some qualitative
126 research methods explicitly address the differences in perspectives and knowledge
127 systems among stakeholders and aim to reach agreement through consultative and
128 democratic processes, and through assessing social justice values in decision-making
129 (Mertens, 2013). Qualitative social research can also be the basis for more efficient
130 consultation processes leading to more effective outcomes in terms of the social
131 acceptability of policies (Andre et al., 2006, Larson and Dahal, 2012, Sayce et al.,
132 2013).
133
134 Fisheries governance scholar Svein Jentoft has proposed that qualitative social
135 science can bring together different types of knowledge and comprehend them in an
136 interconnected way in order to work out how to proceed with more effective
137 governance of marine resources (Jentoft, 2006). The groundbreaking work *Fish For*
138 *Life* (Kooiman et al., 2005) introduced the concept of 'interactive governance' to
139 fisheries and aquaculture management evaluation. Governance includes all of the

140 factors influencing decision-making in a fishery, including fisheries management but
141 also market influences, cultural factors, and the activities of conservation
142 organizations. Jentoft (2006) argues that the starting point for improving fisheries
143 governance is to recognize the fundamental methodological differences that exist
144 between qualitative social science and the natural sciences, and to appreciate what
145 qualitative social science can add to the field.
146
147 Decisions about what to do with our natural resources are inherently and
148 unavoidably political decisions. There are always trade-offs that benefit some people
149 more than others, or are based on particular sets of values. Do we try to preserve
150 our natural world or do we try to use our natural world for economic gain? Or both?
151 Where will the boundaries of protected areas fall? What kinds of economic or
152 cultural activities will be prioritized? Decisions about the natural world should be
153 based on science, but they should also be based on political, as well as economic and
154 cultural considerations. The question is how to integrate these disparate
155 perspectives well to achieve policy outcomes that are biologically and economically
156 sustainable and broadly accepted as fair and reasonable. Qualitative social scientists
157 can knit together scientific knowledge with experienced-based knowledge of fishers,
158 the values of conservationists and the various political and economic interests
159 involved in a way that can make resource management more pragmatic, more
160 feasible, and less likely to be derailed by opposition (Jentoft, 2006).
161
162 The case studies of the application of the qualitative approach have been chosen to
163 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 *béche-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 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.

211 Wellbeing assessments often use mixed methods. Quantitative tools are used for
212 measuring wellbeing, but qualitative methods, particularly interviews, are vital for
213 understanding what constitutes wellbeing for particular communities and to
214 generate criteria to be measured (McGregor et al., 2015). For wellbeing assessments
215 questionnaires should also be validated using qualitative methods with relevant
216 stakeholders to ensure what is being measured is perceived as useful information by
217 the people whose wellbeing is being measured (McGregor et al., 2015).
218
219 The wellbeing approach is sometimes called '3D wellbeing' because it fleshes out
220 more than just the material standard of living. The approach builds on research into
221 measuring quality of life, including factors such as income, housing, standards of
222 education and access to healthcare (Nussbaum et al., 1993). In the second half of the
223 twentieth century, recognition grew that the subjective and relational aspects of
224 quality of life were also important (Stiglitz et al., 2009). In the 3D wellbeing
225 approach, the factors to consider are divided into material, relational, and subjective
226 (or cognitive) (Coulthard et al., 2011) (Figure 2). A person may have a good material
227 standard of living, but if they are alienated within society (relational), or if they feel
228 dissatisfied with their life (subjective), they do not have wellbeing.
229
230 [INSERT FIGURE 2 NEAR HERE]
231
232 How are these three factors measured and integrated into an analysis of overall
233 wellbeing? The methods used vary according to the questions being asked and

234 specific conditions of field sites.[1] Measuring material wellbeing is fairly
235 straightforward; i.e. income, assets, educational and health status. Often
236 government statistics can provide some of this information and questionnaires can
237 provide whatever else is needed. Relational wellbeing may be determined through
238 an analysis of the social relationships people have that enable them to pursue their
239 livelihoods – 'social capital' (Brooks, 2010), or through psychological questionnaires
240 about satisfaction with important relationships (Coulthard, 2012). Subjective
241 wellbeing is the quality of life people perceive themselves as achieving, including the
242 meanings they give to the goals they achieve and the processes in which they
243 engage. It has been measured by tools such as the Global Person Generated Index
244 (GPGI) (Britton and Coulthard, 2013).
245
246 In this case study, we started with ideas from the literature about implementing
247 wellbeing as a methodology, and a search to find any existing data for analysing
248 social contributions, such as Australian Bureau of Statistics data. From this, we
249 identified the new data we would need to conduct a wellbeing evaluation. We
250 started gathering data with open-ended interviews, asking fishers and non-fishers,
251 such as members of local councils and community groups, what kinds of social
252 benefits they saw arising from the fishing industry in their communities. After we
253 had conducted around half of our intended interviews for the first round of
254 fieldwork we analyzed them via coding using NVivo software (Bazeley and Jackson,
255 2013) to draw out perceptions of the main social contributions. We compared the

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

256 interview data with literature on assessing wellbeing and quality of life (Himes-
257 Cornell et al., 2013, Kasperski and Himes-Cornell, 2014, OECD, 2013, Partridge et al.,
258 2011, New Zealand Quality of Life Project, 2007, Stiglitz et al., 2009). From there we
259 identified areas of community wellbeing that were significant in NSW coastal towns
260 (see Table 1).
261
262 Wellbeing may be used to establish a baseline and track social progress in general
263 (McGregor et al., 2015), and it has been used to understand the wellbeing of
264 particular fishing communities (Britton and Coulthard, 2013). Our question was
265 slightly different; how commercial fishing contributes to the wellbeing of the
266 broader community. Table 1 shows how we adapted the method in our first stage of
267 analysis. Once we had established the areas of community wellbeing relevant for
268 NSW coastal towns (top row), we developed interview questions around those
269 areas, to structure our interviews in the next round of fieldwork. Then we analyzed
270 all of the interviews together – a total of 164 made up of 110 fishers and 54 non-
271 fishers to identify the ways in which commercial fishing in NSW may contribute to
272 broader community wellbeing (see bottom row Table 1). Once we had established
273 these indicators of contribution, we mapped out the interview data on the
274 material/relational/subjective aspects of these indicators, existing government and
275 industry data, and the economic part of the project, and designed questionnaires to
276 measure some elements.
277
278 [INSERT TABLE 1 NEAR HERE]
279

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 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

304 fishing industry, and prefer to buy locally caught seafood for their own consumption.
305 Bait is not usually included in economic analyses of NSW fisheries, but when it
306 emerged as potentially significant in the interviews, we included the bait market in
307 our economic analysis. Our questionnaires then confirmed that recreational fishers
308 were more likely than the general population to want to buy locally produced
309 seafood when at home and when on holiday, and the reason they most often gave
310 for this was because they want to support local industries. Our interviews identified
311 that recreational fishers rely on boating and fuel infrastructure in place to service the
312 professional fishing industry, and they value professional fishing knowledge about
313 fishing conditions. Furthermore, in the questionnaire, over 70 percent of
314 recreational fishers in the sample agreed with a statement that the professional
315 fishing industry can be trusted to act sustainably, and over 80% disagreed with a
316 statement that the professional fishing industry should not be allowed to continue
317 because its environmental costs outweigh its social and environmental benefits.[2]
318 Despite a widespread perception among recreational fishers in NSW that
319 recreational fishing catches are better if professional fishing is excluded, our data
320 clearly shows that if professional fishing were to disappear from areas of the coast,
321 the utility of recreational fishers would be negatively impacted. The use of
322 qualitative with quantitative methods revealed interdependencies between the
323 sectors, and illuminated that recreational fishers also highly value professional
324 fishing. The integrated use of qualitative and quantitative methods offered similarly
325 deep insights into synergies with the tourism sector, and into the complexity of the
326 professional fishing sector's social license to operate in NSW.

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

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 lead 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, 2009a).

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 *béche 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 3,000 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).

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 Oceanscape 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 to impede economic and social progress in rural food producing areas (Balakrishnan and 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

421 out from the narrow lens of what men do on boats. Whole supply chains, whole
422 households and/or whole businesses are the relevant units of analysis. Women's
423 role in support of men's fishing activities is vital to fisheries businesses, through
424 providing food for fishing men and their families, and financial backup (Harper et al.,
425 2013). Small-scale fisheries and aquaculture are often whole-of-family enterprises
426 (The World Bank, 2009). There are multifaceted relationships between men and
427 women as boat owners, processors, sellers, family members, community members
428 and co-workers (FAO, 2012). The fishery sector starts to look like a female sphere if
429 you account for gleaning, trading, processing and aquaculture as well as capture
430 fisheries (Weeratunge et al., 2010).
431
432 Methodologically a gender analysis may be approached in many different ways, from
433 in-depth, interview-based qualitative examinations of gender norms, to economics
434 and statistical quantitative investigations of household income and expenditure, and
435 labour and remuneration patterns. The objective for this study was to take a supply
436 chain approach to understanding the opportunities and constraints for women in
437 coastal fisheries and in tuna processing. There were pockets of existing work to draw
438 on for this – on women in tuna processing and in marketing activities, and on gender
439 relations in coastal resource management – but these had not been pulled together
440 before, nor looked at from a supply chain perspective. An exploratory approach was
441 therefore required to give an overview of tuna and coastal fisheries supply chains,
442 the gendered division of labour within those chains, the gender relations and norms
443 giving rise to that gendered division of labour, and the consequent opportunities and
444 constraints for women. A qualitative approach using interviews and a review of

445 published literature and technical reports was thus appropriate for this stage of the
446 research. A small amount of quantitative analysis was possible using staffing
447 statistics in tuna processing and the Household Income and Expenditure Survey
448 about women's situation in the overall economy. Further quantitative data collection
449 and analysis was beyond the scope of this particular project, but the findings
450 indicated where quantitative methods could be fruitfully applied in further research.
451
452 Interviewees were recruited via 'convenience' and 'snowball' sampling. That is,
453 interviewees were sought from relevant organizations, such as the Ministry of
454 Fisheries and Marine Resources, and by turning up to relevant locations, such as
455 markets, and interviewing people available there on that day. These interviewees
456 then suggested further interviewees. They included: 19 people selling fish and other
457 marine products in markets; 14 people from fishing villages; 14 people from
458 government and 10 from non-government organizations (NGO) working on gender,
459 conservation and fisheries management; 15 employees and managers from two tuna
460 companies; 4 community representatives from the town of Noro, which has a large
461 tuna processing factory, and 7 people from villages around Noro. Interviewees were
462 approached if they worked in areas related to coastal fisheries or tuna processing,
463 lived in fishing villages or around the tuna processing company, or worked in
464 organizations focused on gender relations. In this kind of fieldwork interviewees are
465 not excluded as such. No claims to generalizability are made, rather, respondents
466 from relevant stakeholder groups are sought until 'saturation' is reached, meaning
467 adequate depth and breadth has been achieved in the sample relative to the
468 research questions and no new data is being generated (O'Reilly and Parker, 2013).

469 The themes covered in the interviews included: 1) what are the respective roles of
470 women and men in coastal fisheries and tuna supply chains; 2) what are the reasons
471 behind gendered divisions of labour in these supply chains, including constraints on
472 women moving into new roles; 3) what levels of income and types of livelihoods
473 does this work provide; 4) what kinds of issues do women face in this work, including
474 gender-based violence, norms about appropriate activities for women, and
475 subordination by men; and 5) what changes to work environments could result in
476 improved conditions and opportunities for women.
477
478 In addition to the interview fieldwork, we undertook an extensive literature review.
479 We started with reports and publications suggested to us by interviewees (especially
480 important for the 'grey' technical literature not available through internet-based
481 searching) and also searched the scientific and technical literature. We searched for
482 pieces on gender in fisheries, fish processing, seafood marketing and aquaculture,
483 especially in the Pacific, but also other developing countries, and also in agriculture.
484 We also searched for pieces on gender relations in the Pacific, especially to do with
485 economic activities. This was not a systematic review with exclusion criteria, but was
486 similar to the interview method – anything fitting the terms above was included until
487 we ceased finding new information. The literature was organized using EndNote
488 software, with points from each piece relevant to our research questions included in
489 the entries, producing a large annotated bibliography.
490
491 Qualitative analysis of the interview and literature material followed an inductive
492 process, as is usual in qualitative research (Creswell, 1998). We manually worked

493 with the data in a similar way as may be done with NVivo software. We identified
494 themes from the interview notes and the literature annotations that addressed and
495 explained the issues involved in the research questions. In this process information
496 from interviews was compared and contrasted with similar points from other
497 interviews, and triangulated against the literature. This formed the basis of the
498 analysis. The findings were validated by eliciting comments on a draft from key
499 informants in fisheries management, gender in fisheries, coastal conservation, and
500 tuna processing. Outputs of the analysis included a table summarizing the gendered
501 division of labour along supply chains (see Table 2 for part of this summary).
502
503 [INSERT TABLE 2 NEAR HERE]
504

505 ### 3.2 The qualitative value-add

506 Qualitative methods enabled this gender analysis to be exploratory, bringing
507 together information from the different fields of gender studies, development and
508 fisheries management to give an overview showing the connections within society
509 that cause fisheries supply chains to operate the way they do. The open-ended
510 interview method contributed to the exploratory approach through drawing from
511 participants themselves their perspectives on the opportunities and constraints for
512 women in fisheries, revealing causal factors that the researchers could not have
513 elicited through the more closed data collection involved in quantitative methods.
514 For example, one reason women market fresh fish is to make sure money from sales
515 goes to the family – when men fishers sold their own catch they sometimes used the
516 money for beer, rather than bringing the money home. These connections shed light

517 on the human dimensions of fisheries. Relevant human activities are not restricted
518 to the activities of men on boats, but include the activities of women on boats,
519 women in the intertidal zone, and what families do in accommodating fishing
520 activities, non-fishing livelihoods to compensate when fishing declines, and what
521 men and women do in markets, processing, and seafood consumption.[3]
522
523 The range of species to be monitored and managed as coastal resources was
524 identified by the gender analysis as a gap in existing resource monitoring. Hitherto
525 the lists of inshore resources of interest have tended to cover tunas, reef fish and
526 invertebrates sold for export – including sea cucumbers, gold- and black-lip oysters,
527 trochus, and giant clams (see for example: Richards et al., 1994, Brewer, 2013,
528 Brewer, c.2011). Since 2012, the MFMR has also been working towards monitoring
529 reef fish stocks through market data from Honiara and Gizo (Pomeroy and Yang,
530 2014). Interviews with women in fishing communities and observing markets,
531 however, revealed a much wider range of species being collected for food and sale,
532 and perceptions of overharvesting of some of these and associated environmental
533 degradation. These included mud crabs, clams gleaned from mangroves and sandy
534 areas, mangrove seeds used as a vegetable, mangrove firewood, and shells used for
535 customary shell money and jewelry for domestic markets. Women are heavily
536 involved in the harvesting, use and sale of these resources so their absence from the
537 usual discourse about species of concern could be an example of the gender
538 blindness preventing fisheries science from considering the full range of ecosystem
539 impacts (Kleiber et al., 2014). The qualitative overview tying together open-ended

[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).

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

564 and resource management in Solomon Islands for coastal CBRM (Hilly et al., 2012,
565 WorldFish, 2013) and agricultural development (World Bank, 2015). These insights,
566 however, were not visible in MFMR approaches to CBRM in either our interviews or
567 the reports reviewed for this project. We concluded that although MFMR has a
568 Gender Strategy in place and a Gender Focal Point on staff, further capacity building
569 and collaboration is needed to embed gender awareness into CBRM approaches
570 (Krushelnytska, 2015).
571

572 ## 4. Papua New Guinea *Béche-de-Mer* – Governance Analysis

573 Papua New Guinea (PNG) lies to the north of Australia with a population of eight
574 million. Mining, oil and natural gas, and logging have brought great wealth into the
575 country, but this has not 'trickled down' to the majority of the population. Papua
576 New Guinea's development statistics put it in the lowest quartile internationally,
577 with education rates, income levels and life expectancy having improved steadily but
578 slowly since independence in 1975 (United Nations Development Programme,
579 2015b). It has around 800 different language groups and strong Indigenous cultures.
580 The majority of the population live on their own land under officially recognized
581 customary tenure arrangements. The cash earning opportunities are extremely
582 limited in villages far from transport routes because it is very expensive to bring
583 inputs in and send goods out.
584

585 Boiled and dried sea cucumbers called *béche-de-mer* (BDM), along with dried shark
586 fin and shells such as trochus, have long been an important source of cash incomes

587 for PNG coastal communities (Kinch, 2002). Tropical BDM have for hundreds of years
588 been a delicacy throughout southern China and South East Asia as a prestige dish for
589 special occasions, and as a health food (Akamine, 2005). Around 30 species of sea
590 cucumber have been traded commercially in PNG (Kinch et al., 2008).
591
592 The market for BDM has grown and prices have increased over the last three
593 decades with economic growth in China. As traditional sources dried up, traders
594 have sought new supplies throughout the world, resulting in serial stock depletions
595 (Eriksson and Byrne, 2013). From the late 1990s, the PNG the BDM fishery shifted
596 from low-volume, high-value to high-volume low-value species due to the higher
597 value species being fished out and increased demand (Kinch et al., 2008).
598
599 In the 2000s, sea cucumber stocks collapsed and in 2009 the PNG government
600 instituted a moratorium on the fishery, banning exports (Kinch et al., 2008). Fisheries
601 in PNG are managed by the National Fisheries Authority (NFA), which is well-
602 resourced through fees paid for access to PNG's rich tuna fishing grounds. There had
603 been a sea cucumber fishery management plan centred on regulation of exports,
604 with Total Allowable Catches (TACs) and annual closed seasons, but it failed to
605 prevent overfishing. The TACs were routinely exceeded without penalty and
606 additional amounts leaked out through loopholes in the regulatory system and illegal
607 trade (Kinch et al., 2007). Sea cucumber fisheries in most places around the world
608 are not sustainably managed, in part due to the high value of and large demand for
609 the commodity, creating strong incentives to continue fishing despite stock declines
610 (Purcell et al., 2013). Since the moratorium started in 2009, the NFA has worked on

611 stock assessments revising the fishery management plan to make the fishery
612 sustainable when it reopens, possibly in the near future. The aim of this project was
613 to conduct a governance analysis to assess how effective the new fishery
614 management plan will be in making PNG's sea cucumber fishery sustainable.
615

616 ## 4.1 Fish Chain Interactive Governance Analysis

617 This research employed the conceptual framework of fish chains within the
618 interactive governance understanding of fisheries (Jentoft and Chuenpagdee, 2015).
619 The interactive governance approach is broader than simply government regulation
620 of a particular sector. It involves: 1) *diverse* actors and institutions, including state
621 and non-state (such as markets or cultural institutions), human and non-human; 2)
622 inherently *complex* or 'wicked' problems that require multi-disciplinary analysis; 3)
623 situations that are interactive and *dynamic*; and 4) as operating across various *scales*
624 from the local to the global. These four system properties – diversity, complexity,
625 dynamics and scale – are a key part of the interactive governance approach. In
626 interactive governance analysis, the unit of analysis is the fishery itself as a natural
627 and social system-to-be-governed, and also the entire supply chain through to
628 consumers, called a 'fish chain'. The interactive governance approach posits five
629 goals for fisheries governance: 1) food security; 2) community wellbeing; 3)
630 economic livelihood viability; 4) social justice; and 5) environmental sustainability.
631 Since the first major publication on interactive governance, *Fish For Life* (Kooiman et
632 al., 2005), it has been applied as an analytical tool to many different fisheries
633 internationally (Bavinck et al., 2013, Jentoft and Chuenpagdee, 2015).
634

635 Quantitative biological, economic and sociological methods have been used in
636 interactive governance analyses, as have qualitative geographical and
637 anthropological methods (Bavinck et al., 2013). Previously, the 'fish chain' had not
638 been described for the PNG BDM fishery. It was therefore appropriate for this study
639 to take an exploratory approach, to map out the field and draw together existing
640 discrete bodies of knowledge about the fishery as it operated on the ground,
641 management by government, the trade in PNG, the trade in China, and regional and
642 international governance structures. The study was thus based on interviews and a
643 desktop review.
644
645 A total of 62 interviews were conducted with fishers and customary resource
646 owners, exporters in PNG, importers, wholesalers and retailers in China, key
647 informant BDM researchers and staff of relevant government agencies in PNG (NFA,
648 Customs, Provincial Fisheries Officers and other Provincial Government officials, and
649 Local Level Government representatives). We interviewed anyone available from
650 relevant stakeholder groups and stopped when we ceased finding new information
651 (i.e. reached saturation). We used a semi-structured interview format, with targeted
652 questions for each stakeholder group. Interviewees were asked open-ended
653 questions about: their role in the supply chain; prospects for making the sea
654 cucumber fishery sustainable; their relationships with other stakeholders (relations
655 between fishers and buyers/exporters, relations between exporters and government
656 agencies, and so on). Government interviewees were asked how well the
657 management system functioned, and about articulations between government
658 agencies involved in managing the BDM trade. Fishers were asked about whether

659 exporters funded their fishing or provided equipment or training in processing, and
660 prospects for community-based resource management. Exporters were asked about
661 their business models, their interest in making the industry sustainable, changing
662 margins over the years, how they raised capital, how they learned about the market
663 and how they established relations with importers.
664
665 A key part of the desktop review portion of the study was a close examination of the
666 new management plan, the old management plan, and reports about issues with the
667 old plan, with further follow up questions in the interviews. The literature review
668 also involved mining for information and ideas about factors affecting: the operation
669 and management of sea cucumber fisheries; the effectiveness of CBRM; the trade in
670 BDM; Chinese market shifts towards sustainability; and Chinese government seafood
671 importing regulations. The literature review included anything we found through
672 informants and through searching on these topics, until we stopped finding new
673 information. In addition, the project was conducted in tandem with a sister project
674 being conducted by conservation organization, EDO NSW, providing a desktop
675 review of the legal and policy framework of fisheries management for BDM in PNG.
676 In a process similar to that followed for the other two case studies discussed above,
677 the material from the interviews, literature review and legal review was analysed by
678 searching for themes addressing the research question. Ideas arising from interviews
679 were compared and contrasted with similar material in other interviews, legislation
680 and policy documents, and triangulated with the literature. Findings were validated
681 at the draft stage by seeking feedback from stakeholders via presentations by the
682 lead author to NFA staff, and to fishing villagers in Manus Province.

683

684 ## 4.2 The qualitative value-add

685 The study gave rise to three main findings about: 1) the development potential for
686 sea cucumber fisheries for coastal villages; 2) the goodness of fit of the new
687 management plan to the fishery and trade in BDM; and 3) the importance of
688 addressing the relationships between stakeholders as well as technical solutions in
689 fisheries management tools. The benefit in using qualitative methods for the study
690 was in giving an overview of all the factors affecting governance – government and
691 non-government, at different scales – pulling things together in a new way to
692 highlight the interactions between different aspects of governance. Table 3 is the
693 village part of a longer table summarizing the overview, assessing management
694 measures and other influences on governance in terms of the five goals of
695 governance – environmental sustainability, livelihood viability, community wellbeing,
696 social justice and food security. The full version of this table carries the analysis
697 through to PNG provincial and national levels, regional, international, and then Hong
698 Kong and China for the market end of the chain (see Barclay et al., 2016).

699

700 [INSERT TABLE 3 NEAR HERE]

701

702 NFA fisheries managers, when presented with the findings, said they found the
703 overview aspect of the findings useful in two main ways. First, it provided evidence
704 supporting the approach of the new management plan. In this research, interview
705 material and literature was used to describe the whole BDM supply chain as a
706 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

731 them an evidence-based assessment of ways to pursue their goal of development
732 through community-based management of fisheries resources. The MEnAR aimed to
733 secure a BDM export license and set up an exporting business, believing they would
734 achieve a better return by 'cutting out the middle man' and selling their product
735 direct to overseas importers. This approach to fisheries development has been
736 fostered over decades in the Pacific, whereby donor support has been provided to
737 turn fishing activities into businesses (Barclay and Kinch, 2013). Our report provided
738 several pieces of information relevant for assessing the viability of this approach: 1)
739 a review of projects in the island Pacific supporting fishers to enter business without
740 developing track record first (showing high failure rates); 2) interview-based
741 information about what is involved in the export business, including the large
742 amounts of capital required for buying and the years needed to learn markets and
743 build relationships with importers; and 3) interview- and literature-based analysis of
744 what kinds of activity amount to 'development' (improvements in food security,
745 livelihood viability, community wellbeing and social justice) versus simply increased
746 income. These varied sources of information were synthesized into an alternative
747 model of development to consider in parallel with the conventional model of seeking
748 external support to set up an export business. The evidence-based alternative model
749 involves: 1) working at a community level to ensure increased income leads to
750 development; 2) actively developing expertise in seafood trading and business
751 management, including through partnerships with established businesses; and 3)
752 pursuing ownership of export businesses as a long term goal after building track
753 record and access to capital.
754

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

778 in the Solomon Islands case study, should be part of any social evaluation of
779 fisheries, since gender norms and gender relations fundamentally shape the ways
780 fisheries and post-harvest activities operate, the ways natural resources are used,
781 and the community development outcomes of projects. The interactive governance
782 approach applied to BDM in PNG was developed as a way to tackle the complex
783 interrelations fishing activities have with the natural world and non-fishing social and
784 economic world. The potentially broad coverage and exploration possible with
785 qualitative approaches enables researchers to uncover aspects of their topics they
786 would not otherwise be able to see, providing depth and contextual understanding
787 for quantitative findings. These three case studies highlight the value of qualitative
788 approaches to complement other approaches used more consistently in fisheries
789 and would add a significant dimension to understanding the broader implications of
790 release programs.
791
792 Interviews are a key element of qualitative research fisheries scientists may
793 incorporate to improve understanding of why fisheries operate as they do, and what
794 the effects of policy changes are likely to be. This means going beyond the fishers
795 and managers themselves, to interview people with a wide range of perspectives on
796 the fishery. Gaining useful and reliable information from interviews is a complex
797 research skill – it takes training and years of experience to do well. Fisheries
798 scientists may invest in developing that skill themselves, or collaborate with
799 qualitative social researchers.
800

Disclaimer and Acknowledgements

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.

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Title page

Using a wellbeing approach to develop a framework for an integrated socio-economic evaluation of professional fishing.

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Running title: Social and economic value of fisheries

Using a wellbeing approach to develop a framework for an integrated socio-economic evaluation of professional fishing.

Abstract

The principles of Ecologically Sustainable Development and Ecosystem Based Fisheries Management require that fisheries be managed for social as well as environmental and economic objectives. Comprehensive assessments of the success of fisheries in achieving all three objectives are, however, rare. There are three main barriers to achieving integrated assessments of fisheries. Firstly, disciplinary divides can be considered 'too hard' to bridge with inherent conflicts between the predominately empirical and deductive traditions of economics and biophysical sciences and the inductive and interpretative approach of much of the social sciences. Secondly, understanding of the social pillar of sustainability is less well developed. And finally, in depth analysis of the social aspects of sustainability often involves qualitative analysis and there are practical difficulties in integrating this with largely quantitative economic and ecological assessments. This paper explores the social wellbeing approach as a framework for an integrated evaluation of the social and economic benefits that communities in New South Wales, Australia receive from professional fish harvesting. Using a review of existing literature and qualitative interviews with more than 160 people associated with the fishing industry the project was able to identify seven key domains of community wellbeing to which the industry contributes. Identification of these domains provided a framework through which industry contributions could be further explored, through quantitative surveys and economic analysis. This framework enabled successful integration of social and economic, and both qualitative and quantitative information in a manner that enabled a comprehensive assessment of the value of the fishery.

Keywords

Social and economic valuation, wellbeing, resource conflict, integrated management, professional fishing

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1. Introduction

Ecosystem Based Fisheries Management (EBFM), sometimes also known as the Ecosystem Approach for Fisheries Management (EAFM), requires consideration of the full spectrum of environmental impacts of wild-harvest fisheries along with the social and economic costs and benefits that the industry provides to local communities (Engler, 2015; Fletcher, Chesson, Sainsbury, Hundloe, & Fisher, 2005; Fletcher et al., 2016). Managing fisheries for environmental, social and economic objectives also lies at the heart of the principles of Ecologically Sustainable Development now central to many of the world's fisheries policy and regulatory frameworks (Brundtland, 1990). Despite this, comprehensive assessments of fisheries against all three objectives are rare and there remains limited guidance for fisheries managers and researchers around how such an integrated assessment might be achieved. A number of key barriers exist to achieving this integrated approach to fisheries assessment and management approaches.

The first barrier is a function of the disciplinary divides that exist between the scholars and practitioners working on the different aspects of fisheries management. Traditional economic and ecological assessments largely draw on empiricist and positivist paradigms to develop improved understandings of the way natural systems and society work, using deductive methods and hypothesis testing (Creswell, 1998; Crotty, 1998). There are similar statistical approaches used in the social sciences, but in addition there are approaches that draw a more interpretive, 'constructivist' understanding of the world, recognizing that meanings are constructed by people, and that people develop their own subjective understandings of the world that influence the ways they live and interact with others, with nature, and with

regulation (Creswell, 1998; Crotty, 1998). There is considerable work currently being undertaken across all three disciplinary areas which attempts to bridge this divide – Social-Ecological Systems (SES) research for example, attempts to better integrate social and ecological understandings of nature (Berkes, Colding, & Folke, 2003; Folke, 2007; Kittinger et al., 2013; Partelow, 2015). Environmental and ecological economists are also interested in understanding the economic and non-market values of nature and the social and cultural benefits that humanity derives from nature (Bennett et al., 2017; Costanza et al., 2016). Truly integrated assessments, still remain the exception, rather than the rule, in fisheries management, with these disciplinary differences often considered 'too hard' to reconcile (Creswell, 1998; Miles & Huberman, 1994). In particular, inherent barriers exist around the importance of subjective understandings, including values, beliefs and norms in relation to natural and economic systems, which influence people's attitudes and behavior (Stern, Dietz, Kalof, Guagnano, & Abel, 1999). Subjective understandings may be dismissed as 'anecdotal' within the positivist paradigm, which aims for objective, unbiased assessment and privileges empirical data over examination of people's experiences or beliefs.

An additional barrier exists simply through the paucity of available information on the social aspects of fisheries, in comparison with much greater availability of ecological and economic data. In fisheries management, the contest between the most appropriate measure of sustainability of a fishery - maximum sustainable yield or maximum economic yield – has traditionally focused fisheries management (and associated data collection) on only two of the three 'triple bottom line' objectives by incorporating only economic and ecological variables into the modelling process. As a consequence there has been a sidelining of social

benefit considerations that look beyond the economic component of social systems. These social aspects have been relegated to occasional studies of the social impacts of policies, and fisheries management generally has a poor assessment framework for measuring the social aspects of the fishery management system, or integrating social assessments within fisheries management (K Barclay, 2012). In recognition of this knowledge gap, there has been some recent progress towards the development of social indicators to monitor the success of fisheries management in achieving social objectives (Anderson et al., 2015; Brooks et al., 2015; Hicks et al., 2016; Triantafillos, Brooks, Schirmer, & Pascoe, 2014). These studies have revealed the importance of consideration of all three aspects of 'triple bottom line' decision making by highlighting examples of socially successful fisheries based on depleted resources and healthy resources that do not support high social or economic outcomes (Anderson et al., 2015).

Finally, a third barrier to integrated triple bottom line assessments of fisheries exist on a practical level and relates to the primary forms of data collection across the three disciplines. Economic and ecological assessments rely primarily on large quantitative data sets. Social sciences may also involve quantitative analyses, however, qualitative social research is really useful for complementing the positivist biological and economic approaches with understanding of the subjective aspects of the human dimension driving behavior (K Barclay et al., 2017). Qualitative social research is often exploratory and inductive, qualitative data also plays a significant role, particularly in formulating theory, or new ideas about how social systems work, which can then inform the development of appropriate social indicators (Glaser & Strauss, 1967). It usually involves discrete data sets, often with small sample sizes

and cannot be used to make generalized findings because the practical realities of recruiting respondents for such work means they cannot be statistically representative (Maxwell, 2005). While this form of social inquiry provides useful insights, given some aspects of the human experience may be difficult to quantify, the nature of the data sets makes integration with ecological and economic data sets problematic (K Barclay et al., 2017).

'Wellbeing' has been proposed as a useful 'comprehensive integrating 'lens'', or framework, through which more thorough assessments of fisheries might be conducted. In particular, the social wellbeing framework is a means of 'unravelling and better assessing complex social and economic issues within the context of fisheries governance' (Weeratunge et al., 2014 p255). The concept of wellbeing has received increased attention in recent times, particularly since the evolution of the Sustainable Development Goals (SDG) which incorporate an increased emphasis on wellbeing (Costanza et al., 2016). This paper evaluates the wellbeing approach as a framework for an integrated assessment of the professional fishing industry in coastal New South Wales, Australia. In so doing it assesses whether the wellbeing approach enabled researchers to respond to and address the three barriers to effective triple bottom line assessment identified above, namely 1) disciplinary barriers, 2) paucity of social data and 3) practical difficulties in integrating qualitative and quantitative data. The results outlined in this paper summarizes a large-scale project investigating the social and economic contributions, or value, of the professional fishing industry to coastal communities in NSW, Australia (for the full report see Voyer, Barclay, McIlgorm, & Mazur, 2016). It should be noted that the study combines both positivist and inductive research paradigms. For example, a positivist approach is taken in the measurement of the economic activity and contribution

being made by commercial fishers and measurement of the wider economic contributions from professional fishing is assessed by qualitative social methods. Future research could integrate wider analysis of non-monetary values using quantitative and inductive economic methods based around the indicators identified in this study and investigate the possible discreteness or degree of overlap of applied economic and social approaches.

1.1 Applying a social wellbeing approach to assessing the value of NSW coastal fisheries

The development of an integrated approach to considering both the social and economic contributions of the wild-catch industry was guided by a 'social wellbeing' framework, where wellbeing is defined as 'a state of being with others, where human needs are met, when individuals can act meaningfully to pursue self-defined goals, and when they can enjoy a satisfactory quality of life' (McGregor, 2008 p1).

Most studies into wellbeing conducted around the world now recognize the interplay of a variety of different factors in influencing community and individual wellbeing. The needs, freedoms and quality of life conditions that contribute to wellbeing vary across different geographical, societal and cultural contexts (Coulthard, Johnson, & McGregor, 2011). In recognition of this, development theory has increasingly moved away from measures of quality of life which focus exclusively on economic factors (Coulthard, 2012; Hicks et al., 2016; McGregor, Coulthard, & Camfield, 2015; MC Nussbaum, Sen, & World Institute for Development Economics Research, 1993; Sen, 1999; Sen, Muellbauer, & Hawthorn, 1987; Stiglitz, Sen, & Fitoussi, 2009). An important aspect of the wellbeing approach is its

recognition of the need to consider both objective and subjective aspects of wellbeing. Conventional, objective measures of wellbeing include factors such as income and education, and are essential to any studies of this nature. People's satisfaction with life and their standards of living, and how they feel about their lives will, however, also influence their wellbeing. Just as people's sense of wellbeing can differ considerably according to different conceptions of their economic circumstances and their relative wealth in relation to their community, so too can their beliefs around the value of different goods, services or activities to their wellbeing. These beliefs may be influenced by their economic or employment circumstances, but also by a range of other factors including other less tangible contributions to their physical, mental and social health (Himes-Cornell et al., 2013; Kasperski & Himes-Cornell, 2014; New Zealand Quality of Life Project, 2007; MC Nussbaum, 2000; M Nussbaum, 2003; MC Nussbaum et al., 1993; OECD, 2013; Partridge, Chong, Herriman, Daly, & Lederwasch, 2011; Stiglitz et al., 2009). Wellbeing can also be highly malleable, with people assessing their own wellbeing in the context of socially constructed meanings formed through their relations with others (Coulthard et al., 2011; Deneulin & McGregor, 2010; Gough & McGregor, 2007). The relationships that people have within their communities can strongly influence their own sense of wellbeing, and can also affect their capacity to improve their wellbeing. The 'social wellbeing' approach builds on these different influences of wellbeing by measuring three key aspects;

- Material: resources people have and the extent to which needs are met including food, income and assets, access to services and environmental quality.
- Relational: extent to which social relationships enable people to act to achieve (their own conception of) wellbeing.

- Subjective: level of satisfaction with the quality of life people achieve. A person's perceptions, values and beliefs that shape this level of satisfaction (Britton & Coulthard, 2013; Coulthard, 2012; Coulthard et al., 2011).

This approach combines an objective evaluation of circumstances in which people live with a subjective evaluation of those circumstances, whilst also giving emphasis to the social context by which these meanings are framed, and the social relations through which aspects of wellbeing are pursued (Britton & Coulthard, 2013). Work has been done in the past that uses the 'social wellbeing' approach to measure and assess current wellbeing within fishing communities (eg see Belton, 2016; Britton & Coulthard, 2013; Coulthard, Sandaruwan, Paranamana, & Koralgama, 2014). Our study, however, represents the first example of an evaluation of *the contributions the fishing industry makes to community wellbeing*, integrating qualitative social science with economics methods. Given its focus on contributions fishing makes to broader community wellbeing (rather than the wellbeing of fishers), our study used a slightly modified version of the 'social wellbeing' framework, as detailed below:

- Material: the extent to which the wild-catch fishing industry contributes resources for local communities to meet their needs, including food, income and assets, access to services and environmental quality.
- Relational: the extent to which the wild-catch fishing industry contributes to the development and maintenance of social relationships that enable coastal communities to achieve wellbeing.

- Subjective: levels of satisfaction with or awareness of the contributions made by the wild-catch fishing industry to the quality of life of local communities, which are shaped by values and beliefs about the importance of having a local fishing industry.

1.2 The NSW wild-catch professional fishing industry

The NSW professional fishing industry, like many other fishing industries around the world, has been in an almost constant state of reform and restructure for close to 150 years, with significant changes to fishing methods, gear and vessels since its beginnings not long after colonization. A defining characteristic of the NSW industry has been the relatively large numbers of small, often family-run businesses working a variety of methods to catch a diversity of species. This is a direct response to the unique environmental conditions in NSW, where coastal waters are characterized by relatively low levels of productivity due to largely temperate waters and relatively low nutrient levels. These environmental restrictions have meant that there is limited opportunity for larger, industrial scale fishing operations such as those seen in more productive areas like New Zealand and Japan (Wilkinson, 1997).

In the last 25-30 years the focus of fisheries management has been on rationalization of the NSW industry from a peak of over 4000 licenses in the 1980s to just less than a thousand in 2016. Current reforms are underway which aim to reduce this number further (NSW Department of Primary Industries, 2016). These changes have focused on reducing the number of small-scale fishers as well as latent licenses in order to improve profitability and security for larger-scale or more active operators. Changes implemented since the late 1980s have included a shift from open access to restricted fisheries, a freeze on new licenses, the

introduction of share management (including quotas) and significant increases in license fees and charges (Schnierer & Egan, 2012; Stevens, Cartwright, & Neville, 2012; Wilkinson, 2013). In addition, there has been a substantial reduction in professional fishing access through the expansion of the Marine Protected Area (MPA) network across the state and the establishment of recreational fishing havens (where all professional fishing is banned) in 30 NSW estuaries. These restrictions on access have resulted in a substantial loss of fishing grounds for the industry with only nine of the 24 most productive estuaries in NSW remaining completely open to professional fishing (Stevens et al, 2012). The industry has also been subject to increased scrutiny of its operations by both Government and the wider public. Concerns over an incomplete understanding of the impacts of the continued decline of the industry on community wellbeing were some of the key drivers of this research agenda.

2. Methods

The principle aim of this paper is to show how the social wellbeing approach may be used to develop a framework for an integrated assessment of the social and economic contributions fisheries make to their communities. In order to provide a foundation for our understanding of the different factors that influence community wellbeing we started with a detailed literature review of studies into wellbeing and quality of life. The literature review assembled a range of different indices currently used around the world and within Australia to measure wellbeing, quality of life and 'standards of living' (Australian Bureau of Statistics, 2013; Himes-Cornell et al., 2013; Kasperski & Himes-Cornell, 2014; New Zealand Quality of Life Project, 2007; MC Nussbaum, 2000; M Nussbaum, 2003; MC Nussbaum et al., 1993; OECD, 2013; Partridge et al., 2011; Stiglitz et al., 2009). Commonalities were identified across the

different indices used and categorized into a number of different aspects or ‘domains’ of wellbeing.

After identifying these commonalities across the literature we conducted the first round of fieldwork interviews. Given there was not yet enough data or comprehensive understanding of the social contributions of the industry to local communities to be able to do quantitative work an inductive, qualitative approach was need to build a theoretical understanding of the potential nature and scope of these contributions. Using a grounded theory approach (Glaser & Strauss, 1967), we began with a number of largely unstructured interviews where general questions were asked about the participants’ beliefs about the contribution of the fishing industry to their local community. In total more than 160 interviews were conducted with people from across the state. The majority of the interview participants were directly engaged in the fishing industry as fishers, members of fishing families or co-operative staff (66%), with some interviews also conducted with people from a range of other perspective as outlined in Table 1.

[INSERT TABLE 1]

Initial contact with interview participants was made in a variety of ways, including purposive sampling of industry bodies, co-operatives and community groups, opportunistic sampling (e.g. via advertising ‘drop in sessions’ through local media and industry channels) and ‘snowball’ sampling whereby people interviewed recommended additional people to contact. The interviews were audio recorded and transcribed in full. The social interviews were not

designed to be statistically representative but rather tried to capture a broad cross section of the industry. As such they reflected the primary characteristics of the industry in many respects (largely male, older and small operators) but also drew from a diverse range of backgrounds, ages and styles of fishing. These qualitative, unstructured interviews were used to develop a picture of the types of contributions different sections of the industry felt it made to the community.

All the interview transcripts and associated interview notes were entered into NVivo 10 and coded using a thematic analysis approach. This involved repeated coding, sorting and categorizing and allowed for the identification of major themes, as well as the examination of the intersections of ideas, concepts and beliefs across interview participants in relation to the value of the industry in their community (Bazeley & Jackson, 2013; Creswell, 2009; Maxwell, 2005; Miles & Huberman, 1994). As the analysis involved multiple coders, inter-coder reliability was checked regularly to ensure consistency across the project team.

Following on from the identification of major themes or categories of contributions of the industry to coastal communities, these ideas (termed 'contributions to wellbeing') were grouped under relevant aspects of 'quality of life' (or 'domains of wellbeing') identified in the initial literature review. Indicators were subsequently developed, which were used to triangulate the interview findings with other data sources and to 'test', validate and, where possible, quantify the nature of these contributions (Creswell, 2009). This process included examination of the material, relational and subjective aspects of industry contributions to each domain of wellbeing. Figure 1 highlights the pathway that led to the development of the

final wellbeing framework used in the research, beginning with the development of a theoretical and conceptual model through to a practical research instrument, incorporating social and economic, qualitative and quantitative data.

[INSERT FIGURE 1]

The additional quantitative data collection and analysis involved a range of techniques, including:

- an economic questionnaire (sent to all NSW professional fishers)
- a random phone general public questionnaire of 1400 people living in NSW coastal communities
- random and targeted phone questionnaires of fish co-operatives, fish retailers and wholesalers
- an internet survey of hospitality and tourism operators in NSW(Voyer et al., 2016).

The social and economic questionnaires were the primary tools used to measure material and subjective aspects of the identified contributions. For example, the economic questionnaire quantified the economic contributions of the industry while the community questionnaire explored the way the wider community perceived the economic importance of the sector. The qualitative interviews supplemented these findings, especially in domains which were difficult to quantify, as well as providing detailed information on the relational aspects of the contributions.

In this paper our discussion of results concentrates on the overall wellbeing framework and its usefulness in addressing some of the key barriers to improved integrated, triple bottom line assessment of benefits from fisheries. For a fuller discussion of results see Voyer et al. (2016).

3. Results

In order to provide a foundation for our understanding of the different factors that influence community wellbeing we conducted a detailed literature review of studies of community wellbeing and quality of life. The literature review assembled a range of different indices currently used around the world and within Australia to measure quality of life, sometimes also referred to as 'standard of living' (Nussbaum, 2003, Partridge et al., 2011, Nussbaum, 2000, Stiglitz et al., 2009, Himes-Cornell et al., 2013, Kasperski and Himes-Cornell, 2014, OECD, 2013, New Zealand Quality of Life Project, 2007). The literature review and fieldwork interviews identified seven of these key domains of wellbeing as being relevant to the contributions of the NSW professional fishing industry (Table 2). The nature of industry contributions to each of these seven domains are outlined in further detail below.

[INSERT TABLE 2]

It should be noted that there are many intersections between the identified domains of wellbeing and therefore clear distinctions between individual aspects of each domain are not always possible. The project team relied on detailed definitions and descriptions of each domain to ensure that contributions were allocated in a consistent manner. There is potential

for some contributions to be relevant to multiple domains, and this was acknowledged where it occurred whilst avoiding repeating or reporting on the same contribution in multiple domains.

3.1 A resilient local economy

The main themes to emerge from the fieldwork interviews in regard to economic contributions related to two key areas: 1) the revenue and employment created for local communities, especially in rural and regional communities and 2) the interactions between the industry and other important economic sectors in regional communities. Material, relational and subjective indicators were identified around these key themes (Table 3) and were explored and tested through subsequent fieldwork.

[INSERT TABLE 3]

Economic contributions were seen by interview participants to be direct and indirect, with fishers seen as making important economic contributions to a range of other businesses within their communities.

> *Our dollars go a long way ... I would replace one capital item every second year. I've just bought a new trailer, last year I bought a new outboard motor. There's $3000 to $6000 a year of my money and he [the mechanic] gets to service that equipment and my money goes through our local marine dealer here.* ***Fisher (041114_2) Mid-north coast***

The material, or tangible economic contributions of fishers to their communities was therefore highlighted as an important contribution and was subsequently measured through an economic survey of NSW professional fishers and analysis of catch and price data. This was

used to quantify the extent of these material contributions (Voyer et al., 2016). Whether the communities themselves see these economic contributions of the sectors as important was also considered as part of a large scale general public survey, which found that the majority (90%) of respondents felt professional fishing is an important industry for NSW, and 90% believed that the industry provides important employment opportunities in NSW towns. Inclusion of qualitative data in the overall wellbeing analysis allowed for a deeper understanding of some of the reasons which underlie this high level of support. For example, some interviewees highlighted the relative consistency of economic contributions from primary production, contrasting this with the more seasonal and, on occasion, fickle tourism and recreational fishing markets. While many interview participants acknowledged a decline in the economic importance of professional fishing in their communities as the industry shrank over time, there was still a sense that it provided relatively stable and ongoing employment opportunities and multiplier economic benefits that complemented and supported other economic activities in the region, including recreational fishing.

> *Economically I see the fishing industry as a baseline in our community. Whilst it is seasonal, generally year-to-year it's something that's been there for a hundred years providing a steady economic benefit to the town and the region. Other industries fluctuate and any region - whether it's in the city or country - needs baseline economic load for their economy to survive. The fishing industry provides that.*
>
> ***Secretary Chamber of Commerce and non-fishing business owner (050515_2) South Coast***

These intersections between the industry and other sectors were a consistent theme of the interviews. For example, the link between a local fishing industry and tourism was frequently mentioned, with interviewees discussing how visitors to regional areas commonly visit fishing ports to watch fishing boats unload and stroll along fishing wharves. Locally sourced

seafood was also considered a major tourist attraction in coastal communities and having a visible fishing industry was therefore seen as an important factor in encouraging tourism. These results were again borne out in subsequent community and business surveys which assessed the subjective aspects of this contribution – for example, the general public questionnaire indicated that 89% of NSW residents expect to eat local seafood when they visit the coast, 76% feel that eating local seafood is an important part of their coastal holiday experience and 64% indicated they would be interested in watching professional fishers at work while on holidays (Voyer et al., 2016).

The relationship between recreational and professional fishing was also highlighted in many of the interviews conducted throughout the project. Both types of fishing were considered by interviewees to make important economic contributions to local communities and these contributions were often seen as inter-dependent. These intersections were therefore considered an important part of the relational aspects of the overall wellbeing framework and were subsequently explored further through economic and social data collection (as outlined in Table 3). The results of this analysis indicated that NSW professional fishers supply approximately a third of the bait (by value) purchased by NSW recreational fishers and that recreational fishers had overall high levels of support for the industry, in some cases significantly higher than non-fishers. Recreational fishers, for example, were more interested in watching professional fishers at work than non-fishers, were more likely to be interested in knowing the provenance of their seafood and were more likely to purchase seafood from their local seafood co-operative (Voyer, Barclay, McIlgorm, & Mazur, 2017).

3.2 Community health and safety

The contribution of the industry to the food and nutritional needs of local communities was one of the most frequently raised ideas within the fieldwork interviews (discussed by 68% of participants), and was therefore one of the primary indicators explored in this wellbeing domain (Table 4).

> *Well, basically, it's a food resource. In my opinion. We're only collectors. We harvest the community resource for them, and supply it in the best possible condition that we can… As a service for the community. We actually work for the community. They own the resource. We just harvest it for them.*
>
> ***Fisher (071014_2) Mid North Coast***

[INSERT TABLE 4]

These discussions focused on the nutritional benefits of local product, which was perceived as being fresher and of higher quality than other seafood. Material, relational and subjective aspects of this idea were explored by asking how often people bought local or NSW seafood, where they bought that seafood from and about their views or beliefs regarding local seafood (that is, does it matter to them where their seafood comes from). The results of this analysis indicated high levels of interest in purchasing local seafood, however this did not necessarily translate into purchasing behavior, with likely impediments possibly including a lack of awareness of provenance, lack of availability and cost (Voyer et al., 2016).

The qualitative interview data also uncovered additional, unexpected contributions of the NSW wild-catch industry to other areas of community health and safety which were subsequently incorporated into the overall analysis. Benefits for Aboriginal health and

nutrition were identified including health and wellbeing contributions of employment in the industry, nutritional benefits provided to a generally low income group by ready access to cheaper, but culturally significant fish species, and facilitation and growth of community connections through the act of fishing together and sharing the catch amongst the community.

> *When we get an abundance of fish we take so much to the local community and share it with - around and then just drive around the mission and then back into town because there's so many Aboriginal relatives that live in town as well. We just go around to key family members that we know will pass it on to the rest of their families.*
>
> ***Aboriginal professional fisher (061114_7) Hunter Great Lakes***

A contribution to community safety highlighted in the interviews was the role of fishers in search and rescue operations in local waterways. Of the fishers interviewed 62% discussed their first hand experiences of towing in vessels or vehicles that had run into trouble, being involved in rescues of people they had come across by chance or taking part in more coordinated search and rescue operations.

> *I've certainly towed broken down people from outside and on the river. Or (if) they haven't got a radio, I'll just radio in where they are and they (Marine Rescue) will come and get them. Yeah, probably half a dozen in a year would be normal.*
>
> ***Fisher (041114_2) Mid North Coast***

3.3 Education and knowledge generation

The process of learning to be an effective fisher involves little in the way of formal training, and instead relies on many years of informal, practical and 'hands on' learning, often passed on over multiple generations or through mentoring, as well as individual trial and error. This knowledge includes familiarity with techniques and methods as well as building an understanding of fish movements and habits, the influence of weather events on catches and

the best fishing locations. Analysis of this domain demonstrated the importance of including qualitative assessment in the study given the difficulties in quantifying the predominantly informal transfer of knowledge associated with the sector. Its central role in the experience of being a fisher meant that it was considered important to incorporate as an indicator, measured using qualitative techniques (Table 5).

> *It's either passed on by your dad or you've got to try and learn it. That's very frustrating when you think there's nothing in this State to educate a professional fisherman on how to be a fisherman. You can't learn to tie a knot. You can't learn to catch nothing. But if I want to be a recreational fisherman, I can do a Tech course on how to go and tie lures.*
>
> ***Fisher (020615_1c) Central Coast-Hawkesbury***

[INSERT TABLE 5]

For Aboriginal fishers there were additional, and highly valued, cultural elements to this training process which involves passing on customary knowledge and cultural practices. This transfer of cultural knowledge is an important aspect of subjective wellbeing in Aboriginal communities that is also difficult to quantify.

> *But it's part of our wellbeing, as well… I suppose it's like a lot of people meditate. To us, it's, I suppose, to some degree, our meditation. Getting out there with nature. Looking and seeing and observing, taking it in and learning. And it's about, you know, not just individuals, it's about the family. You come back with fish or what have you. Your family have got fish, and your extended family, they come around and you share it out.*
>
> ***Indigenous fisher (170215_1) Far North Coast***

Our interviews uncovered a range of ways in which researchers and managers in state, federal and local governments, universities and businesses are currently benefiting from data and knowledge provided by the NSW professional fishing industry. Approximately a third of the

fishers we interviewed indicated they were currently or had been previously involved in formal research programs undertaken by government departments or university researchers.

> *I do a fair bit of work with Southern Cross Uni. Help them with water quality monitoring and all that sort of stuff. Sometimes every day for six months…Just (as) a volunteer. I got a bushman's pocket knife last time. A year and half I done. Every day. (laughs)*
>
> ***Fisher (180515_1e) Far North Coast***

Another commonly discussed contribution of the NSW wild-catch industry to local communities related to public education or public relations activities undertaken by individual fishers in their daily activities (46% of fieldwork interviewees, including 56% of fishers interviewed during fieldwork). This occurred through regular interactions with customers, fellow users of the waterways, 'spectators' of fishing operations and recreational fishers, but also in some cases included visits to schools and universities to talk about their practices with children and students, or participation in open days or other educational events.

3.4 A healthy environment

Although a healthy environment can be assessed in ecological terms, it also has a bearing on the social and economic aspects of wellbeing and these were considered in the development of a range of indicators against this wellbeing domain (Table 6). In particular we considered how professional fishing contributes to a healthy environment that has benefits for social and economic aspects of community wellbeing.

[INSERT TABLE 6]

Our fieldwork interviews revealed that those directly engaged in the industry have a high level of confidence in the sustainability of their industry and their practices in contemporary times (many said that in the past unsustainable practices were more prevalent). Many of the interviews we conducted during fieldwork made mention of a range of voluntary measures undertaken within the industry to improve local environmental health. Interviewees noted the involvement of professional fishers in monitoring environmental conditions (38% of fishers interviewed), experimenting with gear modifications to improve bycatch and maximize productivity and quality (31% of fishers interviewed) or active engagement in stewardship activities, such as collection of litter, wildlife rescue or participation in environmental campaigns (48% of fishers interviewed).

Whether this confidence is shared by the wider community was also tested as a subjective measure. For example, 67% of the NSW public surveyed in the community questionnaire believed that the industry could be trusted to act in a sustainable manner and only 13% of respondents agreed with the statement: "*The NSW professional fishing industry should not be allowed to continue, because its environmental costs outweigh its social and economic benefits*".

A relational aspect of the industry's contribution to environmental health, which is difficult to quantify, is the accumulated environmental knowledge held by individual fishers and fishing families. Examples we uncovered included one family who had diaries spanning more than 100 years, documenting catches, weather and other environmental conditions for the lake system they fished. The ways in which knowledge such as this is shared with decision

makers, scientists and the wider community is largely ad hoc and occurs in variety of formal and informal ways. The most common formal method by which environmental knowledge is shared is through involvement in research projects and environmental committees.

> *Those anecdotal observations are so important that we've actually got a database. Not just for the professional fishers, but for others. They'll make notes on red spot disease. Or they'll make a comment about 'I've never seen it so cloudy'…. We just capture all of that because that's all part of that learned experience of being a professional fisher.*
>
> ***Council Natural Resources Manager (041214_1a) — Central Coast_Hawkesbury***

3.5 Integrated, culturally diverse, & vibrant communities

A diverse range of indicators were identified to test the extent to which the NSW professional fishing industry contributes to integrated, diverse and vibrant communities. This included examining its contributions to cultural diversity, participation in cultural events and celebrations, as well as its role in building social capital, as detailed in Table 7. This domain is closely related to the additional 'cultural heritage' domain which explored the historical contributions of the industry to local communities.

[INSERT TABLE 7]

There was a great deal of discussion in the fieldwork interviews about the role of seafood in the cultural life of Australians from a diversity of ethnic backgrounds. Seafood was mentioned as being synonymous with key celebrations on the cultural calendar including Christmas, Easter and Lunar New Year. These ideas were confirmed in the social questionnaires, which showed a strong preference for seafood, and high seafood sales, during these periods. For example, 75% of respondents indicating that they consumed seafood the

previous Christmas and 68% of respondents indicated they had consumed seafood the previous Easter.

> *Good Friday is our single busiest day of the year here, and the Christmas, we open for 36 hours straight the day before Christmas. So, that's our busiest trading period, and it's amazing….when I started working here and saw this obsession with prawns at Christmas, it just amazed me because it's like one of the core foods for a lot of people…I guess it's also, maybe, a weather thing. People don't want to sit down and eat a roast, and turkey and ham, but prawns are kind of like the perfect celebration, easy to make, easy to eat food.*
>
> ***Employee Sydney Fish Market (250315_1) Sydney***

The role of the fishing industry in contributing to community diversity included contributions to both cultural and socio-economic diversity. In relation to cultural diversity the contributions highlighted in the interviews were twofold. Firstly, the historical contribution of the industry to migration patterns of the last century was noted (see also Section 3.6). This included reference to Italian, Croatian and Vietnamese fishing families who migrated to NSW, bringing with them new traditions, tastes for seafood and ceremonies such as the 'blessing of the fleet' which are now long established rituals in some fishing ports (Clarke, 2011; Puglisi & Puglisi Inglis, 2008). Secondly, around a quarter of interview participants noted the role of the industry in providing seafood products to a culturally and ethnically diverse consumer base. The importance of seafood for different cultural groups in the community has opened new markets for NSW fishers and increased the popularity of a range of previously low value products.

> *Well, mud crabs used to be worth bugger-all. Bring on the Chinese and Vietnamese and now can almost plot the price relative to the abundance of those cultures in Sydney.*
>
> ***Fisher and co-operative board member (041114_2) Mid north coast***

The contributions of the wild-catch industry extended beyond cultural or ethnic diversity, however, to also include contribution to class or socio-economic diversity. A large number of interview participants discussed the value of the NSW wild-catch fishing industry in providing opportunities for socially disadvantaged groups, particularly men of all ages with low levels of education. Nearly half (46%) of participants noted the prevalence of men in the industry who had not finished school, including a number with learning difficulties that would have otherwise severely limited their employment prospects. Some came from socially disadvantaged backgrounds, and this was especially noted in relation to deckhands with a history of drug or alcohol problems or criminal backgrounds. For others fishing was a career linked strongly with a desire to be engaged in physical, outdoors, largely autonomous work. These men often expressed the opinion that they would find more non-fishing forms of employment difficult or less rewarding.

> *I couldn't get a trade because I only went to Year 10, and to even get an apprenticeship when I left school, they really wanted Year 12..I wasn't good at school. I wasn't bad, but… I like it (fishing). It interests me.* ***Fisher (190914_3) Central Coast –Hawkesbury***

Relational aspects of this contribution were explored through examination of social capital using a range of qualitative and quantitative data sources. This included analysis of formal relationships through committees, contributions to community life through donations and involvement in community events. For example, a commonly discussed form of social capital came in the form of sponsorship and donations to community groups and individuals, sometimes through cash donations from co-operatives but more commonly through in-kind support including seafood trays or vouchers for raffles and donation of ice to sporting groups and community events.

> *We provide ice, and we give them vouchers for their raffles and their fetes. We provide prawn trays and…I think we donate about $8,000 to the marine rescue, and that's in the form of forgiven rent for their moorings, and we give them fuel from time to time…We sponsor the lifesaver jet boat by keeping it fueled up, and that, I think, runs at about $1500 to $2000 a year.*
>
> ***Co-operative manager (180215_2a) Far north coast***

More informal relationships were also explored, including industry concerns related to poor public perceptions of the industry, sometimes referred to as 'social license to operate' (Demuijnck, 2016). Concerns around social license were especially relevant to relationships with recreational fishers in the community. Some fishers had personally experienced abuse, vandalism or negative comments from members of the public who perceived their activities as destructive and wasteful.

> *You cop heaps…They just think we rape and pillage the local waterways, when our areas are proven sustainable.*
>
> ***Fisher (190914_3) Central Coast***

Despite these concerns around social license, 72% of respondents to the general public questionnaire supported the continuation of the industry. This points to the complexity of social relationships that exist within local communities. In particular the support for the industry was seen to be highly contingent on the environmental sustainability of its practices, a finding supported by other similar research in this area (Mazur, Curtis, & Bodsworth, 2014).

3.6 Cultural heritage and community identity

The role of the fishing industry in contributing to a shared sense of community identity and contributions to the cultural heritage of local communities was an important theme of the

interviews, and was explored through quantitative and qualitative data against a number of indicators as outlined in Table 8.

[INSERT TABLE 8]

Material contributions to community identity come largely in the form of historical artefacts linked with the development and growth of the area. Today the identity of many coastal villages up and down the NSW coast is in part defined by fishing ports, with jetties, wharves and rows of fishing boats, located in visible places in the heart of the settlements. Fishing ports are regularly visited by residents and visitors and are the focal point for celebrations and events. In many towns we visited, evidence of the prominent role that many long-term fishing families have played in coastal communities was demonstrated by coastal suburbs, streets and sporting ovals being named after them. The subjective importance of this contribution was explored through the community questionnaire, which indicated that 67% of respondents were concerned about a loss of character or identity which might result from further reductions in professional fishing.

Analysis of data related to indicators associated with Aboriginal cultural heritage revealed the crucial role professional fishing has played in supporting Aboriginal communities along the NSW coast, not only as a source of employment and income for Aboriginal fishers but also as a means of survival. As colonial control over Aboriginal people in NSW increased it was not uncommon for the Government to provide boats and fishing gear to Aboriginal communities and individuals to encourage both active participation in the NSW economy and so that

seafood could supplement government issued food rations (Egloff, 1981; Feary & Donaldson, 2015; Goodall, 1996; Goodall & Cadzow, 2009; NSW Office of Environment and Heritage, 2012). Fishing therefore played a critical role in the survival of many Aboriginal families and communities on the coast of NSW and is inextricably linked to many personal histories as well as the histories of many Aboriginal settlements. As detailed previously, professional fishing has also played a role in sustaining intangible cultural heritage by providing opportunities to share catches and pass on important cultural knowledge, as families work together in beach hauling operations.

3.7 Leisure and recreation

The NSW professional fishing industry contributes to community leisure and recreation in a variety of ways including through public infrastructure such as wharves and jetties, which are popular locations for people to walk along, looking at the boats. Recreational fishers use these jetties and wharves as safe, accessible fishing platforms and recreational boaters use moorings, fuel pumps and slipways managed and maintained by the professional industry to moor and service their vessels (Table 9).

[INSERT TABLE 9]

The general public questionnaire included responses from recreational fishers, who made up 35% of the sample. In particular it revealed strong preferences for locally sourced bait, with 78% of recreational fishers agreeing or strongly agreeing that they preferred local bait, even

if it is more expensive. Their subjective reasons for these preferences included a desire to support the local industry and a belief that local bait assisted in catches.

4. Discussion

The framework presented here takes the task of doing integrated mixed method social and economic evaluations of the contributions of industry out of the ‘too hard’ basket. Evaluating the contributions of the NSW professional fishing industry using a wellbeing approach enabled the identification of a range of complex and intersecting contributions to wellbeing that would be difficult to identify using only economic valuation, or economic with social quantitative survey methods alone. Using an interdisciplinary approach, but working to a common agreed framework, allowed disciplinary and methodological divides to be bridged. In particular the wellbeing framework allowed for, and valued equally, positivist, empirical scientific, economic and social approaches with qualitative assessments of the subjective aspects of fisheries contribution to wellbeing. Significantly, the incorporation of qualitative data allowed for a richer appreciation of the suite of contributions that the sector makes to coastal communities, which are valued by local communities but are not necessarily easily quantified or measured.

Use of qualitative data to establish the initial building blocks for the framework was a crucial aspect of the development of the overall approach, a strategy supported by leading proponents of the social wellbeing approach (McGregor et al., 2015). Using qualitative interviews with a range of stakeholders to guide the development of indicators meant that the final framework was readily understood and accepted by the ‘end users’ of the research,

including policy makers, industry representatives and local community members. They were able to relate to the identified 'contributions to wellbeing' and the associated indicators because they had, in part, helped to define them.

The wellbeing framework employed in this study also addressed another key barrier to integrated triple bottom line assessments – the paucity of social data. The wellbeing framework developed through this project provided clear and direct guidance as to the most effective strategy for gathering additional social data. The qualitative data, in effect, provided a series of ideas and themes that could be tested and explored in greater depth through the quantitative analysis. Further work in this area could expand on this approach and incorporate additional social and economic assessment methodologies.

This process demonstrates how researchers and resource managers in other locations could develop frameworks and indicators to enable integrated evaluations of the social and economic benefits from fishing or other primary production industries. The framework developed takes an internationally accepted theoretical approach - social wellbeing – and adapts it to a specific research question that is being asked of fisheries around the world – what is the value of fishing, especially small scale fishing, and what do these fisheries contribute to society? We used this framework as the foundation for a detailed assessment of the contributions of industry to community wellbeing which incorporated, but was not limited to, an economic evaluation. The framework has subsequently been successfully trialed in an additional assessment of the contributions of the aquaculture industry in NSW (K. Barclay et al., 2016) and is currently being used as the basis for the development of a consistent

methodological approach to contribution studies for the seafood sector in Australia, and recreational fishing.

One reason the wellbeing approach is useful is that it allows for a broad conception of 'value' to communities. The framework enables consideration of both social and economic relationships across industries, and also provides scope for incorporation of ecological or biological data. In identifying and, in some cases, measuring benefits flowing from fishing it enables decision makers and communities to focus on building and supporting contributions the community values, rather than measuring importance by economic values only. There is considerable potential for this approach to be incorporated into valuation strategies across a range of sectors and geographical areas. In particular, the increasing focus on the expansion and growth of a Blue Economy around the world is likely to bring increased interest in understanding the contributions of different sectors and how they can be managed in order to maximize community benefits, whilst reducing environmental impacts (The Economist, 2015; WWF Baltic Ecoregion Programme, 2015). Detailed assessments of contributions of various marine industries contributing to a potential Blue Economy have been undertaken in many countries and regions around the world but, as yet, these studies have not extended to consideration of social contributions (e.g. see Australian Institute of Marine Science, 2014; Ebarvia, 2016; McIlgorm, 2016). The detailed, inter-disciplinary analysis made possible through the wellbeing framework would allow decision makers to identify and focus on the range of social and economic benefits most likely to be positively or negatively impacted by management approaches. Moreover, the framework provides a structure by which these contributions can be monitored over time. Application of this model in other areas or sectors

would require initial validation of the relevance of the identified domains of wellbeing to the context being studied, making reference to the suggested approaches to assessing wellbeing outlined in McGregor et al. (2015).

Finally, the wellbeing approach brings the interests and views of different sections of the community to light, including marginalized stakeholder groups, and therefore provides a mechanism through which equity considerations can be foregrounded. This a particular strength of incorporating relational aspects of wellbeing into the framework, as demonstrated by the insights provided into relationships between Aboriginal communities and the professional fishing industry in NSW. This aspect of the wellbeing approach recognizes the intersections and interdependencies that exist across different sectors, across communities and across human and non-human groups of actors. In the NSW example, the consideration of the 'relational' dimensions of wellbeing allowed for a more nuanced picture of the role of the industry in local economies. The social and economic interactions of the industry with other important sectors in coastal communities, particularly tourism and recreational fishing, was significant especially given these industries are often considered to be in conflict. The consideration of relational measures of wellbeing, necessarily forces an examination of areas of mutual interest, and provides a framework by which commonalities can be explored and developed (Voyer et al., 2017). This provides a basis on which successful conflict transformation or resolution can be built (Stepanova, 2015; Stepanova & Bruckmeier, 2013).

5. Conclusion

Integrated, triple bottom line assessments of fisheries are a fundamental requirement of ecosystem based fisheries management. However there are a number of potential barriers to adequately integrating social factors into existing models of assessment. Using a social wellbeing approach as a lens through which to develop new ways to assess and manage fisheries allows these barriers to be addressed. The framework allows for consideration of both objective and subjective measures of wellbeing, effectively providing a bridge between seemingly incongruent disciplinary approaches. It also provides a useful guide to direct and focus social data collection, in order to address a second major barrier relating to a lack of information on the social aspects of fisheries. Finally, it allows for meaningful analysis and comparison of both qualitative and quantitative data in an integrated manner, with both forms of data informing and complementing the other to provide an overall picture of influences on wellbeing. As it becomes more recognized by governments around the world that wellbeing is the appropriate goal for building a sustainable future, there is an increasing need to understand the multi-dimensional nature of wellbeing, and how it is influenced by patterns of resource use. This framework has significant potential to improve and inform fisheries management regimes around the world. Systematic and detailed examination of the way a resource sector benefits community wellbeing allows for a better understanding of the potential impacts of future changes to use patterns associated with resource management, environmental change or shifting economic conditions. The wellbeing approach allows for a broader understanding of the benefits provided by a sector by looking beyond purely economic measures to consider these contributions in context with a range of other factors. In

particular inclusion of relational measures of wellbeing help to reframe resource conflict debates towards an examination of areas of mutual benefit and shared objectives.

6. Acknowledgements

The Project team would like to acknowledge the assistance and advice of the project steering committee and NSW DPI and Sydney Fish Market for allowing access to catch and price data. Thanks also to the many people that gave up their time to be interviewed, participate in workshops, complete questionnaires and provide feedback on the project findings.

7. Funding source

This work was supported by the Australian Government Fisheries Research and Development Corporation [FRDC2014/301].

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Tables

Table 1. Interview participants by relationship to Industry

Fishing Industry	**Interviewees**	**Other**	**Interviewees**
Licensed fisher	71	Local government (including councilors and mayors)	15
Fisher and fish merchant	9	Service Industry	8
Aboriginal fisher	5	Retail outlet/ restaurant/take away	7
Partner/wife	7	Industry representative body	5
Co-operative staff, managers or board	18	Community/Recreational fisher	6
		Wholesaler/processor	5
		Government (state)	3
		Tourism	3
		Other	2
Total	***110***	***Total***	***54***
Grand Total			**164**

Table 2. Dimensions of community wellbeing identified through literature review

Domains of wellbeing (from a review of Quality of Life/Standard of Living literature)	**Description**
A resilient local economy	Economic or financial wellbeing, including employment, income, housing as well as quality and stability of employment.
Community health and safety	Physical and mental health, including life expectancy and availability of safe and healthy food and water.
Education and knowledge generation	The capability to build one's skill set and knowledge, including access to and involvement in learning opportunities (formal and informal).
A healthy environment	Physical, social and mental health benefits associated with the natural environment, including ecosystem services.
Integrated, culturally diverse and vibrant communities	Opportunities for cultural expression and engagement in community life regardless of ethnic, cultural or socio-economic background. Feelings of connection within social or geographical groups (bonding social capital), across different groups (bridging social capital) and with decision makers (linking social capital).
Cultural heritage and community identity	Connections with heritage and tradition. A shared sense of community identity.
Leisure and recreation	Work-life balance, including opportunities for fun, play and participation in the arts and cultural events.

Table 3. Contributions of the NSW wild catch fishing industry to a resilient local economy

Domain of community wellbeing	Contributions of the NSW wild-catch fishing industry		Indicators	Methods and tools for of data collection & analysis
A resilient local economy	Material	Primary economic impact through direct revenue and business profitability	Gross Value Added (GVA) is preferred to Gross Value of Production (GVP)	• Analysis of catch and price data • Economic questionnaire • Regional Input/output analysis • Qualitative interviews
			Business profitability and employment	
		Secondary economic impacts (or multipliers)	Regional inputs (multipliers), including value added, household income and employment	
			Investments	
	Relational	Interactions between the professional fishing industry and the post-harvest sector	Value of the secondary (post-harvest) sector	• Catch and price data – DPI SFM • Qualitative interviews • Social questionnaire – fish merchants
			Post-harvest supply chain characteristics	
			Importance of the NSW wild-catch industry to the secondary (post-harvest) sector	
		Interactions between the professional fishing industry and the tourism sector	Professional fishing tourism products	• Qualitative interviews • Social questionnaire – general public
			Importance of the NSW wild-catch industry to the NSW tourism sector	• Social questionnaire – tourism and hospitality businesses
		Interactions between the professional fishing industry and the recreational fishing sector	Comparing the value of the NSW recreational and professional fishing sectors	• Social questionnaire – general public • Qualitative interviews
			Value of NSW wild-caught bait market	• Catch and price data – DPI SFM
	Subjective	Level of community support and understanding of the economic contributions of the fishing sector	Beliefs about economic importance of the industry (including amongst recreational fishers)	• Social questionnaire – general public

Table 4. Contributions of the NSW wild catch fishing industry to community health and safety

Domain of community wellbeing	Contributions of the NSW wild-catch fishing industry		Indicators	Methods and tools for data collection & analysis
Community health and safety	Material	Contributions to food security and the nutritional needs of local communities	Purchasing patterns – local seafood	• Social questionnaires – general public and fish merchants
			Seafood preferences – local seafood	
		Contributions to community safety through involvement in maritime search and rescue operations	Rescues and maritime safety incidences	• Qualitative interviews
	Relational	Channels through which consumers access the products supplied by the NSW industry	Purchasing channels – local seafood	• Social questionnaires – general public and fish merchants
	Subjective	The level of importance the community puts on the provision of local product by a local industry for health and nutrition	Beliefs about importance of producing local seafood for community consumption	• Social questionnaire – general public
		Contributions to Aboriginal mental and physical health and wellbeing needs	Beliefs relating to role of professional fishing in Aboriginal communities	• Qualitative interviews • Literature review

Table 5. Contributions of the NSW wild catch fishing industry to education and knowledge generation

Domain of community wellbeing	Contributions of the NSW wild-catch fishing industry		Indicators	Methods and tools for data collection & analysis
Education and knowledge generation	Material	Formal training and learning opportunities provided by the professional fishing industry	Education and training levels and opportunities for informal learning in learning to be a fisher, including: • Fishing practices • Boat handling • Food handling • Regulatory knowledge • Environmental knowledge • Physical and mental strength/preparedness • Etiquette and 'unwritten laws'	• Social questionnaire – fish merchants • Qualitative interviews
	Relational	Social learning and informal knowledge transfer		
		Contributions to community knowledge, especially environmental knowledge	Community and sector based interest in 'fisher knowledge', including: • Researchers/managers • Aboriginal communities • Recreational fishers and the general public	• Qualitative interviews
	Subjective	Levels of trust and respect for the knowledge and skills of the fishing industry (social license)		

Table 6. Contributions of the NSW wild catch fishing industry to a healthy environment

Domain of community wellbeing	Contributions of the NSW wild-catch fishing industry		Indicators	Methods and tools for data collection and analysis
A healthy environment	Material	Practicing sustainable and environmentally friendly fishing	Sustainability assessment of the fishing industry	• Literature review • Qualitative interviews
		Involvement of the industry in stewardships activities	Involvement in environmental stewardship activities	• Qualitative interviews
	Relational	The role of the NSW fishing industry in wider environmental management networks	Involvement in environmental management programs and committees	• Qualitative interviews • Social questionnaire – fish merchants
	Subjective	The level of trust in the fishing industry to act in a sustainable manner	Community trust in industry/social license	• Social questionnaire – general public

Table 7. Contributions of the NSW wild catch fishing industry to integrated, culturally diverse & vibrant communities

Domain of community wellbeing	Contributions of the NSW wild-catch fishing industry		Indicators	Methods and tools for data collection and analysis
Integrated, culturally diverse and vibrant communities	Material	Contributions of the NSW wild-catch industry to the needs of a diverse community	Cultural significance of NSW seafood products	• Qualitative interviews • Social questionnaire – fish merchants
			Role of the fishing industry in providing opportunities for different socio-economic and cultural groups	
		Involvement in citizenship activities and community events	Contributions to cultural events	
			Sponsorship and donations	
	Relational	Role of the NSW Industry in building and maintaining social networks (formal and informal) in local communities (social capital)	Contributions to social capital – bridging, bonding and linking	• Qualitative interviews • Social questionnaire – fish merchants
	Subjective	Community awareness and beliefs in relation to the importance of the services provided by the fishing industry for community life	Importance of the role of the industry in community life	• Qualitative interviews • Social questionnaire – general public
			Importance of seafood for community celebrations	

Table 8. Contributions of the NSW wild catch fishing industry to cultural heritage and community identity

Domains of community wellbeing	Contributions of the NSW wild-catch fishing industry		Indicators	Methods and tools for data collection and analysis
Cultural heritage and community identity	Material	Contributions to the history of NSW coastal towns/regions	Historical role of the industry in regional growth and formation	• Literature review • Qualitative interviews
			Contributions to cultural heritage (e.g. infrastructure or artefacts)	
	Relational	Contributions to cultural and community identity	Historical migration patterns associated with fishing	• Literature review • Qualitative interviews
			Historical role of fishing in Aboriginal communities	
			Community identification with fishing heritage and notion of 'fishing villages'	
	Subjective	Importance to the community of the contributions of the industry to a shared sense of community identity and to local cultural heritage	Levels of concern over loss of identity associated with decline in industry significance	• Social questionnaire – general public

Table 9. Contributions of the NSW wild catch fishing industry to leisure and recreation

Domains of community wellbeing	Contributions of the NSW wild-catch fishing industry		Indicators	Methods and tools for data collection and analysis
Leisure and recreation	Material	Contributions of the fishing industry to community recreation	Contributions of infrastructure for recreational users	• Qualitative interviews • Social questionnaire – fish merchants
			Contributions of bait for recreational fishing.	• Qualitative interviews • Social questionnaire – general public and fish merchants
	Relational	Social connections and interactions between the wild-catch industry and recreational users	Contributions of fishing knowledge to recreational boaters and fishers.	• Qualitative interviews
	Subjective	The level of importance recreational users put in the provision of local services and infrastructure by the fishing industry	Importance of local bait to recreational users	• Social questionnaire – general public