

Critical reflections from fostering adaptive community-based, co-management in Solomon Islands' small-scale fisheries

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Abstract

Adaptive co-management approaches have been at the core of attempts to apply resilience principles to small-scale fisheries. Although recommendations of what should be done to promote resilience are commonplace, insights from practice are rare. The authors provide a critical analysis of WorldFish's effort to improve the resilience of small-scale fisheries, particularly experiences with facilitating, implementing and sustaining a collaborative form of management referred to as community-based resource management (CBRM) in five regions in Solomon Islands over nine years. A participatory diagnosis and adaptive management framework was applied to foster the emergence of CBRM in intense community engagements. The authors reflect on the adoption of resilience principles in their practice through: 1) defining a fishery to fit local governance contexts; 2) drawing on multiple knowledge sources to guide local rules to protect the ecological, social and other functions of small-scale fisheries; 3) fostering local ownership and participation, while also brokering external links for learning; 4) developing monitoring that is meaningful for communities; and 5) promoting inclusive forms of governance that are responsive to change. Results were fair at best because adaptive new, negotiated forms of management were sustained in only two regions. However, insights led to changes in WorldFish's practice, and demonstrate that embedding resilience principles (such as encouraging learning, fostering adaptive systems, and thinking and promoting links across scales of governance) requires capacity among all participants to reflect, adapt and adjust.

Introduction

Fishers engaged in small-scale fisheries (SSFs) are vulnerable to the compounding effects of stresses within fishery systems (e.g. stock depletion, increased competition) as well as environmental and social shocks emanating from outside their domain (e.g. climatic variation, global trade, price fluctuations). This complexity is challenging for managers to ensure SSF can maintain the delivery of benefits to those reliant on them. To continue functioning as a livelihood "safety net" for the rural poor, SSFs must better absorb shocks, and adapt to change. However, resilience theory is difficult to translate into practical guidance for managers attempting to sustain and improve small-scale fisheries (Béné et al. 2014).

Decentralised adaptive co-management has long been promoted as consistent with principles of resilience (Berkes et al. 2001; Biggs et al. 2015), and it is

increasingly common in practice as a strategy to preserve social and economic benefits from SSFs (Cinner et al. 2012; Evans et al. 2011). Adaptive co-management seeks to promote management that is responsive and specific to local conditions. It often devolves some governance responsibility to resource users, and ultimately seeks to share governing responsibilities between resource users and other (often state) stakeholders. A global review of cases of adaptive co-management suggests that outcomes are generally more positive than negative. Positive outcomes reported included improved inclusion and representation in governance processes, increased capacity to control or influence decisions, higher rates of compliance with management rules, and quantitative increases in household income, well-being, resource status and fishery yield (Evans et al. 2011). However, it is also important to recognise that it is the successful projects that are more likely to be evaluated and reported in the literature, whereas projects that fail or are discontinued are rarely documented (Evans et

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al. 2011). In the Pacific, there are enthusiastic reports of adaptive co-management (e.g. Bartlett et al. 2009; Govan et al. 2011; Jupiter et al. 2014), but critical reflections about approaches applied, and the logic behind them, are much more difficult to come by.

To overcome this gap, we offer a critical account of our experience in facilitating a form of adaptive co-management, commonly referred to as community-based resource management (CBRM) (WorldFish 2013), a model particularly common throughout the Pacific Islands region (Govan 2009). In this paper we describe implementation of CBRM for SSF in five coastal regions of Solomon Islands over nine years. A participatory diagnosis and adaptive management (PDAM) framework designed for developing world contexts (Andrew et al. 2007; Evans and Andrew 2009) was used to order the different phases of implementation. The framework emphasises the need for particular attention to factors arising from outside the fishery domain that may influence management performance and the livelihoods of fishery stakeholders; and the local, cultural and national institutions (i.e. established sets of rules) that govern fisheries. The framework identifies distinct opportunities for learning, reflection and adjustment in three main stages of implementation: 1) participatory diagnosis, 2) defining the management constituency, and 3) implementation of management and monitoring.

The research questions addressed were how, and in what ways, does the use of participatory approaches, structured by the PDAM framework, foster the emergence of CBRM? The research was addressed

through a comprehensive objective of promoting the emergence of CBRM. To align with resilience principles, we organised this into five specific objectives: 1) define the fishery, management constituency and management solutions to “fit” the local governance context; 2) draw on multiple knowledge sources to guide locally designed rules that would protect the ecological and social function of the small-scale fishery; 3) foster local ownership and participation while simultaneously presenting ourselves as a broker to external knowledge, expertise, resources and links to higher-level governing support; 4) foster monitoring that was meaningful to communities, and that promoted reflection and informed adjustments to management; and 5) promote governance structures that were inclusive and responsive to change. The paper is structured around each of these objectives, and concludes by setting findings within the literature on adaptive co-management, and discussing the practical implications for governing SSF for resilience in Solomon Islands.

Background to the study region

In Solomon Islands more than 70% of people rely heavily on subsistence fishing, yet a shortfall of fish looms as a long-term threat (Bell et al. 2009). Historically, governments have had little influence over rural fisheries (Lane 2006), and this gap has been filled by non-governmental organisations (NGOs) that promote and directly support various forms of adaptive co-management (Cohen et al. 2012). However, substantial regional policy, described within and built on by SPC (2014), and national policy (the Coral Triangle National Plan of Action, the Fisheries

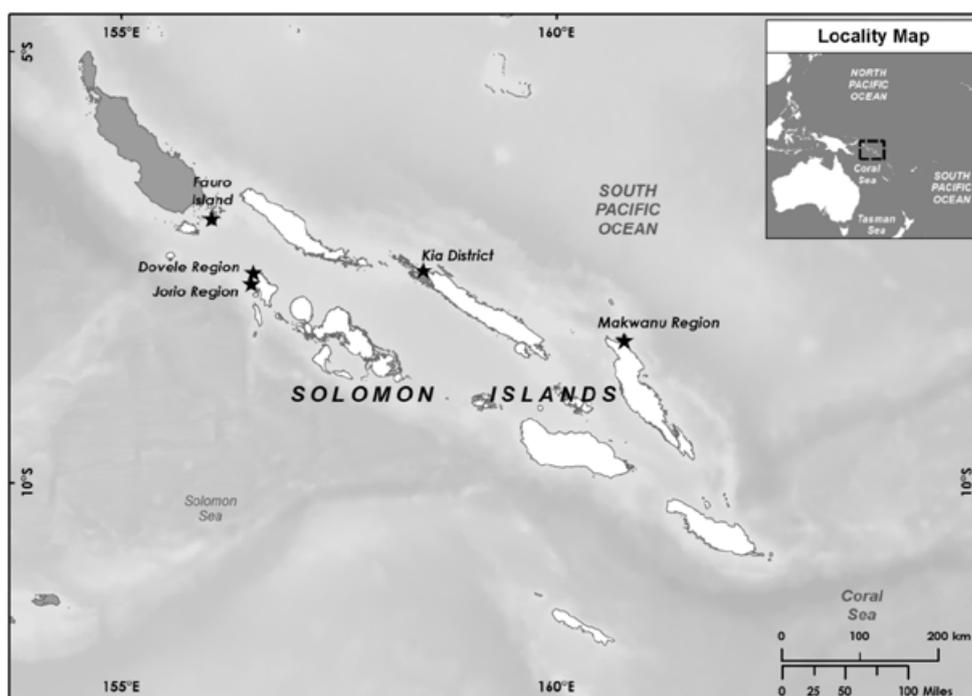


Figure 1. Five regions within Solomon Islands where the project was implemented.

Table 1. Details of the regions with which the authors engaged to support adaptive co-management.

Region	Province	No. of villages	No. of households (approx.)
Kia	Isabel	14	280
Jorio	Western	5	350
Dovele	Western	3	240
Fauro Island	Western	1	300
Makwanu	Malaita	5	80

Management Act 2015, the Ministry of Fisheries and Marine Resources Strategy 2017) in the last decade, now support community-based approaches as a principle strategy for SSF management, marine conservation and climate change. In an effort to synthesise lessons to inform policy and practice, this article reflects on applied practice and outcomes in five areas in Solomon Islands (Fig. 1) where WorldFish was involved in facilitating CBRM.

Each region comprised multiple villages of between 80 and 350 households (Table 1) that were close together and had historical social alliances. In common with other coastal Solomon Islands communities, all communities rely heavily on coastal fisheries and agriculture, within a predominantly subsistence economy (Clarke 2007; GSI 2011). Each region has limited livelihood alternatives, in part, owing to poor access to provincial and national markets. All retain customary land and marine tenure, and leadership roles are played by both traditional and church leaders.

Methods

From an office based in Solomon Islands, WorldFish implements a project-funded programme of collaborative SSF management with communities that have requested assistance, either directly through their provincial government or through one of the responsible ministries: the Ministry of Fisheries and Marine Resources (MFMR) or the Ministry for Environment, Climate Change, Disaster Management and Meteorology (MECDM). In 2005, work began to establish SSF management within Kia District, and in 2006, in one community in the Jorio region (Fig. 2). Engagement in the three additional regions started in 2008 (Fig. 2 and Table 1).

Here, all cases where WorldFish had worked between 2005 and 2008 are examined to benefit from the in-depth knowledge created over a nine-year involvement.

This study is descriptive, reflecting the direct, long-term engagement of the authors, and draws on two main sources of data. The first is published work

(e.g. Abernethy et al. 2014; Cohen and Alexander 2014; Cohen and Steenberger 2015; Cohen et al. 2013; Schwartz et al. 2011), which employed methods such as semi-structured interviews, key informant interviews and focus group discussions (FGDs) described in detail in the articles from which results are cited. The second source draws extensively on project documentation from 2005 to 2014 as primary qualitative data. These project documents include field reports containing transcripts of FGDs, notes from participant observations, meeting minutes, key informant interviews, and informal interviews collected from different social groups (i.e. gender, age, livelihood type).

Results and discussion

Participatory diagnosis

Subsequent to receiving and responding to community requests for assistance, a “scoping” phase commenced (Orirana et al. 2016; WorldFish 2013). This provided an opportunity to determine if there was broad consensus among the community to proceed with CBRM and to develop a mutual understanding between community leaders and WorldFish about the nature of the collaboration, and the roles and responsibilities of each party. Once this initial agreement had been reached, the “diagnosis” phase commenced (Fig. 2)

The diagnosis phase is important in order to understand the fishery from ecological, social and political perspectives (Lebel et al. 2006; Nadasdy 2007). Diagnosis involved facilitating community discussion on a definition (Ostrom 2007, 2009) of their fishery, with a particular emphasis on eliciting perspectives of men, women and youth. FGDs and key informant interviews were used to draw out further local knowledge of ecological, social and governance aspects of the fishery. Interviews with fishers were used to understand catch composition, average catch size, perceptions of harvesting trends, and to collate local ecological knowledge (e.g. fish spawning periodicity and locations) with the intent that this knowledge would improve “fit” in the design of management measures. FGDs and

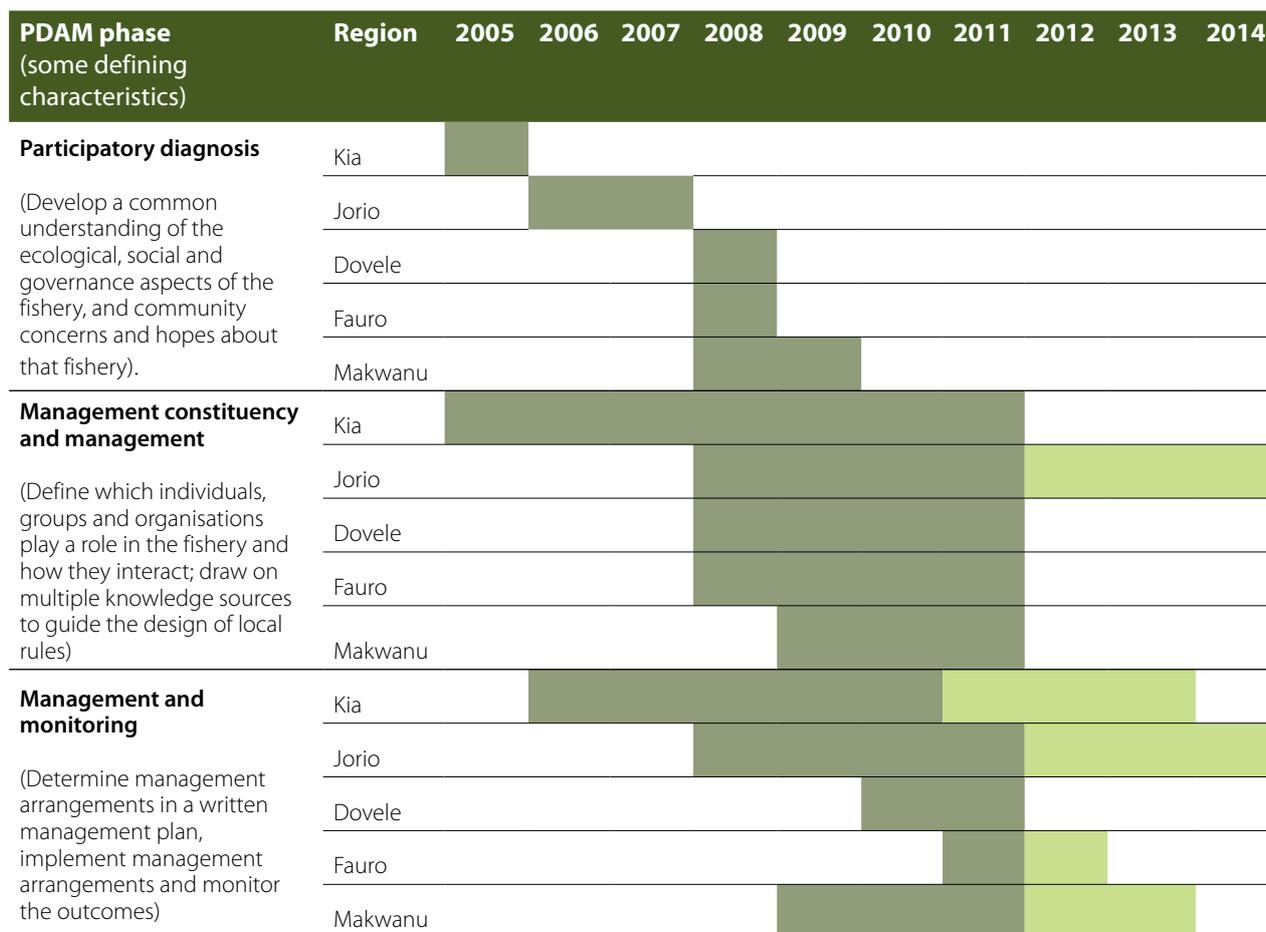


Figure 2. Timeline of implementation of the three major phases of the participatory diagnosis and adaptive management framework through periods of direct and regular engagement (dark green) and lower level engagement (light green) including through the partners of the Solomon Islands Locally Managed Marine Area Network.

interviews underwent preliminary analysis and were then presented back to communities in a public meeting. Detailed discussions regarding customary tenure rights and boundaries were conducted with committee members and community leaders; the objective of this was to determine physical and social boundaries appropriate for management. Household surveys were also conducted as part of the diagnosis phase.

Outcomes of the diagnosis phase

The diagnosis phase uncovered a range of issues in defining a fishery. In Kia, beche-de-mer was (and had been for decades) an important source of income in an otherwise largely subsistence economy; the project was designed initially to tackle the management of this fishery. The initial fishery definition, documented in the preamble to the community management plan, reflected this focus:

The sea cucumber fishery in Kia community is based on the sea cucumber resource and the people of Kia community who harvest it. The Kia community and the marine resources it controls extends ... [geographic details confidential] ... This community is unified under a House of Chiefs which is responsible for its wellbeing and for managing the fishery.

Within six months of the diagnosis in Kia, a national export ban on beche-de-mer was imposed and the fishery ceased to exist.⁵ In response, the community sought to broaden the focus of management, and, therefore, revise their fishery definition to include fish and invertebrates, which are important for food and income. Whereas the focal taxa changed, the identity of the broader fishery in terms of habitats, resource users and governance institutions did not.

⁵ The ban was lifted temporarily following an April 2007 earthquake and tsunami, but was re-instated one year later. In recent years Solomon Islands has alternated between bans and an open fishery.

Experience in Kia illustrated the tradeoffs between diagnosing and defining a fishery for local legitimacy and management achievability (i.e. in this case the sea cucumber fishery) on the one hand, with a definition that accounted for “externalities”, or factors operating outside the local level (e.g. a national export ban on the fishery of interest) on the other. The PDAM framework suggests that *ideally*, management should account and prepare for these externalities (Andrew et al. 2007), but it was found that at the local level, at the time of management design, they can appear to be fairly intangible and unforeseeable. In the other regions, fisheries were defined in terms of all the marine resources that communities recognised as important, but management tended to concentrate on taxa or habitats most commonly harvested. For example, in Makwanu 23 fish and 6 invertebrate taxa were named as part of the fishery, but subsequent management focused on rabbitfish (Siganidae) in particular, and finfish in general, because of their importance for food and income.

Across the regions, concerns about declines in size and abundance of resources were ubiquitous, and informal and formal interviews showed perceptions of causes, such as local increases in human population, habitat destruction, improved gear efficiency, lack of respect for community rules, lack of alternative livelihood opportunities, and/or an increasing demand for financial resources. These causes were taken into account in the advice that was provided to communities. As a result, management responses were designed, as much as was feasible, to address particular threats and their causes.

The participatory diagnosis phase, as originally conceived and executed, required a significant investment of time and resources, both from the facilitators and the community. As the number of communities that facilitators worked in grew, it was clear that data collection via household surveys was relatively expensive, time consuming, and unsustainable. Surveys were valuable for academic research purposes (e.g. Schwarz et al. 2011) but had little value in directly informing more immediate management design and adaptation, and were a poor tool for encouraging community “buy-in” and participation. In engagements subsequent to the five cases reported here, initial information gathering was streamlined to a series of FGDs (Orirana et al. 2016; WorldFish 2013).

Management constituency

The “management constituency” describes participants in the fishery and their interactions, and governance structures that influence management (Evans and Andrew 2009). In rural Solomon Islands, constitutionally recognised customary

marine tenure and local governance structures are, arguably, more influential on SSF resource use patterns than national laws and regulations (Lane 2006). Nonetheless, at certain times, or for exported commodities (e.g. beche-de-mer), national government controls can become highly influential (Cohen et al. 2013). In the study regions, management constituencies were defined by both men and women as a combination of all or some of the following: all community members and resource owners, elected chiefs, clan chiefs, community leaders, elders and fishers. External entities (e.g. government or NGOs) were rarely included. The highest, locally relevant authority identified by communities was the district-level House of Chiefs, where, in Kia for example, infringements of community or customary rules are adjudicated and appropriate penalties imposed. In addition, offenders are publicly named in church as an active form of punishment and deterrent.

Strengths and weaknesses of the management constituency

Common themes that emerged were capacity for enforcement of adaptive co-management, and matching national government rules to the local diagnosis of the fishery. People’s views on community-level capacity for enforcement varied markedly. Although respondents in all regions acknowledged that traditional enforcement mechanisms existed, in practice, compliance and enforcement were perceived as low. For example, one tribal chief reflected:

Before, people have a lot of respect for the chief and if he gives instruction, people will obey and follow him because they value his leadership. Now when I ask people to do something, they will not follow.... People nowadays have lost their kastom (custom) and their respect.

Nonetheless, chiefs and spokespersons for reef-owning clans were recognised as having management responsibilities and, prior to engagement with WorldFish, they had to varying degrees asserted this authority in the implementation of customary measures (i.e. reef or mangrove closures) in four of the five regions.

In common with the findings of Sulu et al. (2015) in Malaita, Solomon Islands, there were low levels of awareness about national regulations. When we discussed rules enshrined in national legislation (e.g. bans on natural poisons or dynamite for resource harvesting), they were recognised as being important, but enforcement was identified as being problematical. As a consequence, people expressed doubts that new management measures that might be implemented via adaptive co-management

could be enforced effectively. While there was a desire to implement controls, respondents felt that local management would need support from government; a sentiment identified for community development in general by rural Solomon Islanders (Dinnen and Allen 2015).

Villagers were confident that local environmental knowledge could help to craft management solutions to fit the issues identified in diagnosis. For example, in Fauro, most fishers (men and women) felt they had a good understanding of the marine environment, and felt their knowledge was sufficient for them to manage it. Similarly, in Dovele a majority of fishers agreed on the threats to the environment and what should be done to mitigate them, including closing reefs, improving community and fisher unity, targeting deep-water fisheries, having leader and fisher discussions and seeking advice and assistance from outside institutions. When asked how other individuals or organisations could support them working toward a better future, fishers from Dovele, Fauro and Makwanu most commonly suggested externally sourced scientific information and support from an external agency to work directly within the community to support management implementation. In addition, respondents felt there was a need for the provision of equipment, new fishing techniques and better enforcement. Despite having confidence in their local knowledge, many resource users stated they were not involved in decisions about resource management. Women in particular were poorly represented. This persistent reality (e.g. Vunisea 2008) is being addressed through multiple strategies in current approaches to both fisheries and terrestrial CBRM in Solomon Islands (e.g. Schwarz et al. 2014) and is a priority of new Pacific-wide policy focused on community-based management (e.g. SPC 2014).

Strengthening the management constituency

All communities expressed a desire to have a small constituency to hold management responsibilities. In all villages (except those in Dovele), leaders decided to use an existing group rather than form a new committee. Committees included village leaders and men and women from reef-owning clans. An overarching committee was also created in Jorio and Dovele to encompass the multiple villages within those regions. Committees undertook to develop management plans, enforce and adapt management arrangements, monitor progress towards objectives, act as the point of contact for consultations with external representatives, and to share information. In follow-up research, it was found that the durability of management was strongly influenced by whether people acted as “gatekeepers” and denied access to information to others in the fishery, or “knowledge brokers” in that

they shared information and generated broad and long-term support for management within the community (Abernethy et al. 2014).

In principle, any member of the community was able to participate in management decision-making through public meetings arranged by the committee or via informal feedback to committee members. This was through supporting effective committee formation and function (including financial management, meeting process, facilitation) by sourcing appropriate local training providers. Requested information was also sourced and provided, and committee members were supported to attend meetings and establish links with provincial and national governments and communities of practice (e.g. the Solomon Islands Locally Managed Marine Area, SILMMA, network; see Cohen et al., 2012). As the level of engagement and ‘brokering’ support by WorldFish scaled down, however, only those communities that were able to leverage relationships with another NGO partner were able to sustain those links.

Having clearly defined boundaries is recognised as an important principle for the effective governance of fisheries resources (e.g. Ostrom 1990). Despite efforts to clarify physical and associated social boundaries for management in the diagnosis phase, at various stages disputed tenure appeared to be a significant barrier to establishing or sustaining management. Similar to the findings of others (e.g. McDougall 2005) clarification and definition of the fishery boundary via tenure actually raised some disagreements and concerns about the legitimacy of existing governance structures, which communities in all regions then attempted to address through local deliberation; resolution was variable.

Management

Despite being recognised as important foundations on which to build CBRM, customary measures (e.g. restricted access through tenure, protection of sacred areas, restrictions on harvesting particular species; see Hviding 1990) may be ineffective in contemporary, competitive and intense resource-use contexts (Foale et al. 2011). In recognition of this, one objective was to help communities draw on multiple knowledge sources to guide the design of local rules that would protect the ecological and social functions of their fishery.

Consultations to determine management arrangements were the most time-consuming component of engagements. Management arrangements were initially developed in a dialogue between WorldFish facilitators and a subset of the management constituency (usually the management committee plus some expert fishers). The process to

determine appropriate rules and actions for management began by looking back at the outcomes of the participatory diagnosis phase, particularly the identified causes of problems. An ecosystem approach was encouraged through informed discussions on ecosystem processes, including habitat functions and life cycles of taxa targeted by fishers and through facilitating discussions of the social structures that influenced the fishery. This information was provided to complement local and traditional knowledge shared during the participatory diagnosis phase.

In all regions, communities historically used temporary closures or *tambus*⁶ to limit access and use of certain areas. At the time of these engagements, *tambus* were used either as “storage” areas that would be opened for fundraising (e.g. Kia) or feasts (e.g. Fauro), or were implemented in response to certain events such as deaths (e.g. see Cohen and Steenbergen 2015). *Tambus* were re-established or modified as part of proposed management regimes in all five regions. Other restrictions, on fishing gear and access, were also proposed (Table 2). For example, the Makwanu region had identified that the decline in rabbitfish was due to fishers targeting spawning aggregations and the use of nets to target juveniles. Their response was to implement a permanent *tambu* on an important spawning area and place a seasonal ban on harvesting juveniles. It was

typical for an initial set of possible rules and actions to be devised after one facilitated discussion, and then refined by the management committee in consultation with the wider management constituency. This process of negotiation usually took months and often amended the original proposition. In addition to rules prescribed in national fisheries regulations, three regions applied rules about habitat use and four regions banned the removal of certain species or life-history stages (Table 2).

The management planning process also involved the committee allocating responsibilities for surveillance and enforcement, including specifying penalties for infringements. For example, the management plan for Kia was enforced through customary law with backing from the House of Chiefs. The penalties for non-compliance were proposed as cash or *kastom* shell money⁷ fines, and the amount was set in the management plan (e.g. Fauro) or decided on at the discretion of the chiefs, depending on the severity of the offence (e.g. Kia and Makwanu). WorldFish helped prepare written plans documenting the decisions of the committee about management goals, resource use rules, enforcement strategies, penalties for infringements, indicators of management performance and the period for evaluation and review. To support committees in raising awareness about management, short summary posters were

Table 2. Management measures articulated in management plans of the five regions.

Type of management measure	No. of management plans adopting this measure
Fishing gear (5 regions)	
Dynamite ban	4
Fish poisons ban	5
Small-mesh net ban	4
Night diving restrictions	3
Fishery targets (4 regions)	
No harvesting of juveniles	3
No targeting of spawning aggregations	1
No targeting of breeding areas	1
Habitat (3 regions)	
No removing of coral boulders	1
No removing of mangroves	3
No plastic or tins thrown in the sea	1
Spatial (5 regions)	
Rotational closures	1
Periodic closures	4
Permanent closures	2

⁶ *Tambu* is analogous to the English word “taboo”. It refers to a social prohibition or ban, and in this case refers to the traditional closure of a marine area to fishing.

⁷ Shell money is a traditional currency used as bride wealth, compensation, and trading purposes in Melanesian societies.

prepared for public display.

Success in implementing new, negotiated forms of management measures was mixed, and there were three broad outcomes: 1) none implemented, 2) initially implemented but not sustained, or 3) implemented, modified and sustained in some form (see Cohen et al. 2013). Situations of “no implementation” (Dovele) and “initially implemented but not sustained” (Kia, Makwanu and three of the five communities in the Jorio regions) were attributed to perceived illegitimacy of the governance and rule-making processes, and distrust of community representatives involved in decision-making (Abernethy et al. 2014). In successful communities, rules-in-use differed from rules-on-paper because, for example, committees found it unrealistic to implement some rules they were initially keen on (e.g. total bans on night spearfishing) and implemented rules with more flexibility than they had originally envisaged (e.g. more frequent temporary opening of closed reefs) was required to meet social obligations (Cohen et al. 2013; Cohen and Steenbergen 2015). Only a subset of management rules (and most commonly *tambus*) were implemented continuously.

Monitoring

Monitoring is fundamental to adaptive co-management (Armitage et al. 2007) but intensive monitoring programmes and high data requirements are ill-suited to many community-based, co-management contexts. In all regions except Makwanu, training was provided on the low-intensity quantitative monitoring of invertebrates (of interest to communities) using free-diving techniques. Although underwater monitoring appeared to

foster enthusiasm for management, it proved unsustainable, largely owing to the high cost and problems with the accuracy and adequacy of data (see Léopold et al. 2009). Results from quantitative data were rarely, but occasionally, utilised in making adjustments to management (Cohen and Steenbergen 2015; Abernethy et al. 2014).

Indicators are widely used in fisheries because they provide a balance between ease of implementation and reliability (e.g. Clua et al. 2005; Rice and Rochet 2005). Garcia et al. (2008) proposed categories of indicators for SSFs in developing countries: people and livelihoods, institutions and governance, natural systems, and external threats and opportunities. WorldFish, in conjunction with communities, developed locally relevant indicators for each of these categories. To illustrate the “state” (i.e. informed by resilience concepts of thresholds) of indicators WorldFish developed a simple dashboard (Fig. 3). Participatory planning sessions with communities to identify indicators, thresholds and states aimed at encouraging broader thinking about the complex linkages within a fishery.

Both the facilitation team and communities found it easier to identify indicators for “natural systems” and “institutions and governance” than for “people and livelihoods” and “external threats and opportunities”. As a result, only the first two were represented in written management plans. Ecological indicators, such as catch per unit effort, were relatively easy to identify because of their direct connection to food or income, and thresholds were easy for fishers to identify using local knowledge. Governance indicators were also relatively intuitive for committees, and focused on measures of

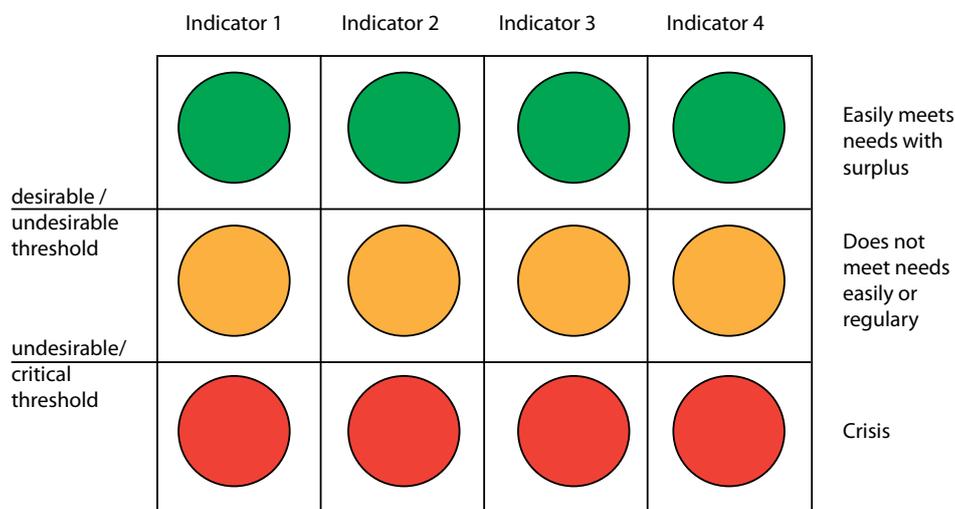


Figure 3. Dashboard illustrating the status of, and thresholds between, indicators identified by communities. This template shows three possible states — crisis (bottom row), undesirable (middle row) and desirable (top row) — and the thresholds between them.

compliance and enforcement with rules (e.g. the proportion of fishing offences receiving fines).

Thresholds reflected limits considered to be important to the community. For example, the thresholds below “undesirable” where fisheries then entered a crisis or critical state were set at the point where catches of selected species became insufficient to meet household needs, or the number of management infringements was perceived to be intolerable. In Jorio and Makwanu, the threshold above which undesirable became desirable was defined as being where catches could meet the needs of the fishers’ households *and* would also enable fishers to meet social obligations and/or accrue financial capital or assets.

While the concept and process of monitoring the performance of management rules was found to be initially well-received, in most cases it was not sustained beyond project engagement. Changes to management rules that were successfully implemented were, in fact, adjusted based on local social rationale and informal fisher observations, rather than structured processes of examining thresholds and states or ecological data collected through monitoring (Cohen and Steenbergen 2015; Cohen et al 2013).

Conclusions

Reflecting global enthusiasm CBRM is proliferating in a variety of forms and for a range of objectives throughout the Pacific Islands region (Govan 2009; Jupiter et al. 2014). Policy-makers believe that strengthening SSF governance by further empowering communities as resource stewards, is a key strategy for preserving the social and economic benefits from SSFs (SPC 2014). The belief that co-management will lead to improved social and environmental outcomes is built on the assumption that fostering local stewardship and promoting legitimacy of local governors will increase the fit of management solutions and improve compliance with devised management (Jentoft et al. 1998). There is emerging evidence that this can be the case in Solomon Islands (Orirana et al. 2016). In three of the five examples presented here, disputes associated with local institutions and influences beyond the scale of the (local) fishery presented insurmountable barriers within the timeframes referred to here. The objective of determining a locally meaningful definition of the fishery can be difficult to reconcile with external factors that can rapidly and unexpectedly become highly influential (e.g. the national-level opening or closing of a fishery such as sea cucumber). Further, the very process of definition can bring to the surface disagreements and concerns about legitimacy of governance. In some cases, greater investments in integrating additional sources of knowledge, brokering cross-scale governance linkages and making adjustments to

governance arrangements, may be able to address overcome these challenges, as illustrated by the efforts of community champions in Langalanga Lagoon, Solomon Islands over the last five years (Sukulu et al. 2016).

The PDAM framework provided a structure for planning and implementation. It also implicitly promoted learning phases and periodic reflection by CBRM partners to adjust engagement actions. Reflections on the performance of engagement strategies of what was working well, what was not working well, and what changes could be made (Apgar et al. 2017; Boso et al. 2010; Cohen et al. 2014; WorldFish 2013). Attention needs to be paid to fostering the necessary capacity to adjust engagement methods based on the outcomes of reflections (Apgar et al. 2015) and this requires institutional flexibility (Evans and Andrew 2009).

A global review of fisheries co-management cases, suggested that social and ecological outcomes were overall more positive than negative, yet also that projects that fail, or are discontinued, were rarely published (Evans et al. 2011). This reporting bias hinders our collective ability to improve adaptive co-management models, and gauge progress and potential towards improving resilience of SSF. Our study has highlighted that governance challenges that stall or halt local progress towards adaptive CBRM are not uncommon. While strong leadership, clear and uncontested boundaries, cross-scale links and social capital are identified as critical determinants of success (Armitage et al. 2007; Cinner et al. 2012), their absence or instability may be the norm, rather than the exception. Our research also highlights that the project modality of engagements targeted towards ideal conditions, specific sectors and localised communities will continue to be challenged by the complexity, dynamics and diversity of SSF.

The engagements with communities that we describe were relatively intense in terms of human and financial resources – this type of engagement has provided sound backing to community efforts and has allowed WorldFish to draw and disseminate substantial lessons learned on engagement, outcomes and shortcomings of CBRM. Such lessons are critical to improving outcomes and designing complementary governance and rural development solutions, but intense community-by-community engagements are slow and unlikely to reach large numbers of communities. A model has been proposed whereby relatively more effort would be invested in “core” communities (Govan et al. 2011), but simultaneously, resources are committed to ensure that other communities receive, at a minimum, information to help build more gradually active support (Abernethy et al. 2014; Orirana et al. 2016).

Despite the challenges, community-based and adaptive forms of co-management are appropriate and necessary models for governing SSFs (Parks 2011), and may also act as useful entry points for addressing deeper community development and governance concerns. An improved enabling environment for CBRM is increasingly being fostered by responsible national agencies in Solomon Islands backed up by relevant regional policies. Our experience suggests that a conscious application of resilience principles, particularly with the adoption of reflecting and learning phases across scales of governance, will ensure that increasingly relevant and effective support will continue to improve community-based approaches to SSF management.

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