

Fisheries certification in the developing world: locks and keys or square pegs in round holes?

Yorgos Stratoudakis^a, Patrick McConney^b, John Duncan^c, Abdul Ghofar^d, Nancy Gitonga^e, Kolliyi S. Mohamed^f, Melita Samoilys^g, Keith Symington^h, Luis Bourillonⁱ

^a IPMA – Instituto Português do Mar e da Atmosfera IP, Avenida de Brasília s/n, 1449-006, Lisboa, Portugal

^b Centre for Resource Management and Environmental Studies, University of West Indies, Cave Hill Campus, Barbados;

^c WWF South Africa, PO Box 23273, Claremont 7735, Cape Town, South Africa

^d University of Diponegoro, Indonesia

^e FishAfrica, PO Box 64358, 00620, Nairobi, Kenya

^f Central Marine Fisheries Research Institute, PO Box 1603, Kochi 682018, Kerala, India

^g CORDIO East Africa, PO Box 10135, Mombasa 80101, Kenya

^h WWF Coral Triangle Program, 4/414 Cua Dai, Hoy An, Vietnam

ⁱ COBI - Comunidad y Biodiversidad, AC. Isla del Peruano 215, Col. Lomas de Miramar, Guaymas, Sonora 85448, México

* Corresponding Author: Y. Stratoudakis; E-mail address: yorgos@ipma.pt; Telephone: (00351) 21 302 71

32

Email addresses: P. McConney, patrick.mcconney@gmail.com; J. Duncan, jduncan@wwf.org.za; A. Ghofar, aghofar099@gmail.com; N. Gitonga, nanisgitonga@yahoo.com; K.S. Mohamed, kismohamed@gmail.com; M. Samoilys, melita.samoilys@gmail.com; K. Symington, keithsymington@yahoo.ca; L. Bourillon, lbouillon@cobi.org.mx

Abstract

The Marine Stewardship Council (MSC) is the frontrunner in fisheries certification, receiving both extensive support and strong criticisms. The increasing uptake by fisheries and markets (almost 10% of world fisheries tonnage engaged by the end of 2014) has been followed by a widening pool of stakeholders interacting with the MSC. However, the applicability of the MSC approach for fisheries in the developing world (DW) remains doubtful, reinforced by a worldwide uptake skewed towards developed world fisheries. Here, a group of MSC stakeholders, with the aid of an ad-hoc questionnaire survey, reviews constraints to MSC certification in DW fisheries, evaluates solutions put forward by the MSC, and recommends actions to improve MSC uptake by DW fisheries. Recommendations to the MSC include researching and benchmarking suitable data-limited assessment methods, systematizing and making readily available the experiences of certified fisheries worldwide and constructing specific fisheries capacity-building for regional leaders. The MSC can further review the certification cost, especially for small-scale fisheries and, in partnership with other institutions, mobilize a fund to support specific DW fishery types. This fund could also support the development of market opportunities and infrastructures likely to satisfy local conditions and needs. For wider market intervention, the MSC should consider embarking on some form of vertical differentiation. Finally, for fisheries that may never move towards certification, the group identifies tools and experience available at MSC that can improve environmental performance and governance bearing.

Key words: MSC, transnational governance, environmental standard, market, sustainable development.

1. Introduction

Fisheries certification emerged in the 1990s as a non-state, market-driven alternative to address worldwide overexploitation of fishery resources and degradation of fished ecosystems resulting from absent or ineffective management (Constance and Bonanno, 2000). During a period of market transformations that increased the complexity of supply chains (Oosterveer, 2008) and led to the globalization of the agro-food sector, similar initiatives appeared for other natural resource production systems, like forests (Durst *et al.*, 2006; Bernstein and Cashore, 2007), palm oil plantations (Oosterveer *et al.*, 2014) and aquaculture (Bush *et al.*, 2013a). With hindsight, a common aspect in all these transnational private governance initiatives has been an early choice between two problem-framing logics: the logic of control to ameliorate environmental externalities resulting from business action through prescriptive standards; or the logic of empowerment to overcome marginalization of peripheral actors through development solutions adapted by local networks (Auld *et al.*, 2014). This initial choice not only defines the program and priorities of action for each initiative, but also shapes the profile of early constituents and determines the most likely sources of tensions, criticism and institutional concern along its evolutionary path.

The Marine Stewardship Council (MSC) is the clear front-runner scheme for certification of fishery sustainability (Gulbrandsen, 2009; Bush *et al.*, 2013b), using a science-driven environmental standard and a thorough third-party verification process that also audits product traceability to provide reliable information to consumers (Gutiérrez *et al.*, 2012; Agnew *et al.*, 2014). By December 2014, 319 fisheries were formally engaged with the MSC (already certified or in full assessment) representing almost 10% of the world's annual harvest of wild capture fisheries (MSC, 2015). However, uptake has not been proportionate, either geographically or in terms of size of operators. For example, the 18 major producer countries in the world (FAO, 2014), contributed in 2012 similar percentages to the global marine capture fisheries yield and to the total of MSC certified seafood tonnage (75% and 68% respectively). However, these major producer countries only represent in number 37% of the MSC certified fisheries, demonstrating a disproportional importance of few large-scale and vertically integrated operators. More importantly, 9 of these 18 countries (China, Indonesia, Peru, Myanmar, Philippines, Republic of Korea,

Thailand, Malaysia and Morocco) do not have any fishery certified thus far by the MSC, making the continental and regional asymmetries particularly acute (in April 2015 a scallop fishery in Zhangzidao Island was the first to be certified in China). The discrepancy is even greater when inland fisheries are considered – in this case only 3 of the 15 major producer countries in 2012 had any fishery certified until December 2014 and only one (Russian Federation) has a certified fishery also operating in inland waters (pink salmon *Oncorhynchus gorbuscha* fishery that has recently opted not to seek re-certification).

According to Auld *et al.*, 2014, these distributional asymmetries are predictable for certification schemes that opt for the logic of control, requiring subsequent corrective action. However, balancing accessibility to certification with credibility of the environmental standard is a difficult task. It requires overcoming apparently untenable contradictions between objectives of uptake and rigor (Bush *et al.*, 2013b) while negotiating evolving pressures of market chain actors and NGOs (Bush and Oosterveer, 2015). Here, a group of MSC stakeholders (primarily members of the Developing World Working Group, DWWG, of the Stakeholder Council of the MSC, as well as participants from other governance bodies of the MSC) aims to contribute to this debate by addressing sequentially the following questions:

- What are the main constraints to MSC uptake for developing world (DW) fisheries?
- What is the likely effectiveness of solutions currently put forward by the MSC to DW fisheries?
- What else can be done and will this be sufficient to cover all or most of the DW fisheries?

To do this, the study first reviews literature on the relationship between the MSC and the DW, after providing a brief description of the diversity and current trends in DW fisheries and markets. It then advances with the identification of the main constraints to MSC uptake and the solutions that the MSC has been considering or implementing. The relative importance of constraints and solutions are informed by an *ad hoc* on-line questionnaire survey to DW fisheries stakeholders. In the final section, possible future paths are traced, both with respect to solutions that can be pursued under the current operational framework of the MSC and beyond.

2. Developing world fisheries and the MSC

Without seeking a precise definition for the distinction between developed and developing world in terms of fisheries, observing aggregate fisheries statistics and indicators across continents (FAO, 2014) permits some broad differentiation in prevailing world fisheries types and socio-economic realities. The relative importance of small-scale fisheries (SSF, indicated by the mean per fisher annual production and the proportion of motorized vessels in each continent – FAO, 2014) is considerably higher in Africa and Asia than in Europe and North America, with intermediate levels of importance in Oceania and the Pacific, Latin America and the Caribbean. Similarly, there are large regional differences in the relative importance of inland fisheries (indicated by the proportion of inland operating fishing vessels by continent – FAO, 2014), with the highest proportion in Africa, followed by Asia, Latin America and the Caribbean. It is widely recognized that in regions with important inland and coastal SSFs, people are highly reliant on fish for food security and nutrition and are also heavily dependent on fishing as a source of employment (Sale *et al.*, 2014; Béné *et al.*, 2015; Blackmore *et al.*, 2015). These systems are also likely to rely on temporal and complementary production activities (“tri-economy” of fishing, farming and herding – Andrew *et al.*, 2007) and suffer from infrastructural deficiencies that can lead to substantial post-harvest losses (Béné *et al.*, 2010). Despite the higher dependence of such systems on fish, the developed world continues to have a higher annual per capita fish consumption rate on average, with a large and growing share consisting of imports from the DW (FAO, 2014). In the DW, domestic seafood consumption remains predominantly based on locally and seasonally available products, although in emerging economies urban consumers are experiencing an increase in diversity on offer due to imports (FAO, 2014).

It is also important to register that there is no single description of DW fisheries, with distinct patterns at regional and sub-regional levels. For example, in Southeast Asia (SEA), the role of fisheries in providing livelihoods, trade, and food security has become increasingly vital and will likely continue to grow, as will its importance as a producer region. SEA nations account for about one quarter of global fish production, with six SEA nations among the top 20 global producers (FAO, 2014). Levels of domestic fish consumption are also amongst the highest in the world, with per capita annual consumption for the region increasing almost threefold in the past four decades. Along with these sharp rises in exports and domestic consumption, export processing industries in SEA have experienced frequent shortfalls in raw material, driving increased demand for imports of seafood from DW nations outside of the region (K. Symington,

personal observation). Conversely, in sub-Saharan Africa, fish supply per capita has been declining, though dependence on fishing for food and livelihoods remains high particularly in the least developed countries (Béné *et al.*, 2010).

Despite regional variations, the clear global trend is an increase in trade between DW regions and from the DW to the developed world in terms of both the volume and value of the seafood commodities traded (FAO 2014). High value products are creating increasingly valuable export fisheries, yet many of these source fisheries remain poorly monitored and managed, thus raising the sustainability of DW fisheries as a globally significant issue and increasing the interest in certification. Among the criticisms that the MSC has received over the past two decades, concerns about the applicability of the MSC Standard and the overall MSC approach to DW fisheries have been prominent (Constance and Bonanno, 2000; Gardiner and Viswanathan, 2004; Ponte, 2008; Gulbrandsen, 2009; Jacquet *et al.*, 2010, Bush *et al.*, 2013b). These criticisms have generally centered on three topics (that jointly determine applicability for the purposes of this study):

- Governance: Biases associated with the legacy of the MSC's creation and early history;
- Accessibility: Equity concerns introduced by an environmental standard apparently more suited to specific types of fisheries and management systems;
- Appropriateness: Goodness of fit for market-based interventions, especially avoiding undesired socio-economic perturbations in DW markets and communities potentially resulting from the shift of seafood products away from local markets subsequent to MSC certification.

The creation of MSC was initially faced with suspicion in the DW (e.g. round of SAMUDRA Report contributions between 1996 and 1998 - see Constance and Bonanno, 2000). Although some criticism of the MSC governance structure persists (e.g. Jacquet *et al.*, 2010; Kalfagianni and Pattberg, 2013), the reform initiated in 2001 has helped to address major concerns (e.g. Bernstein and Cashore, 2007; Eklof, 2008; Gulbrandsen, 2009; Bush *et al.*, 2013b). For example, the geographical distribution of the public chamber membership in the MSC Stakeholder Council has progressively become more even across continents, Board members were also recruited beyond North America and Europe, while the MSC's Developing World Working Group (DWWG) was created and has been formally integrated into the MSC

governance structure (but see also Auld *et al.*, 2014 for need for a wider range of stakeholders to become direct participants in MSC rule making).

Less straightforward for the MSC to address has been the challenge of balancing a rigorous and sometimes overly demanding ecological standard against the need to keep the standard accessible to fisheries operating under very different management regimes (Bush *et al.*, 2013b; Blackmore *et al.*, 2015). The MSC's science-based approach has often led to criticisms that certification against the standard is unaffordable, especially when fishery products are not exported to high-value markets (Gardiner and Viswanathan, 2004; MacFadyen and Huntington, 2007; Ponte, 2008; Bush *et al.*, 2013a). Fisheries from the global South and smaller in scale also inherently have more limitations in technical knowledge, fewer resources and weaker support from government institutions to meet the standard requirements (Eklof, 2008; Ponte, 2008), making it more difficult for any benefits from eventual certification to outweigh the costs (MacFadyen and Huntington, 2007; Blackmore *et al.*, 2015). In addition, DW fisheries often face extra constraints related to the capacity of local markets and firms to process fish products according to the hygiene and traceability requirements of developed countries (Béné *et al.*, 2010). Similar criticisms have been presented for forest certification (Durst *et al.*, 2006) and aquaculture (Bush *et al.*, 2013a), providing a basis for the generic observations of Auld *et al.*, 2014 about the tensions faced by schemes relying initially on the logic of control and the need for subsequent adjustment.

Finally, early criticisms around the absence of a fourth – social – pillar in the MSC Standard have progressively shifted towards the unintended or unanticipated changes in political economy resulting from certification (Gardiner and Viswanathan, 2004; Ponte, 2008; Guldbrandsen, 2009; Foley, 2012; Foley and McCay, 2014). This is particularly relevant for some west African and Asian coastal countries and small island states that rely heavily on fish for dietary protein and micro-nutrients and which, in many cases, are also poor (income-wise) and food-deficient (Béné *et al.*, 2015). However, the small island developing states' (SIDS) reliance also has deep connections to culture and multi-sectoral livelihoods (e.g. fishing with tourism and transport) that illustrate the complexity and importance of the social dimension of fisheries sustainability beyond food security (McConney *et al.*, 2014a). The poorly understood influences of MSC certification on socio-economic relations and the market dynamics of fisheries production, property and

power need to be better monitored and studied (Eklof, 2008; Campling *et al.*, 2012; Blackmore *et al.*, 2015), while acknowledging that the consequences of certification may differ according to local settings (Oosterveer *et al.*, 2014).

Nevertheless, not all socio-economic changes reported so far as a result of MSC certification are exclusive to the DW (Foley, 2012) nor are they necessarily negative (see Durst *et al.*, 2006 for similar report on forest certification). In specific studies of MSC certified fisheries in Argentina (A - Pérez-Ramírez *et al.*, 2012a), Mexico (M - Pérez-Ramírez *et al.*, 2012c; Foley and McCay 2014) and South Africa (SA - Field *et al.*, 2013) many of the anticipated benefits resulting from certification (Eklof, 2008) have been registered:

- Economic: access to new markets (A); market maintenance (A, M, SA); preferred supplier status (M); attract investments in the fishery (A, M, SA); renew fishing rights in the form of concessions (M).
- Ecological: improved fisheries management (facilitate ecosystem-based management - SA), ecosystem research development (SA); cooperative research (A, SA); better monitoring and surveillance (A, M); new sources of financing for research and monitoring (A); better understanding of stock status and marine environmental problems (A, SA).
- Social: funding for local community social and economic infrastructure (M); improving image (A); public recognition of conservation efforts (SA); empowerment of fisheries cooperatives (M); community strengthening (M); public awareness (SA).
- Governance: long-term planning (A); involvement in co-management (A, M, SA); effective stakeholder participation (A, SA); empowerment of fisheries cooperatives (M); shifting burden of responsibility from government to science-fishery-government partnership (SA).

In addition, the co-authors' experience with certain certified DW fisheries provides anecdotal evidence that point to similar findings elsewhere. For example, the Ben Tre lyrate clam (*Meretrix lyrata*) hand collection fishery in Vietnam (a community-based fishery in SE Asia) demonstrates several positive socio-economic indicators after certification (more households involved and higher wages in the fishery, higher price for clams, higher safety standards in employment) that have consolidated the supply chains (creating some sense of long-term stability) and have strengthened a locally enabling environment (families can

better afford children's school fees, or support vocational training, etc.). Another indicator of local success is that the MSC experience has prompted adjacent provinces to emulate the Ben Tre management model (collectives, closed access) and also pursue MSC certification (K. Symington, personal observation). Further, some benefits can also surge during the preparatory phase towards certification. For example, in the recently certified Ashtamudi Lake short-neck clam (*Paphia malabarica*) fishery in India, the informal system of self-management was formalized during the MSC candidature period through the formation of a clam fisheries governance council and the development of a clam fisheries management plan (K.S. Mohamed, personal observation). Further, for fisheries in improvements projects (FIP), the MSC Standard provides a reliable benchmark to measure ecological performance and progress in a structured and comprehensive way (Bush *et al.*, 2013b; Stratoudakis *et al.*, 2014; Deighan and Jenkins, 2015; Sampson *et al.*, 2015).

3. Constraints to certification

Based on the collective experience of the co-authors, discussions within the MSC DWWG and literature review, 13 potential constraints to MSC certification were identified (Table 1 – **near here**). Table 1 also summarizes constraints in terms of their links to the MSC Standard and citations in the literature (both specific to DW fisheries and others). The first elements of the list correspond to constraints that prevent a fishery from reaching a certain stage in the certification process, unrelated to the performance indicators of the Standard. This distinction becomes less clear in the middle part of the list, while the last elements are constraints clearly related to difficulties in specific performance indicators of the MSC Standard for DW fisheries. Although these constraints influence a specific step in the process towards certification or in the evaluation against the Standard, in many cases will not act in isolation. Finally, although cost is a relevant, and in some cases the single most important, underlying reason for many of the constraints identified, it was opted not to consider it explicitly, in order to reach a more specific recognition of main problems (a complementary approach is taken by Blackmore *et al.*, (2015) that focus on the direct and indirect costs of MSC certification).

The list of constraints shown in Table 1 was presented to fisheries stakeholders in the DW through an online questionnaire sent out in May 2013 to 278 valid email contacts from the MSC stakeholder database. The questionnaire contained 10 questions organized in five sections: basic description of the fishery, main constraints to MSC certification, possible solutions to improve likelihood of certification, other opinions on fishery certification and replier profile and contacts. Most questions were closed (choice from menu), but space for comments and some open questions captured respondent statements or clarifications. Each respondent was asked to consider a specific DW fishery with direct engagement or experience to evaluate the importance of these constraints and other issues. 41 replies (15%) were considered sufficient for analysis describing specific fisheries in at least 19 DW countries (see Table in Supplementary Material online). Some replies were not complete, with 36 respondents giving information on profile and 32 providing contact details. The most common working region was Africa (42%) or Asia/Pacific (31%). Most respondents were linked to non-governmental (44%) or scientific (28%) organizations, with others coming from the food industry, MSC assessment teams, national or international administration, consultants or providers of fisheries improvement projects. Most respondents reported having very good or good familiarity with the MSC scheme, although they were almost equally likely to have a long (>15 years), intermediate or short (<5 years) experience with the DW fishery considered in the questionnaire.

Although the fisheries listed in the Table (Supplementary Material online) cannot be considered a random sample of DW fisheries (given that the MSC database only contained contacts of people that voluntarily considered themselves as stakeholders), they cover a wide range of geographic areas and fishery types. For fisheries with sufficient information for characterization (n=35), representation of the operation area was fairly even among the Pacific (37%), the Atlantic (34%) and the Indian (29%) Oceans and type of fishing gear was similar among static (41%), mobile (32%) and hand-held or hand-pick (27%). The majority of fisheries focused on pelagic fish (43%), followed by invertebrates (31%) and demersal fish (20%), with no freshwater species and only one diadromous and deepwater species targeted. In terms of trip duration, the majority were considered either to perform intermediate (3-14 days, 37%) or very short (<1 day, 31%) fishing trips, while in terms of tonnage there was a clear separation between a larger group with annual landings up to 1 000 tons (60%) and a second group of at least 10 000 tons (37%). Overall, there was a

predominance of hand-held gears for invertebrate targets in the former group and of mobile gears for pelagic targets in the latter.

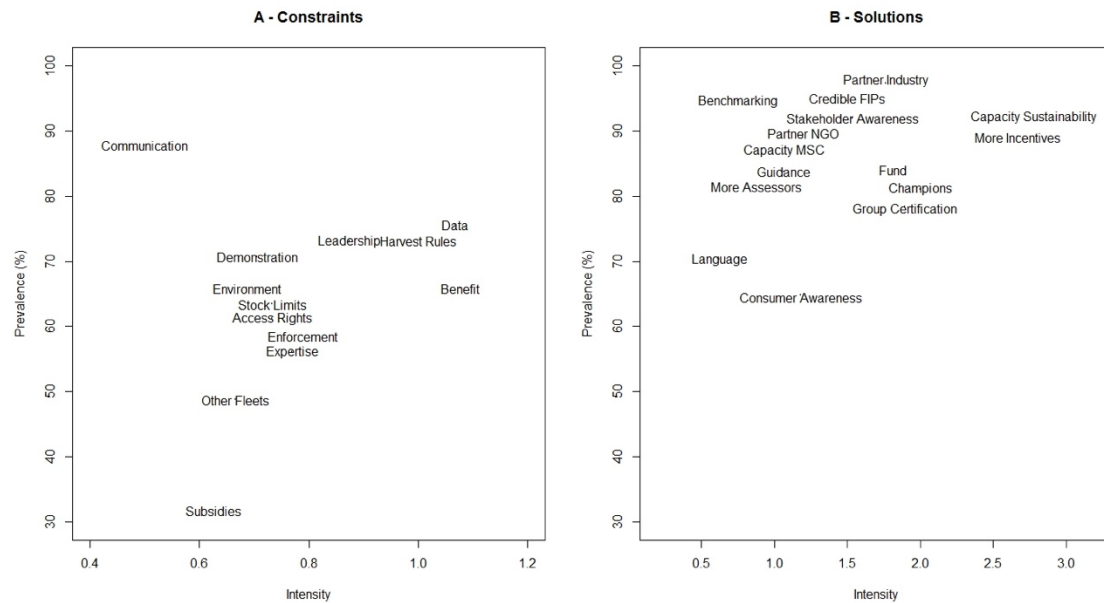


Figure 1: Bivariate representation of A) the constraints to MSC certification for DW fisheries considered in the questionnaire (41 replies) and B) the solutions promoted by the MSC to improve DW fisheries participation (37 replies). Graphical representation is made in terms of the percentage of participating fisheries that considered a constraint important or very important (prevalence, y-axis) and the percentage of fisheries that considered a constraint to be very important among those that at least considered it important (intensity, x-axis). In a few cases, legends are slightly jittered (vertically) to improve legibility.

Figure 1A summarizes the relative importance of the 13 pre-identified constraints described by stakeholders in the questionnaire replies. *Communication* was the most prevalent constraint (only considered unimportant by 12% of the fisheries) while *Subsidies* was the least prevalent (considered unimportant by 67%) followed *Other Fleets*. These three constraints at the extremes of prevalence were those that scored lowest in terms of intensity. Lack of *Data*, lack of *Harvest Rules*, unclear *Benefits* and weak *Leadership* were the most relevant constraints in terms of intensity, also showing high levels of prevalence. The remaining six constraints showed intermediate levels of intensity and prevalence. Despite

the clear separation between small and large fisheries in the sample, fishery size was not found to influence the distribution of replies for any constraint (Wilcoxon rank sum test).

Apart from evaluating the list of constraints by ordinal levels of importance, respondents were asked to identify and comment upon the most important constraint in the fishery under consideration. When elaborating on the lack of incentives or the inability to tap into the benefits of MSC engagement, respondents' statements ranged from very generic (e.g. lack of MSC buy-in in a whole country or lack of seafood consumers concern with sustainability in a whole region) to very specific (e.g. presence of foreign crews on short contract preventing long-term vision and stewardship in a fishery or key exporter uncertainty of access to specific foreign markets). Similarly, some expanded on the *Data* and *Harvest Rules* constraints to focus on difficulties in effective fishery management. These were linked to a lack of government mandate, commitment, capacity or support to develop, formalize or implement a management plan and with bad decisions in management.

In relation to the level of MSC engagement, the majority of the fisheries considered either did not have any engagement (32%) or were at the stage of considering engagement (20%). Of the remainder, 22% had gone through an MSC pre-assessment, 20% were in a fishery improvement project (FIP) and 7% were either in full assessment or already certified. In relation to the perceived temporal period required to reach full assessment of MSC under current conditions, the majority of the fisheries (41%) were estimated to require 2-5 years, followed by 29% requiring 6-10 years and 24% needing less than 2 years. No fishery without current engagement to the MSC considered full assessment to be imminent, but two fisheries of those considering engagement, two of those with a pre-assessment and three in FIPs evaluated that within the next two years they would be in full assessment. Finally, in relation to anticipated benefits from MSC certification, 80% of respondents identified some form of economic reward (mainly new or improved access to markets or a price premium), 51% identified environmental benefits (half relating to improved processes, like better monitoring and information, and half to improvements in the water, like reduction of bycatch mortality) and 14% identified social benefits (credibility, recognition, wider resonance, or more equity).

To the question on whether the MSC is an effective system for creating change in DW fisheries 15 of the 29 respondents believed that MSC is relevant for creating change in DW fisheries, unconditionally or conditionally if linked to FIPs, bringing short-term benefit, or measuring social re-organization. Another 10 thought it may be relevant if the MSC becomes more engaged with the DW, the cost of assessment reduces, local fishery experts get involved, the local supply chain is not destroyed, or the program gets integrated in a more holistic fishery development approach. Finally, four thought it is not relevant because it is shaped for developed world countries and it is too costly or too rigorous for many DW fisheries.

4. Solutions considered by MSC

Based on knowledge of the MSC's strategic plan for 2012-2017 and its updates in discussions within the MSC governance bodies, a series of solutions considered by the MSC to improve accessibility of DW fisheries were listed and also sent for evaluation in the questionnaire in May 2013. The list was validated with members of the MSC executive and explanatory phrases are added for some solutions depicting also developments after the questionnaire consultation in the paragraph following the list:

- 1) Adapt the **language** of the MSC Standard to DW fisheries;
- 2) Include additional **guidance** to the MSC Standard interpretation to cover small-scale, DW fisheries;
- 3) Develop an MSC specialized **fund** to support small-scale, DW fisheries assessments;
- 4) Facilitate **partnerships** of fisheries with **NGOs** and development agencies for FIPs;
- 5) Promote **partnership** of fisheries with commercial actors and retailers (**industry**) to generate market incentives;
- 6) Raise **awareness** among all **stakeholders**;
- 7) Raise public **awareness** with **consumers**;
- 8) Build **capacity** on the **MSC** scheme and the certification processes/Standard;
- 9) Build **capacity** on sustainable fisheries and management plans (**sustainability**);
- 10) Develop **credible FIPs** that would allow market benefits while progressing to MSC levels of sustainability;

- 11) Develop tools to support fishery improvements, including the **Benchmarking** and Tracking Tool;
- 12) Increase MSC (**more**) **assessors** capacity in developing world countries;
- 13) Increase (**more**) **incentives** for certification of developing world countries;
- 14) Promote **group certification** for small-scale fisheries in developing world countries;
- 15) Develop/identify **champions** to lead fishers on the process towards certification.

Some developments around the solutions identified above are already initiated or implemented by the MSC. Regarding items 1 and 2, while formal stock assessments and biomass based reference points were not compulsory in earlier versions of the Standard (see MSC guidance to Fisheries Certification requirements 1.3), provisions allowing for the use of proxy indicators were more clearly articulated during the revision to the MSC Standard in 2014. In addition, the MSC Standard currently provides guidance on how to consider informal and traditional approaches to management in assessments. On item 9 the MSC has commenced the development of a module based pre-MSC capacity building programme, involving training on the MSC process and Standard and which is to be piloted in 2015. In addition, in relation to item 11 a range of tools have been developed and made available to support fisheries embarking on FIPs. These include the development of the MSC Benchmarking and Tracking tool, which is a tool developed to provide a consistent method of comparing the performance of a fishery against the MSC Standard, as well as tracking the fishery's progress as it moves towards MSC certification. It is intended to provide buyers, funders and FIP coordinators with a means to understand the current status of a fishery, and the rate and type of progress the fishery is making on the improvements required to become sustainable (and MSC certified). On the issue of solutions around incentives to meet costs involved in getting certified, the MSC undertook a review of its process in a bid to reduce cost and complexity of the assessment process. This led to changes in process requirements aiming at significant reductions in auditing costs. More recently (July 2015) MSC announced the launching of a sustainability fund that aims to support critical research and capacity building for small scale and DW fisheries.

Figure 1B summarizes the responses of the 37 fisheries stakeholders on the relative importance of the 15 proposed MSC actions to address current constraints for DW fisheries. *Partnering with industry*, providing a *Benchmarking* tool and defining *Credible FIPs* were solutions of almost universal prevalence (>95%),

while improving *Consumer awareness* and *Language* adaptations to the MSC Standard were the least prevalent (but still with 60-75% acceptance). Provision of additional *Incentives* and *Capacity* building on *sustainability* were the most important actions in terms of intensity, both of them also showing very high levels of prevalence. *Group certification*, development of *Champions* and creation of a *Fund* to support small-scale fishery assessments formed a cluster of solutions with high intensity but slightly lower prevalence, while *Partnering with industry* and development of *Credible FIPs* headed a third cluster with still lower intensity but very high prevalence. Lowest intensity scores were attributed to *Language* adaptation of the Standard, development of a *Benchmarking* tool and increased availability of *Assessors*. Non-significant differences in the distribution of replies between small and large fisheries were found for all solutions other than the *Fund* to support small-scale fishery assessments.

When asked to identify the most important action for the fishery under consideration, most referred to the creation or clarification of incentives. Specific suggestions ranged from development of a fund to cover the wider costs of capacity building and the administrative costs of a certification candidature in the artisanal sector; or development of a nonprofit entity to facilitate fisher engagement to the creation of sustainability awareness programs in the regional markets of the DW; or provision of partial market recognition prior to certification through credible FIPs. The second most important action proposed was local (DW) capacity building around fisheries sustainability. This included suggestions for more MSC interaction with governments to encourage them to act, engage or support fisheries improvements, in some cases in articulation with incentives for fishery engagement to the MSC process or even public support for the cost of MSC assessment.

5. Way forward

Sustainability is multi-faceted, reflecting the complexity of fisheries as adaptive social-ecological systems, especially in the developing world (Mahon *et al.*, 2008). Some of the solutions considered above by the MSC clearly extend cases beyond the purview and mandate of the organization. The focus here, given the research design and expertise of the authors, is primarily on the aspects of sustainability that the MSC can address or influence directly through certification. However, in addition to these initiatives, some

solutions are better achieved through partnerships while others are largely external to the domain of certification, requiring more attention to broader aspects of fisheries governance. The way forward requires action on all three of these fronts.

5.1 Improving DW fisheries accessibility within the MSC framework

The MSC has been active in supporting research (for example on the ecosystem role of forage fish or the risk-based methodologies for fisheries with limited information for stock assessment), in providing additional guidance for the interpretation of the performance indicators of the Standard, and in making available methods, tools and courses relevant to DW fisheries (Agnew *et al.*, 2013; Agnew *et al.*, 2014). However, given the persisting asymmetries in uptake (with the developed world and among DW regions), there is a need for bolder and more coordinated actions to develop capacity for handling sustainability challenges specific to DW fisheries (Fig. 1B). The following three recommendations would address these needs:

- 1) Provide more and better options for evaluating the state of exploitation of fished populations based on time-limited and affordable data, including more specific guidance in the Standard;
- 2) Systematize and make easily accessible in different DW circumstances the extensive and diverse accumulated MSC experience from the certification of more than 250 fisheries globally;
- 3) Improve the capacity to initiate, develop and sustain processes towards effective fisheries management in the DW, according to the MSC Standard but with respect for and adaptation to local and regional realities and dynamics.

Despite the development of the risk-based framework some years ago (used by 49 fisheries of which 10 from the DW by the end of 2014), the provision of additional guidance and the acceptance of empirical reference points and triggers that do not depend on complex model-based stock assessment approaches in the latest Standard review, there remains a need for methods that do not demand substantial amounts of detailed data and computational skills, such as extended time series disaggregated to species level and costly fisheries-independent surveys, or extensive technical and other capacities. It is recommended that the MSC promotes the further development of data-limited methods that are also more intuitive and can

be part of community-based data collection programs (Agnew *et al.*, 2013), while developing clear protocols on how to obtain the necessary information and use the outputs of such methods for MSC assessment. However, it is also important that a safe level of precaution is maintained when assessing the health of the target and non-target stocks and their ecosystems by means of these data-limited approaches. This level of precaution could be adjusted depending on the size and nature of the fishery, similar to what is inherent in the risk-based framework.

The MSC has been developing a suite of tools, among them one to guide the development of fishery improvement action plans. This is in part for performance indicators requiring corrective action after certification, but mainly for fisheries requiring improvement prior to full assessment. This guide is a tool long-overdue for DW fisheries wishing to engage with the MSC, as it will exemplify typical failures in performance indicators, illustrate possible improvement actions implemented elsewhere by fisheries already certified and may promote links to exchange know-how among similar fisheries. Given the considerable experience and wealth of information that the MSC has available through the hundreds of assessment reports worldwide and their respective action plans, plus its extensive knowledge and networking capacity, there is a clear requirement for higher prioritization of the production of this guide and its articulation with complementary initiatives (for example, the bycatch mitigation database recently initiated by a New England Aquarium partnership with the MSC).

The third recommendation is likely to be best addressed by dedicated training. One potentially efficient way to create local capacity in terms of (i) how to interpret the MSC Standard given contextual and idiosyncratic characteristics of different DW regions, and (ii) what kind of actions are needed to reach the MSC Standard given the social-ecological characteristics of the fishery, could be through the development of a fisheries sustainability curriculum based on practices by currently certified fisheries. This course could be delivered to groups of DW seafood industry leaders (via training of trainers) who would then adapt the content to their cultural and socio-economic contexts to train fishers, scientists, extension officers and managers, on fisheries sustainability using the MSC as the environmental Standard. Such an 'ambassador program', made up of private sector individuals, universities, fisherfolk organizations and select environmental NGOs, in articulation with governments (depending on the most appropriate regional and

national settings), could have a substantial impact in providing technical capacities to move DW fisheries towards better environmental performance and certification.

Cost control and funding opportunities are major categories of solution bridging within the MSC framework that relate to the incentives of engagement (Fig. 1B). The costs of assessment for certification and certificate maintenance are meant to be supported by client fisheries and are important considerations in the decision to engage or not. Especially in the case of SSF, this cost can be a major deterrent to engaging with the MSC, or a reason to abandon the program prematurely (questionnaire replies; Deighan and Jenkins, 2015; Blackmore *et al.*, 2015). Some effort has been made by the MSC to review the speed and cost of the certification assessment process, but additional action is needed to:

- 1) Further reduce the administration costs involved in obtaining and maintaining the eco-label;
- 2) Create funding opportunities to support the administration costs for specific fishery types.

Although in third-party certification the administration costs are not controlled directly by the standard-setter, they increase with increasing complexity of the Standard and its audit requirements (Auld *et al.*, 2014). In the 2014 Standard review, the MSC strived to reduce the time, cost and complexity of the fishery assessment process whilst maintaining the integrity of the process (Bush and Oosterveer, 2015). Several changes were made, but most related to savings for fisheries which are already certified and considered of low risk (for example, reduction in surveillance for fisheries without conditions, reduction in cost of re-assessment and extension of certificates to new fisheries). On the other hand, new Standard requirements were introduced in the same review (for example the use of the risk-based framework for assessing habitat impacts) which are likely to increase the cost of assessment for data-limited fisheries. There is therefore a need to look at the aggregate impact of such initiatives bearing DW and data-limited fisheries in mind, and seek further efficiencies in the MSC process. In the case of DW fisheries, this can include translating the MSC Standard and supporting documentation to other languages, training of local assessors so as to reduce travel costs across regions, and further updating the Standard to reduce the number of requirements without lowering the sustainability bar (see also Durst *et al.*, 2006 about FSC's criteria for streamlined or simplified procedures for small forest certification candidatures).

Further, any assessment system has fixed costs that are difficult to suppress. This means that for many SSF the administrative cost of certification may constitute a high percentage of (or even exceed) the certified product's first sale value, making certification an enterprise of doubtful profit or even impractical. For example, for the Asthamundi clam fishery, the administration cost of certification was estimated to be close to 2% of the annual cost of fishery management; and for this SSF with an annual yield of several thousand tons and an export market value of about a million dollars, this additional cost was not prohibitive (but still the stakes are high and there is pressure to demonstrate it is worth the investment – K.S. Mohamed, personal observation). By comparison several of the fisheries considered in the questionnaire (see Table in supplementary material on last page) have annual yields that are more than an order of magnitude lower than the Asthamundi clam fishery, currently have no export markets and may encounter language barriers, likely making the administration costs of certification considerably higher or unaffordable.

For a range of such fisheries, a special funding mechanism promoted and managed by the MSC, to which third parties may optionally contribute, will help to alleviate certification costs. This fund is already part of the MSC integrated strategic plan 2012-2017 and was publicly announced in July 2015, but must be implemented and capitalized from a multitude of sources, including governmental support and development organizations. Its application, though, should be restricted to the types of DW fisheries within a specific range of ratios of estimated certification cost to the total cost of management and the total fishery value. Leveraging additional funding to enable DW fisheries to engage with certification processes will be a positive development in the short term, allowing fisheries with borderline business propositions with respect to certification to have an additional incentive to initiate the process. However, if the MSC's market-based model of fisheries improvement is going to succeed in the long run, it is important to develop self-sustaining funding models for certification that do not rely on additional donor funding (we return to this point in the section below).

5.2 Additional interventions and potential partnerships with the MSC

To date, the main driver behind DW fisheries engaging in the certification process has been to access or secure major export markets, mainly in developed countries (Eklof, 2008; Pérez-Ramírez *et al.*, 2012c; Sampson *et al.*, 2015). Similarly, FIPs are mainly supported by global players and partners of the MSC based in developed countries (Bush *et al.*, 2013b; Deighan and Jenkins, 2015; Sampson *et al.*, 2015) and are often focused on fisheries which supply global commodities such as tunas or shrimps. This reduces the interest in and certification potential of fisheries which have chain of custody deficiencies, are not targeting globally important seafood commodities, or are operating in DW regional or national seafood markets (e.g. intra-Africa trade, Béné *et al.*, 2010). Further, there is an inherent risk of developing additional global seafood demand at the expense of food security and sovereignty in DW countries because of the socio-economic externalities of global trade. The proposed solutions include the development of appropriate partnerships between MSC and other institutions to:

- 1) Support projects on market development that facilitate post-harvest interventions, including chain of custody improvements;
- 2) Cut on intermediate gains by linking SSF with channels of the value chain that can transfer more value back to the catch sector.

Parallel to the funding of administration costs for certification for specific fishery types, the MSC could promote similar competitive funding for selected twin projects to associate successful MSC candidatures with specific market developments adapted to local needs in collaboration with local partners. For example, in countries where market preference for certified products is minute, expectations to reach important export markets after certification may be hindered by incapacity to meet stringent regulations and guidelines with respect to seafood importing. The existence of such funding for twin projects to resolve inefficiencies in the supply chain (from basic infrastructure related to temperature control and transportation up to training businesses to be able to handle the MSC chain of custody Standard demands) may not only help to manage expectations in recently certified fisheries and provide new avenues for product commercialization, but can also provide lasting and synergistic effects towards local and regional development.

Other projects may allow NGOs, local entrepreneurs and industry to design and explore appropriately scaled market solutions for products about to obtain MSC certification. Such initiatives could allow stimulation of trade within regions (e.g. increasing urbanization and wealth in eastern Africa), within countries or even locally. For example, in the Caribbean there is a growing demand for chefs in some hotel and restaurant chains to offer sustainable seafood, and guidance on it, to tourists (P. McConney, personal communication). With such initiatives it is not only possible to find alternatives to the main exported markets with large carbon footprint, but also to guarantee a more balanced distribution of gains along the value chain. An example in this direction is the International Pole and Line Foundation (IPNLF), an international charity whose objective is to use the influence of the market to guarantee environmental sustainability for tuna coupled with better social conditions for pole and line fishers and their communities (see, for example, certified pole and line fishery in the Maldives and associated social initiatives). For other types of fisheries with smaller tonnage or targeting less global commodities, this intervention may be more difficult from the market side, but not impossible (e.g. linking with local sustainable tourism initiatives; partnering fair trade and livelihood projects in coastal areas with seasonal fishing activity, etc.).

For market-based initiatives to make an effective contribution to the global state of exploited common-pool resources, significant adherence to the principles and practices of reliable sustainability standards is required (Bernstein and Cashore, 2007; Tlusty 2012). Little doubt remains that the MSC is the environmental standard most suitable to act as a reference for global fisheries sustainability, but it is currently used by only a relatively small fraction of them. This fraction includes the majority of well-managed fisheries worldwide, that required little additional effort to reach the MSC Standard, or fisheries that had the means and the structure to rapidly improve to make certification a probable outcome (Tlusty, 2012). Currently, the great majority of world fisheries are in a situation where considerable improvements need to be made prior to considering MSC certification, and such improvements require adequate action plans and funding to implement them (but also see following section). As a result, partnerships around FIPs are seen as an attractive solution where the engagement of market actors provides part of the necessary funding for improvement (Bush *et al.*, 2013b; Deighan and Jenkins, 2015; Sampson *et al.*, 2015). In some cases, FIPs are extended to incorporate a livelihood component, especially for SSF where short-

term social priorities are addressed together with environmental health issues (FIP+ concept in Indonesia for fisheries with diverse species composition and seasonality – A. Ghofar, personal observation).

This situation leads to a conundrum which is difficult for the MSC to resolve: on one hand, the MSC needs to increase its pull towards fisheries with environmental performance below the Standard to increase its relevance for global fisheries sustainability; but on the other it cannot recognise or promote the market endorsement of FIPs because it may undermine the market proposition of already MSC certified fisheries or lead to a perception of lowering the bar of the Standard (Bush *et al.*, 2013b; Bush and Oosterveer, 2015, Auld *et al.*, 2014). To resolve this dilemma, several authors consider that the MSC should endorse some system of vertical differentiation to help maximize the ecological benefits from the market pull of certification without diluting the overarching environmental objective (Tlusty, 2012; Bush *et al.*, 2013b; Bush and Oosterveer, 2015). This would require at least two levels of recognition and reward: one for the higher performance standard (the MSC) and one for a lower performance standard. Some authors believe that the MSC should build tiering internally within its system (as FSC – Bush *et al.*, 2013b) or in articulation with other autonomous standards (as in coffee – Tlusty, 2012). A stepwise approach based on a partnership with another scheme could be a way to overcome the reduced adherence of DW fisheries, without destabilizing unduly the current logic, its regulatory capability or its power structure (Durst *et al.*, 2006; Auld *et al.*, 2014). It would though require an explicit statement of the articulated standards to avoid undue similarity and overlap (Tlusty, 2012). In that sense, the lower tier outside the MSC could simply accommodate environmental indicators away from undesirable state, more likely to be relevant for SSF (Andrew *et al.*, 2007), as well as some socio-economic requirements relevant for many DW fisheries. This livelihood component at the lower tier together with some premium could help to address fishers' immediate priorities to get stakeholder support to work towards longer-term environmental challenges and MSC certification.

5.3 Benefits of the MSC to fisheries beyond market-based certification

No matter what the level of an environmental standard, in certain types of fisheries where market forces play little to no role in determining fisher behaviour (e.g. some subsistence fisheries), certification will not

be a solution. Similarly in fisheries where socio-economic or ecological forces external to the fishery far outweigh internal pressures on sustainability (e.g. inland fisheries depending on seasonal flooding or in war zones), the objective of sound long-term fishery management is likely to remain secondary to the need for rapid adaptation to environmental change or immediate survival under social adversity (Andrew *et al.*, 2007). Although not uncertifiable, DW fisheries which focus on low volume, low-value species for local markets are generally unlikely to receive any economic benefits from certification. While there may be scope for some low volume fisheries to cooperate with other local fisheries to increase the volume of the client group's catches and share the certification costs across a broader client group, in most cases this will not be possible. Multi-species, multi-sector fisheries also remain difficult to certify using current methods due to the scientific complexity and data needs associated with assessing fisheries impacts on multiple species as well as the challenges of bringing together a large enough client group across multiple sectors to enable effective management at a stock level. Using the ecosystem approach to fisheries incorporated into the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines – FAO, 2015) can improve their sustainability, but not necessarily to the level of MSC certification.

An example of this would be the South African commercial hand-line fishery in which 455 independently owned and operated vessels catch up to 200 different species of fish all of which are sold on the local market for relatively meager returns (J. Duncan, personal observation). These same fish stocks are also targeted by sizeable recreational and subsistence sectors as well as being caught as bycatch in the commercial trawl sector. The multispecies nature of this fishery and complexity of coordinating an effective client group across such a broad range of stakeholders presents significant challenges to the MSC's certification model. Given this complexity, explicit recognition of these challenges when formulating fisheries improvement approaches for DW fisheries may help to better direct partnerships between environmental NGOs and local fisherfolk organizations to ensure appropriate interventions (McConney *et al.*, 2014b).

However, for all these fisheries there are still elements in the MSC toolkit that can be used to their benefit: for aspects internal to the fishery system, MSC provides operational definitions of sustainability indicators

related to the state of target resources and their marine environment, as well as the actions, procedures and institutional settings likely to enhance sustainability. To the extent that is relevant to the specific situation of a fishery, these tools can be useful to define the current situation and develop an appropriate action plan (e.g. Stratoudakis *et al.*, 2014). Elements of the MSC toolkit can also be used in hybrid forms of environmental governance that draw on the strength of states and the private sector (Bush *et al.*, 2013a, for discussion of similar problems in the aquaculture sector; INSHORE project for obtaining sustainability roadmaps for inshore UK fisheries). A similar opportunity is possibly emerging for new partnerships among international institutions, focusing along with the FAO on implementing the previously mentioned SSF Guidelines (FAO, 2015). While these activities are unlikely to lead to increased fishery certifications in the DW in the short term, these suggestions present an opportunity for the MSC to engage in a broader movement to improve and sustain what are largely DW fisheries. While the MSC was initially envisaged as a market-based mechanism, it is clear that the sustainability standards are of interest to all fisheries, including those in the DW. If sustainability rather than certification is the overall goal, which it should be, then the opportunities for partnerships can expand, even to improve uncertifiable fisheries.

6. Conclusions

The MSC is an organization with a governance architecture that permits evolution through a negotiated process open to social dynamics (Bush and Oosterveer, 2015). Further, it is worth noting that the social-ecological systems defined by the MSC process require certification clients to engage in collective action and the MSC processes encourage participatory and inclusive practices, thus enhancing the potential for relatively democratic outcomes (Foley and McCay, 2014). In this study, a group of MSC stakeholders reviewed the main criticisms related to the MSC's applicability to the DW to conclude that:

- Governance: the system has been able to adapt to criticism, but needs to keep evolving according to evolving needs and pressures. As the organization grows, additional checks and balances will be needed to avoid power groups and privilege positions to form or consolidate;

- Accessibility: specific recommendations are put forward to address the main concerns related to the insufficient capacity for sustainability in DW countries and a cost/benefit ratio often incapable to act as an incentive to certification, particularly for SSF;
- Appropriateness: early evidence from published studies and co-author experience with certified DW fisheries indicates that concerns for potential negative socio-economic consequences may have been overrated in theoretical studies. A specific recommendation is put forward to promote market developments more adapted to local and regional needs. Such interventions would require the formation of wider partnerships that should include governments. The only way to thoroughly evaluate such unintended consequences is through well-designed and rigorous studies (Campling *et al.*, 2012), preferably comparing specific socio-economic indicators before and after certification.

Further, this study highlights the need for the MSC to address the challenges of vertical differentiation holistically, by taking also into consideration the consequences of MSC action or inaction in this field to DW fisheries probability of certification uptake. Finally, it suggests that, even for fisheries beyond certification, the MSC environmental Standard should be recognised and promoted to governments as best-practice models for fisheries management.

Acknowledgements

The study was designed and undertaken by members of the Developing World Working Group of the MSC (DWWG), but it only reports the opinions of its authors and does not represent any group or institution. MSC supported the cost of annual DWWG meetings and the software for online questionnaires. Members of the MSC executive participated in the discussions before and during the manuscript preparation; in particular we would like to thank Oluyemisi Oloruntuyi and Nicolás L. Gutiérrez for their extensive contributions throughout the process and Martin Purves and Cassie Leisk for providing opinions and information. Finally, we would like to thank the 41 respondents of the on-line questionnaire survey, as well as other DWWG, Stakeholder Council members and MSC Executive staff that have participated in related discussions.

References

- Agnew, D.J., Gutiérrez, N.L., Butterworth D.S., 2013. Fish catch data: less than what meets the eye. *Mar. Pol.* 42, 268-269.
- Agnew, D.J., Gutiérrez, N.L., Stern-Pirlot, A., Hoggarth, D.D., 2014. The MSC experience: developing an operational certification standard and a market incentive to improve fisheries sustainability. *ICES J. Mar. Sci.* 71(2), 216-225.
- Andrew, N.L., Béné, C., Hall, S.J., Allison, E.H., Heck, S., Ratner, B.D., 2007. Diagnosis and management of small-scale fisheries in developing countries. *Fish Fish.* 8, 227-240.
- Auld, G., Renckens, S., Cashore, B., 2014. Transnational private governance between the logics of empowerment and control. *Regul. Gov.* DOI:10.1111/rego.12075
- Béné, C., Lawton, R., Allison, E.H., 2010. "Trade matters in the fight against poverty": narratives, perceptions, and (lack of) evidence in the case of fish trade in Africa. *World Dev.* 38, 933-954.
- Béné, C., Barange, M., Subasinghe, R., Pinstrip-Anderson, P., Merino, G., Hemre, G.I., Williams, M., 2015. Feeding 9 billion by 2050 – putting fish back on the menu. *Food Sec.* DOI:10.1007/s12571-015-0427-z
- Bernstein, S., Cashore, B., 2007. Can non-state global governance be legitimate? An analytical framework. *Regul. Gov.* 1, 1-25.
- Blackmore, E., Norbury, H., Mohammed, E.Y., Bartolini Cavicchi, S., Wakeford, R. 2015. What's the catch? Lessons from and prospects for the Marine Stewardship Council certification in developing countries. IIED, London. 104 pp.
- Bush, S.R., Oosterveer, P., 2015. Vertically differentiating environmental standards: the case of the Marine Stewardship Council. *Sustainability* 7, 1861-1883.
- Bush S.R., Belton, B., Hall, D., Vandergeest, P., Murray, F.J., Ponte, S., Oosterveer, P., Islam, M.S., Mol, A.P.J., Hatanaka, M., Kruijssen, F., Ha, T.T.T., Little, D.C., Kusumawati, R., 2013a. Certify sustainable aquaculture? *Science* 341, 1067-1068.
- Bush, S.R., Toonen, H., Oosterveer, P., Mol, A.P.J., 2013b. The "devils triangle" of MSC certification: balancing credibility, accessibility and continuous improvement. *Mar. Pol.* 37, 288-293.

Campling, L., Havice, E., Howard, P.M., 2012. The political economy and ecology of capture fisheries: market dynamics, resource access and relations of exploitation and resistance. *J. Agrar. Change* 12, 177-203.

Constance, D.H., Bonanno, A., 2000. Regulating the global fisheries: the World Wildlife Fund, Unilever, and the Marine Stewardship Council. *Agric. Human Values* 17, 125-139.

Deighan, L.K., Jenkins, L.D., 2015. Fishing for recognition: Understanding the use of NGO guidelines in fishery improvement projects. *Mar. Pol.* 51, 476-485.

Durst, P.B., McKenzie, P.J., Brown, C.L., Appanah, S., 2006. Challenges facing certification and eco-labelling of forest products in developing countries. *Int. For. Rev.* 8(2), 193-200.

Eklof, G., 2008. Slipping through the net – Eco-labelling and developing country fisheries. Swedish Society for Nature Conservation. 20 pp.

FAO, 2014. The State of World Fisheries and Aquaculture. Opportunities and Challenges. FAO, Rome, 2014. E-ISBN: 978-92-5-108276-8.

FAO, 2015. Voluntary guidelines for securing sustainable small-scale fisheries. Rome. ISBN: 978-92-5-108704-6

Field, J.G., Attwood C.G., Jarre, A., Sink, K., Atkinson, L.J., Petersen, S. 2013. Cooperation between scientists, NGOs and industry in support of sustainable fisheries: the South African hake *Merluccius* spp. trawl fishery experience. *J. Fish Biol.* 83, 1019-1034.

Foley, P., 2012. The political economy of Marine Stewardship Council certification: processors and access in Newfoundland and Labrador's inshore shrimp industry. *J. Agrar. Change* 12, 436-457.

Foley, P., McCay, B., 2014. Certifying the commons: eco-certification, privatization, and collective action. *Ecol. Soc.* 19(2), 28.

Gardiner, P.R., Viswanathan, K.K., 2004. Ecolabelling and fisheries management. WorldFish Center Studies and Reviews 27. Penang: WorldFish Center.

Gulbrandsen, L.H., 2009. The emergence and effectiveness of the Marine Stewardship Council. *Mar. Pol.* 33, 654-660.

Gulbrandsen, L.H., 2014. Dynamic governance interactions: evolutionary effects of state response to non-state certification programs. *Regul. Gov.* 8, 74-92

Gutiérrez, N.L., Valencia, S.R., Branch, T.A., Agnew, D.J., Baum, J.K., Bianchi, P.L., Cornejo-Donoso, J., Costello, C., Essington, T.E., Hilborn, R., Hoggarth, D.D., Larsen, A.E., Ninnes, C., Sainsbury, K., Selden, R.L., Sislta, S., Smith, A.D.M., Stern-Pirlot, A., Teck, S.J., Thorson, J.T., Williams, N.E., 2012. Eco-label conveys reliable information on fish stock health to seafood consumers. *PLOS One*, 7(8), e43765.

Jacquet, J., Pauly, D., Ainley, D., Holt, S., Dayton, P., Jackson, J., 2010. Seafood stewardship in crisis. *Nature* 467, 28-29.

Kalfagianni, A., Pattberg, P., 2013. Fishing in muddy waters: exploring the conditions for effective governance of fisheries and aquaculture. *Mar. Pol.* 38, 124-132.

Macfadyen, G., Huntington, T., 2007. Potential cost and benefits of fisheries certification for countries in the Asia-Pacific region. Asia-Pacific Fishery Commission, FAO. RAP Publication 2007/24.

Mahon, R., McConney, P., Roy, R., 2008. Governing fisheries as complex adaptive systems. *Mar. Pol.* 32:104-112

McConney, P., Cox, S.A., Parsram, K., 2014a. Building food security and resilience into fisheries governance in the Eastern Caribbean. *Reg. Environ. Change*. DOI: 10.1007/s10113-014-0703-z

McConney, P., Pomeroy, R., Khan, Z., 2014b. ENGOs and SIDS: environmental interventions in small island developing states. pp 360-373 in S. M. Garcia, J. Rice and A. Charles (Eds.) *Governance of Marine Fisheries and Biodiversity Conservation: Interaction and Co-evolution*. Wiley-Blackwell, UK. 552 pp.

MSC, 2015. Marine Stewardship Council: Global Impacts Report 2015. MSC, London, UK. 52 pp. ISSN 2052-8876. Accessed at: <http://www.msc.org/documents/environmental-benefits/global-impacts/msc-global-impacts-report-2015>

Oosterveer, P., 2008. Governing global fish provisioning: ownership and management of marine resources. *Ocean Coast. Manage.* 51, 797-805.

Oosterveer, P., Adjei, B.E., Vellema, S., Slingerland, M., 2014. Global sustainability standards and food security: exploring unintended effects of voluntary certification in palm oil. *Global Food Sec.* 3, 220-226.

Pérez-Ramírez, M., Lluch-Cota, S., Lasta, M., 2012a. MSC certification in Argentina: stakeholders' perception and lessons learned. *Mar. Pol.* 36, 1182-1187.

Pérez-Ramírez, M., Philips, B., Lluch-Belda, D., Lluch-Cota, S., 2012b. Perspectives for implementing fisheries certification in developing countries. *Mar. Pol.* 36, 297-302.

Pérez-Ramírez, M., Ponce-Díaz, G., Lluch-Cota, S., 2012c. The role of MSC certification in the empowerment of fishing cooperatives in Mexico: the case of rock lobster co-managed fishery. *Ocean Coast. Manage.* 63, 24-29.

Ponte, S., 2008. Greener than thou: the political economy of fish ecolabeling and its local manifestation in South Africa. *World Dev.* 36, 159-175.

Sale, P.F., Agardy, T., Ainsworth, C.H., Feist, B., Bell, J.D., Christie, P., Hoegh-Gulberg, O., Mumby, P.J., Feary, D.A., Saunders, M.I., Daw, T.M., Foale, S.J., Levin, P.S., Lindeman, K.C., Lorenzen, K., Pomeroy, R.S., Allison, E.H., Bradbury, R.H., Corrin, J., Edwards, A.J., Obura, D., Sadovy de Mitcheson, Y., Samoilys, M., Sheppard, C.R.C., 2014. Transforming management of coastal tropical seas to cope with challenges of the 21st century. *Mar. Poll. Bul.* 85, 8-23.

Sampson, G.S., Roheim, C.A., Bush, S.R., Taylor, J.E., Allison, E.H., Anderson, J.L., Ban, N.C., Fujita, R., Jupiter, S., Wilson, J.R., 2015. Secure sustainable seafood from developing countries. *Science* 348, 504-506.

Stratoudakis, Y., Azevedo, M., Farias, I., Macedo, C., Moura, T., Pólvora, M.J., Rosa, C., Figueiredo, I., 2014. Benchmarking for data-limited fishery-systems to support collaborative focus on solutions. *Fish. Res.* DOI: 10.1016/j.fishres.2014.10.001

Tlustý, M.F., 2012. Environmental improvement of seafood through certification and ecolabelling: theory and analysis. *Fish Fish.* 13, 1-13.

Supplementary materials

Table 1: Thirteen constraints to certification: definition (in bold word or phrase used in text and Figure further references), links with MSC Standard (no, indirect or direct reference in a performance Indicator of the MSC Standard) and citations for DW and other fisheries.

Constraint	Definition	Link to MSC Standard	Literature (DW fisheries)	Literature (other)
No obvious benefit from engagement with MSC	Non-existent or no evident market benefit or lack of knowledge of potential benefits from MSC certification	None	E, GV, J, MH, PRa, PRb	B, DJ
Low leadership in fishery	Lack of collective willingness to improve or change practices towards sustainability or lack of internal organization and clear leadership to drive process of engagement	None	FM, PRc (examples that overcome)	-
Information and communication barriers	Lack of information or knowledge of MSC process and possibilities for networking, partnerships and external assistance	None	E	-
Insufficient expertise at hand	Inadequate institutional frameworks or insufficiently trained people to set and perform fisheries monitoring, assessment and management	Indirect	E, FM, MH	B

Incapacity to demonstrate existing good practices (demonstration)	Fishery stable for long time, but unregistered information, assessment and management decisions make it difficult to demonstrate stability to external assessors	Indirect	J	-
Dependence on other fleets performance	Stock dynamics and ecosystem effects of fishing also dependent on fleets (national or international) beyond the one that would constitute the certification unit	Indirect	An, E	DJ
Poorly defined or open access rights	Non-existent or poorly defined access rights to fishery (unregulated commons scenario)	Direct	An, GV, PRb	-
Stock limits poorly defined or controlled	Stock movements poorly known or unknown or stock straddles national boundaries	Direct	An, E, FM	-
Poor environmental performance of fishery	Unsustainable fishing practices or lack of knowledge of potential environmental impacts resulting from its performance (in terms of stock dynamics and ecosystem structure and function)	Direct	PRa	DJ

Lack of data , monitoring or stock assessments	Missing or unreliable catch and effort statistics, non-existent or limited fisheries-independent monitoring, little or no biological information or stock assessment, making it difficult to manage the fishery appropriately	Direct	Ag, E, GV, MH, P, PRa, PRb,	Ag, DJ
Undefined or vague harvest strategy and rules	Lacking, implicit or vague harvest strategy that prevents the elaboration of clear and specific harvest control rules to apply to the fishery	Direct	E, GV, MH,	-
Weak or no enforcement	Unwillingness or incapacity to deter or penalize undue practices in the fishery or to impose harvest strategy and compliance rules	Direct	PRb	DJ
Undue subsidies	Any subsidies considered to promote overfishing and accentuate environmental degradation	Direct	-	-

Ag: Agnew *et al.*, 2013; An: Andrew *et al.*, 2007; B: Bush *et al.*, 2013b; DJ: Deighan and Jenkins, 2015; E: Eklof, 2008; FM: Foley and McCay, 2014; GV: Gardiner and Viswanathan, 2004; J: Jacquet *et al.*, 2010; MH: Macfadyen and Huntington, 2007; PRa: Pérez-Ramirez *et al.*, 2012a; PRb: Pérez-Ramirez *et al.*, 2012b; ; PRc: Pérez-Ramirez *et al.*, 2012c; P: Ponte, 2008.