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CHAPTER II

Do all answers lie within (the community)? Fishing rights and marine conservation

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The role of small-scale fisheries in developing countries has been widely discussed in the fisheries and "commons" literature. However, in the conservationist debate, even small-scale fishing has often been seen as a potential evil that indeed threatens ecosystem health and should be broadly and rapidly eliminated. Besides the global commitments to increase the protection of world's marine and coastal regions, several international *fora* have focused on the issue of how to conciliate fisheries with conservation, with both human and ecological dimensions taken into account in more contemporary governance systems (i.e., ecosystem approach to fisheries, or even fisher's self-governance). This essay draws attention to some examples from Brazil in order to consider alternatives towards community-based processes in fisheries governance and in the political economy of marine resource use. Promising pathways of potentially participative initiatives for small-scale fisheries illustrate the opportunities and challenges of current options where power imbalance between players often undermines socially-inclusive marine conservation.

Introduction

The role of small-scale fisheries in developing countries has been widely shown and discussed in the fisheries and "commons" literature (Berkes, 1989; Ostrom, 1990; Ostrom *et al.*, 1999; Allison and Ellis, 2001; Berkes *et al.*, 2001). A pro-poor function with a capacity to provide labor and cash income to resource-poor households has also been frequently associated with overexploitation (Bené *et al.*, 2010), in that there are too many fishers chasing

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too few fish and thus making too little income (Sumaila, 2008). However, the usual economic assumption that small-scale fisheries is an economic dead-end was deemed incorrect because such fisheries serve other needs in developing countries, such as human and socio-economic development, poverty reduction, employment, food security, dignity, labor buffers, adaptive markets, protein source, and social redistribution (Bené *et al*. 2007; 2010).

In some conservationist debates, in contrast, even small-scale fishing has often been seen as a potential evil that threatens ecosystems and their biodiversity health and should be broadly and rapidly eliminated (e.g. in serveral e-discussion gorups). Besides the global commitment to protect and conserve at least 10 percent of the world's marine and coastal regions by 2012 (CDB, 2006), several international *fora* have focused on how to conciliate fisheries with conservation, with both human and ecological dimensions taken into account in more contemporary governance systems (i.e., EAF, ecosystem approach to fisheries, or even fisher's self-governance).

In the real world, in the struggle to access marine resources industry leaders have the ability to push for the perennial use of the public wealth. Small firms and small communities are often seen as unwelcome impediments to the attainment of their objectives. Industrial operations in coastal and marine ecosystems have frequently been enthusiastic to claims and policies working in the direction of eliminating fishers, and biodiversity conservation initiatives may help in such a purpose even with the noble goal of environmental protection.

Marine protected areas (MPAs) have been promoted around the world as a key management tool or an effective means of protecting marine and coastal resources and biodiversity (Agardy, 1997; Allison *et al*., 1998; Hilborn *et al*., 2004), but agendas have shown little concern about their impact on the livelihoods, culture and survival of small-scale and traditional fishing and coastal communities that can certainly contribute to the success of its implementation (Diegues, 1995; 2002; Hilborn *et al*., 2005).

In some cases, when such a concern apparently exists a masked negotiation can be in place driven by veiled economic interests and political power furthermore the desired ecological concern that may have motivated or justified their original formation (Degnbol et al., 2006). Jentoft et al (2011) give pertinent examples in respect to that the perspective of MPAs as open, complex governance systems consisting of diverse stakeholder coalitions raises the issues of definitional power: whose goals are becoming the real goals of the MPAs, whose interests count more when the MPAs are designed and mandated, who wins or loses as a consequence of the way the MPA is being formed, is marine biodiversity conservation really the issue?.

There is considerable room for policy debate about the objectives: on where we want to be in the well known trade-off between the environmental impact of fishing and fishery yields, but also between marine conservation and fishing rights. There is no denying that fishing can modify marine ecosystems producing impacts to biodiversity and also that different societies make different choices about how much environmental change might be accepted in return for sustainable food production. Considering the outcomes, as suggested by Berkes and Folke (1998), by recognizing the interconnected nature of the social and ecological subsystems, and using ideas of complex adaptive systems and institutional development (Ostrom, 1990; Berkes, 1989; 2002) one can understand why relationships between actors involved in marine conservation may evolve differently in distinct contexts, territories and countries.

In one place, a stewardship role can be attributed to local small-scale communities as a sense of ownership and responsibility amongst natural resource users to manage and protect natural resources for their long-term sustainability and cultural heritage values. In another place, a project that starts with particularly acrimonious relations among the actors has little chance of success in building trust and cooperation (Chuenpagdee and Jentoft, 2007). However, in order to ensure that the known mistakes of large-scale fisheries are not repeated, it seems important to think about the shared way: while the state would have the fundamental responsibility to ensure that access to resources is fair and equitable, local communities would also have a commitment to sustainable use and protection of marine and fisheries resources (Kurien, 2002). The sharing of these mutual concerns seems to be the only way forward (Jentoft, 2003; Kurien, 2010) if honestly set, requiring a partnership accord between the interest groups involved in the fisheries sector to negotiate a trustworthy process of sharing the rights and authority for responsible stewardship (Gutierrez *et al*. 2010; Kurien, 2010).

Negotiating marine fisheries co-management in Brazil can be considered a process that is still in its infancy. The main advantage of this is that innovative governance systems can still arise from local territorial programs for small-scale fisheries and sustainable use reserves when locals and emerging leaders have a clear and open mind about the possibilities and potential of responsible fishing. The main disadvantage is that there is a long way to go to develop awareness, ethics, capacity building, organization and networking, especially in terms of fishery conservation and marine protected areas.

Nevertheless, if it is possible that marine conservation can become effective and socially inclusive and responsible, it is worth examining some available tools from the Brazilian experience. Alternatives and perspectives

will be shown by illustrating the opportunities and challenges of current options.

The Brazilian experience

Are you aware of a place where social scientists talk about conservation of biodiversity, and natural scientists are interested in community-based approaches? One can say that both the awareness of the social movements (i.e., a need for social justice) and concerns of biodiversity loss have been reaching at least a part of the Brazilian scientific community in the last decade, allowing a sort of interchanging "transdisciplinarity". If it can go reasonably in science then again in the policy debate the "social-environmental" discourse attempts to create mechanisms to implement such ideas but in practice it is difficult to transcend the political speech with ethical commitments. Here some promising pathways of potentially participative initiatives for small-scale fisheries in Brazil will illustrate the strengths and weaknesses of current available options. They seem to raise the question: Can Brazil actually hold the potential of being at the forefront of more socially inclusive marine conservation?

Country's current situation and its coastal small-scale fisheries

Brazil currently has a potentially growing economy, a multifaceted and creative culture, and notably the world's largest biodiversity wealth. Although the country still faces a difficult prospect in trying to curb illiteracy, violence and corruption in several areas, it has proven to be a stable democracy in the last couple of decades and faces no imminent social, political or economic unrest; neither is it naturally exposed to extreme events or dramatic disasters. With a coastline of around 8,000 km, which stretches over diverse ecological systems, Brazil has almost one million small-scale artisanal fishers and three million people depend on its economy (Diegues, 2008). However, these "artisanal fisheries systems" are highly vulnerable to a variety of external factors and pressures such as large-scale tourism, pollution, population pressure in the coastal zone, uncontrolled industrial development operating at the land-sea interface, oil and gas drilling, the expansion of modernized inshore fisheries and competing large-scale fleets. Nevertheless, the traditions of small-scale, inshore fishing have continued to prevail and remain the economic backbone of Brazil's coastal poor (Diegues, 2008).

Following the decline and collapse of important industrial fisheries, small-scale artisanal fishers have reoccupied some coastal waters in a process

that was described as "re-artisanalization" of fishing activities. At present, catches from artisanal fisheries represent 60% of the country's total fishery landings (Diegues, 2008). However, in the most industrialized areas of the country, the maritime territoriality of small-scale fishers has been partially or completely lost, which contributes to marginalization and poverty aggregation.

Even if Brazil still seems far from either ecologically, economically, or socially efficient science-based management programs or sustainable harvests in terms of fisheries management, some experiences and perspectives regarding community-based options for small-scale fisheries should be highlighted. When there is not a strong central government control of fishing, community-based co-management seems to be a promising alternative. In this case, territorial fishing rights can be assured in the context of marine conservation.

On the territorial concept, fishing rights and conservation

As we will see in the following sections, the concepts of territory, "territorial idea", and fishing territoriality are quite important as: (1) the local productive structure of fisheries including resources and space, (2) a notion of ownership and rights-based access in a particular living-and-working maritime space, (3) unity of development planning, (4) unity for biodiversity, natural capital, or ecosystem treatment, consequently useful for: (5) "ecosystem-based fishery management" (EBFM) which is mainly area-based, (6) "marine protected areas" (MPAs) which are, by definition, focused on a delimited space to be preserved, as well as for (7) the "large marine ecosystem" (LME) context.

This conceptualization is not trivial, since fishing territories are important for setting social objectives regarding small-scale fishing rights and conservation. As shown by Hasbaert (2005) in "The Myth of no territorialization", the territorial idea is very ancient, used in biology two centuries ago, subsequently incorporated in human sciences through geography, and reaching public policies in the last quarter of the 20th century. Territorial delimitation is not often a consequence of public policies but rather of a very peculiar articulation based on a local productive structure (Santos, 1996). Fishing territoriality is thus based on the knowledge used to locate productive fishing grounds, and its legitimacy occurs through formal or informal institutions in order to maintain long-term access through time (Malberg, 1985; Begossi, 1998). Then, fishing rights (as well as most marine conservation spatial planning) are based on a maritime territoriality idea. Territories have been used to restrict and control the way resources are exploited, and the use and transfer of commons rights. Therefore, by

defining where (and by whom) fishing is allowed, both EBFM and MPAs may affect power relationships related to territorial use rights.

MPAs refer to any coastal or marine area in which certain uses are regulated to conserve natural resources and biodiversity but also historical and cultural features. While numerous studies have examined the potential ecological and biological impacts of MPAs (Agardy, 1997; Allison *et al.*, 1998; Roberts and Hawkins, 2000; Hilborn *et al.*, 2004), few have focused on their social implications for communities and stakeholders that heavily depend on fisheries for their livelihood. Thus, a particular MPA may be both a "biological success" and a "social failure" (Christie *et al*, 2003; Diegues, 2008).

In Brazil, several MPAs have been established opportunistically and not defined either by scientific (biodiversity or cultural values) or social (e.g., aiming to preserve the livelihoods and survival of traditional fishing cultures) criteria. The implementation of no-take sanctuaries or marine parks with restricted human interventions were constrained and challenged not only by the absence of administrative infrastructure and proper capacity for compliance and surveillance (Moura *et al.*, 2007; Gerhardinger *et al.*, 2010), but also by the social justice of territorial trade-offs in the face of industrial pressure.

Genuine Brazilian MPAs: Extractive and sustainable use reserves

In the late 1980s, a new sort of protected area came about in Brazil: the so-called "sustainable use reserves" (SUR), which combined the idea of sustainable exploitation with the aim of conserving natural resources and biodiversity (Diegues, 2008). By definition, SUR are "protected areas aimed at sustainable use and conservation of natural renewable resources by traditional extractive populations". They can also be described as areas of social and ecological interest because they are based on the premise of a real capacity for exploiting natural resources in a responsible way without jeopardizing the objectives of conservation. Unlike no-take reserves, which were created by the government and supported mainly by non-governmental organizations (NGOs), SUR were an outcome of pressure from traditional communities, such as rubber tappers in the Amazon, who wanted to save the resources that afforded them a livelihood before they were completely destroyed. Later on, the concept of "extractive reserves" – a formal and legally recognized co-management system successfully instituted in the western Amazonian forest economies – evolved to the coastal and marine domains of traditional fishing communities, which turned into Marine Extractive Reserves (MER) (Diegues, 2008). Acknowledging that the environment and society stand to benefit from helping the coastal poor secure access to their

traditional sea territories and livelihood resources, MERs were a radical departure from setting up and managing no-take MPAs (Pinto da Silva, 2004). At present there are 20 coastal MER and 19 legally recognized SUR in Brazil, three of them on the coast (ICMBio, 2010).

A MER requires that certain biological, social and cultural criteria be satisfied before it is established. In MERs, fishing or aquaculture is the main, and often the only, economic activity. So a MER is a community-based, site-specific, multi-use, land and sea resource management approach based on claims of culturally distinct groups with longstanding livelihood ties to "artisan-scale" production territories (Cordell, 2006). MERs can also be considered "new commons" that are being built by coastal communities, particularly fishworkers, to protect their fishing territory from encroachment by other economic activities such as large-scale tourism, industrial fisheries, port construction, and oil and gas drilling (Diegues, 2008; Seixas *et al.*, 2009). In contrast to no-take reserves created without consulting the local people (e.g., Environmental Protection Areas off the coast of São Paulo State) and disrespecting traditional fishing rights, a MER is established mainly in response to a formal demand by local communities, fishers' associations and cooperatives. The application, addressed to the Ministry of Environment, should also indicate the approximate area traditionally used by local fishers. Assessments are required to identify fishery resources and biodiversity concerns, economic and social issues, fishing technology, markets, social organizations and conflicts, among other issues. A study by Diegues *et al.* (2008) concluded that (1) restrictions and threats of eviction (as in the case of integral protection units), are the main causes of conflicts between traditional fishers and managers, where fish resources and traditional fishers are the main losers, (2) fishers' associations must be encouraged to establish no-take zones inside the MERs to protect their natural resources, (3) the more successful reserves are those that, in addition to the sustainable use of natural resources, are able to improve fishers' incomes and provide adequate social benefits, particularly educational and health services, (4) women's participation in local associations greatly contributes to the MERs success.

It seems clear that the idea in Brazil that biodiversity conservation can be achieved only through no-take protected areas is based mainly on the fact that institutions are inefficient and incapable of managing natural resources and developing rational control rules or user consensus. Therefore, it is very important to include and spread knowledge on the available portfolio of options in the current conservation debate. On the other side, capacity that reinforces the power of traditional communities, who depend on natural resources, to make decisions needs to be strengthened (e.g., see the Recife Letter in Pedrosa, 2011).

"Territories of citizenship": Is there a potential route to strengthen fishers' self-governance?

"Territories of Citizenship" is an innovative Brazilian public policy for poverty and social inequalities reduction in the neediest regions of the country, especially in rural areas, and in support of family agriculture (Territories of Citizenship, 2009). This country-based territorial concept and policy has also migrated to the fisheries arena, considering that small-scale fishing communities are analogous to rural communities and concentrate several low-income and poor populations. Basically, the conceptual purpose of the "Territories of Citizenship" are economic development and the unification of basic citizenship programs through a strategy of sustainable territorial development, where social participation and integration of actions among the federal government, states, and municipalities are crucial to represent the reality of social groups and institutions. This approach, led by the Ministry of Agricultural Development, aims to facilitate the planning of governmental actions for the betterment of these selected regions with low human development. In 2009, the Brazilian Ministry of Fisheries and Aquaculture created the analogous program "Territories of Fisheries and Aquaculture" (MPA, 2010), to identify fishing and aquaculture territories that are threatened, with the aim of improving their capacity for self-governance by supporting their collective interests. This seems to be a promising route for strengthening community-based management in territories that deeply require collective participation for self-development and survival. This can also be the case in areas close to urban centers that are marginalized by urban societies, competing initiatives, and conservation.

However, the policy is still in its infancy and it needs a proper fund allocation, sound participatory evaluations and locally-engaged projects adapted to local ecosystems, culture and identity. The territorial approach to fisheries co-management can be an important pathway for dealing with both social exclusion and environmental degradation in Brazil. Nevertheless, it will only occur when present "territories" become legitimate with nominated and representative councils and targeted funds, focused on a more ecosystem-oriented approach. In some places, it may eventually happen independently of government institutions.

Coastal fishing agreements

Both the Ministry of Environment (through the National System of Protected Areas) (Prates and Blanc, 2007) and the Ministry of Fisheries and Aquaculture (MPA/FIPERJ, 2009) have been using another sort of community-based management tool, locally called "Fishing Agreements".

The former institution applied this new legal instrument (IBAMA IN nº 29/2002) through projects in the Amazonian region (such as the ProVárzea Project in Santarem and Mamiraua in Tefé), as a way of formalizing use and access rules defined by fishing communities in processes triggered by environmental conflicts and competition by natural resources (Oviedo *et al.*, 2003). Between 2002 and 2007, around 20 fishery management projects were undertaken involving 150,000 people, promoting the strength of institutions, raising local leadership, improving management, and making the fishing economy in Amazonia more environmentally sound (Vidal, 2010).

While more than 50 fishing agreements currently exist in the Northern region of the country, their implementation in the coastal zone is still developing. A new attempt has been made recently in a coastal community of the Southeastern region, in the State of Rio de Janeiro (Ilha Grande Bay), where conflicts between fishers and local marine protected areas are common (MPA/FIPERJ, 2009). However, the way this mechanism will be defined is still in the planning phase, subjected to the organization of co-management arrangements and to the definition of marine conservation priority goals.

The participatory aspect of "Fishing Agreements" in communities that lacked public attention and organization can be a promising differential agenda that will also require capacity building to be properly and effectively implemented.

Marine environmental compensation and fishing communities: May it flow to a healthy direction?

Compensation means recompense, i.e., the loss suffered by an owner or resource user as a consequence of being deprived of his property or resource. It can be monetary or indirect and, in the former case, the amount of compensation payable cannot be less than the monetary value into which that person/community might have converted this property/resource. Restrictive measures in marine conservation or stock recovery programs may trigger compensation processes to socio-economically vulnerable fishing communities (e.g., the cod moratorium in Eastern Canada). On the other hand, indirect compensation to fishers can occur in the case of environmental damage or disasters, such as oil spills or tsunamis, but also through the licensing of projects that will potentially impact the fisheries ecosystem, such as drilling.

In Brazil, projects that cause a significant environmental impact pay a portion (more than 0.5%) of their total cost into an environmental fund as compensation (Federal Law No. 9985/2000). This process is particularly pertinent to the issue of marine conservation and fishing rights. Each

environmental office determines which conservation area(s) is eligible to receive compensation as a result of the project's impacts. If compensation is warranted, the office also decides the exact amount of the compensation, based on the degree of impact. When a project is expected to harm a specific conservation area, the environmental office is also responsible for approving the license for the project. When compensation is warranted, the monies must be spent on the conservation area that is harmed or on creating a new conservation area, depending on the criteria of the office. Recently, negotiations led to the creation of an Environmental Compensation Fund, which will be an alternative to developers and other entities that are required to pay environmental compensation but do not want to get involved in a bureaucratic process (UNEP, 2010). This is particularly interesting because the fund that is financed by monies paid as compensation will be applied to the creation, management, and implementation of protected areas such as parks and reserves.

Moreover, increasing investments in Brazilian pre-salt and oil and gas reserves can potentially result in further funds that will provide compensation to both the marine environment and vulnerable communities, and small-scale fishers are important actors in this scene. The recent discovery of large reserves of gas along the Santos Basin off the more industrialized coast of the country has also seen increased investments in parallel activities. It is to be emphasized that benefits from related compensation funds should be applied to societal and conservation needs in a way that reaches vulnerable communities such as traditional fishers in an ethical and respectfully way .

However, processes disconnected from fishing communities can be very inefficient in making compensation work in practice. This is particularly the case when the officers in charge of fishery-related compensation programs and the paying companies are not able to monitor, verify and evaluate middlepersons reporting so that appropriate compensation occurs benefiting a particular fishing community in a corruption-free positive way based on their social-ecological reality. It seems important to alert that transparent and equal-opportunity bidding procedures are still required. Additionally, it is important that professionals engaged in participatory diagnosis do not participate in both the steps before as well as those after the approval of licensing projects (impact assessment and mitigation steps). Otherwise, the process will be biased, and real benefits will not accrue to local people. In this sense, the fishing communities' degree of organization may have a positive or negative impact on this sort of compensatory process when the definition and setting of local demands are essential steps towards beneficial pay-backs.

The development of compensation schemes that contribute to management and to local and independent responsible fishing agendas should be recommended (Maramar, 2010). Overall, the Brazilian environmental compensation process seems to be a potentially promising way to trigger community-based approaches to both small-scale fisheries management and marine conservation. However, *de facto* real benefits have not been seen so far in several affected fishing communities while it is expected that Brazilian democratic society will evolve through fairer and stronger institutions able to set these procedures in a cleaner, technical, and more solid framework.

Other ways forward: Solidarity trade networks for fisheries

The social solidarity economy is one of the responses to the current economic crisis, both for the South and the North, and should be mentioned considering that it adds value to sustainable resource use based on collective approaches and social-ecological justice. Within a global context, such an economy can only develop by establishing the link between economy and society, local and global, labor and investment, as well as production, consumption and the environment. In the fisheries world, networks of solidarity economy can enhance and trigger a virtuous cycle where market- and trade- imposed benefits of harvests are based on social well-being, economic growth and ecological health (i.e., reduction of impacts on ecosystems, proper by-catch management, and maintenance of target species population under sustainable levels). In 2010, Brazil hosted the first System of Equitable and Solidarity Trade in the world that is recognized and supported by the state (through the National Council of Solidarity Economy). The system set a series of parameters to follow during the execution of public policies aimed at creating employment and revenues through promotion of the solidarity economy and of fair trade. Its objectives include supporting consumer education in order to adopt sustainable habits, and the organization of consumers to purchase products and services from fair and solidarity trade; reinforcing the national identity of equitable and solidarity trade by publicizing the concept and by adopting practices that are inherent to it; and favoring practices of equitable prices by those who produce, commercialize and consume (NCSE, 2011).

It is expected that such a system may possibly extend to the fisheries sector in Brazil, adding value to sustainable products. In this sense, certification processes for small-scale fisheries at both the local and global scale should involve promoting these initiatives for healthy and sustainable supply-chains that include both conservation of fishery resources and fishing rights. They might promote the reduction of illegal, unregulated, and unreported fishing while supporting artisanal fishers' access to resources,

territories, and markets. Besides capture fisheries, this will also encourage market access for community aquaculture and marine fish cultivation.

On "divorced" public policies and institutional weakness

Although several instruments and mechanisms are potentially available for reconciling marine conservation with fishing rights in Brazil, a clear disconnect between different policies may drive institutional weakness that impede proper implementation of community-based fisheries management in the coastal and marine realms. The evidence raises concern about the lack of integration of the different policies, especially between those mentioned before and coastal zone management programs.

The main problems include poor inter-institutional coordination of coastal and ocean governance with fisheries and aquaculture related issues, administrative and bureaucratic systems, and structural problems for MPA delivery. A recent critical analysis (Gerhardinger *et al*., 2010) showed that the National System of Marine Protected Areas in Brazil was perceived as weak, with few recognizable marine conservation outcomes on the ground. The following major flaws were identified: institutional crisis faced by the national conservation agency; poor management within individual MPAs; an overly bureaucratic management and administrative system; financial shortages creating structural problems, and a disconnection between MPAs policy and their delivery. Furthermore, the need for a better understanding of the role of 'leaderships' in the performance of MPA networks, more effective official peer-review mechanisms, and more localized audits (and reforms if necessary) of the federal biodiversity conservation agency were also identified. It is important to highlight that a continuing focus on the designation of more MPAs while not addressing these issues on the present ones will achieve little beyond fulfilling biodiversity commitments on paper. On the other hand, an updated inclusion of fishing rights into the definition of access rules for marine conservation units will be more than pertinent.

Overall coastal zone management, which involves multiple stakeholders at local, state and national levels that in many cases overlap and conflict, and the agendas for natural resource use (living and non-living), seem to be quite incompatible. Also, bias and strong influence of other sectors that lack an environmental commitment often undermine local initiatives based on participatory processes of vulnerable communities such as fishers. For instance, there is a claim from NGOs that while they are invited to participate in public debate aiming to legitimate several decision-making processes in the coastal zone, they are not allowed to bring "real ground-based participatory agendas from the local communities". On the other

hand, the fact that different NGOs are competing for funds and influence at international and national levels seems to undermine their common goals. In addition, the lack of organization within fishing communities and the poor participation of academic institutions in public *fora* also result in weak influence of these sectors in the (non-integrated) coastal zone management as a whole.

Finally, and probably the most important dilemma that still persists without a proper answer: if the fishing communities are not organized, capable mature and capacitated to evaluate and elaborate on the benefits and damage/loss of marine conservation and fishing rights, how can they not remain confined to the eternal delivery of disconnected public policies?

A future perspective: the "science" behind fisher's knowledge

Fishers often rely on an exhaustively knowledge of the natural milieu for their livelihoods. Case studies around the globe show clearly that this knowledge can be joined in collaboration with scientists, government managers and NGOs to become effective and appropriate counterparts in fisheries science and management (Johannes *et al.*, 2000; Haggan *et al.*, 2006). In Brazil, the potential of application and incorporation of fisher's local knowledge in small-scale fisheries management has been highlighted as a promising perspective through a development more linked or rooted in the local culture. Its potential applicative role to better manage tropical fisheries (Silvano *et al.*, 2009) and also in marine high-level science programs (Gasalla and Diegues, 2011) has been discussed.

Also, new methodologies based on its application particularly directed through a policy and decision-making framework have also been locally developed. In terms of science-based global change programs, for instance, Gasalla and Diegues (2011) recently developed the so-called "ethno-oceanography" conceptual framework which has been considered promising to address environmental knowledge on global change issues by interdisciplinary modeling that combines fishers (bottom-up) with scientific knowledge (top-down).

Leite and Gasalla (2010)[2] proposed a new method to incorporate fisher's knowledge in EBFM issues in Southeastern Brazil, seeking consensus in the identification of essential fish habitats, through the spatial location of both spawning and recruits grounds of fishery resources and their seasonal patterns. Such new methods seem somehow promising for future application in participatory approaches that can contribute to reconciling fish-

2 World Small-Scale Fisheries Congress 2010 Best Student Paper Award

ing with marine conservation. It should be emphasized that the development of an "ecosystem approach to small-scale fisheries" should respect the characteristics of this type of activity. A proper approach must be locally developed to deal with its particularities and needs, very distinct from industrial-oriented fisheries policies.

Conclusion

Marine fisheries ecosystem services must be guaranteed for future generations, and both biodiversity conservation and poverty alleviation should be high-level objectives related to this goal. The political economy of natural resource use is a subject that often lacks depth in the conservationist debate. Therefore, potential instruments available for community-based and territorial initiatives in Brazil should be taken into consideration in dialogues between marine conservation and fishing rights.

The conservationist debate in developed countries plays a central role in the way the settings of no-take zones for marine conservation have evolved. However, it should be considered that wealthy and well-structure societies may be capable of appropriately compensating those vulnerable actors negatively affected by conservation policies, which may not be the case in developing countries where small-scale fishing also provides a unique source of protein and food. Moreover, some developed societies have the potential to absorb and redirect human capital to work with sectors other than fishing, which may not be possible in some developing countries. This should by no means deny the needs for more efficient marine biodiversity conservation programs in developing countries, including Brazil. However, policy integration, and local community involvement are essential for the success of such conservation goals especially when the government role on fishing is not strong or solid.

There can be still doubts about the capacity of Brazil to establish socially responsive, economically realistic and environmentally sound MPAs, but as a giant social laboratory (according to Sachs, 2006) it seems to be able to come closer to that, in regard the tropical country context. However, for this to become reality, in-depth technical capacity and experience in developing particular ways of finding solutions for good practices, as well as the support of international agencies for socially-inclusive marine conservation projects are needed.

A new paradigm should allow that marine conservation include the perspective of the people whose lives are closely intertwined with the

ocean and those who essentially make a living from fisheries. In this sense, it is likely that Brazil can become at the forefront of the construction of community-based alternatives for marine conservation that can interest fishers in environmental preservation and make local people the stewards of their territory.

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References

Agardy, M. T. (1997) *Marine protected areas and ocean conservation*. San Diego, California: Academic Press.

Allison G. W., Lubchenco, J. and Carr, M. H. (1998) Marine reserves are necessary but not sufficient for marine conservation. *Ecological Applications*, 8(S79-S92), 76.

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

Begossi, A. (1998) Property rights for fisheries at different scales: applications for conservation in Brazil. *Fisheries Research*, 34, 269-278.

Bené, C., Macfayden, G. and Allison, E. (2007) Increasing the Contribution of Small-scale Fisheries to Poverty Alleviation and Food Security. FAO Fisheries Technical Paper, 481. Rome: Food and Agriculture Organization.

Bené, C., Hersoug, B. and Allison, E. (2010) Not by rent alone: analysing the pro-poor functions of small-scale fisheries in developing countries. *Development Policy Review*, 28(3), 325-358.

Berkes, F. (1989) Common property resources. Ecology and community based sustainable development. London: Belhaven Press.

Berkes, F. and Folke, C. (1998) Linking social and ecological systems: Management practices and social mechanisms for building resilience. UK: Cambridge University Press.

Berkes, F., Mahon, R., McConney, P., Pollnac, R. and Pomeroy, R. (2001) *Managing small-scale fisheries*: *Alternative Directions and Methods*. Ottawa: International Development Research Centre.

Berkes, F. (2002) Cross-scale institutional linkages: perspectives from the bottom up. In Ostrom, E., Dietz, T., Dolsak, N., Stern, P. C., Stonich, S. and Weber, E.U., eds., *The Drama of the Commons*. Washington: National Academy Press, pp. 293-321.

Chuenpagdee, R. and Jentoft, S. (2007) Step zero for fisheries co-management: what precedes implementation. *Marine Policy*, 31, 657-668.

Cordell, J. (2006) Dynamics and challenges of MPA development and coastal protection. In *Taking Marine Management to Scale: Connecting Societies, Coastal Landscapes and the Sea*. Washington: World Bank.

Christie, P., McCay, B. J., Miller, M. L., Lowe, C., White, A. T., Stoffle, R., Fluharty, D. L., McManus, L. T., Chuenpagdee, R., Pomeroy, C., Suman, D. O., Blount, B. G., Huppert, D., Eisma, R-L, Oracion, E., Lowry, K. and Pollnac, R. B. (2003) Toward developing a complete understanding: a social science research agenda for marine protected areas. *Fisheries*, 28(12), 22-26.

Degnbol, P., Gislason, H., Hanna, S., Jentoft, S., Raakjaer Nielsen, J., Sverdrup-Jensen, S. and Wilson, D. C. (2006) Painting the floor with a hammer: Technical fixes in fisheries management. *Marine Policy,* 30(5), 534-543.

Diegues, A. C. S. (1995) Repensando e recriando as formas de apropriação comum dos espaços e recursos naturais. In Diegues, A. C. S., ed., *Povos e Mares: leituras em sócio-antropologia marítima*. São Paulo: NUPAUB-USP, pp. 209 -236.

Diegues, A. C. S. (2002) The myth of wilderness and the fate of traditional communities in the Brazilian Amazon. The Commons in an Age of Globalization, the Ninth Conference of the International Association for the Study of Common Property, Victoria Falls, Zimbabwe. http://dlc.dlib.indiana.edu/documents/dir0/00/00/08/12/

Diegues, A. C. S. (2008) *Marine protected areas and artisanal fisheries in Brazil*. India: SAMUDRA Monograph, International Collective in Support of Fishworkers.

Gasalla, M. A. and Diegues, A. C. S. (2011) People's seas: "ethno-oceanography" as an interdisciplinary means to approach marine ecosystem change. In Ommer, R. E., Perry, R. I., Cochrane, K. and Curry, P., eds., *World fisheries: A social-ecological analysis*. Oxford, UK: Wiley-Blackwell, pp. 120-136.

Gerhardinger, L. C., Godoy, E. A. S., Jones P. J. S., Sales, G. and Ferreira, B. P. (2010) Marine protected dramas: the flaws of the Brazilian National System of marine protected areas. *Environmental Management*, Online First, doi:10.1007/s00267-010-9554-7

Gutiérrez, N. L., Hilborn, R. and Defeo, O. (2011) Leadership, social capital and incentives promote successful fisheries. *Nature*, 470, 386-389.

Haesbaert, R. (2005) *O Mito da desterritorialização*. Brazil: Bertrand Brasil.

Haggan, N., Neis, B. and Baird, I. G., eds. (2006) Fishers' Knowledge in Fisheries Science. Coastal Management Sourcebooks 4. Paris: UNESCO.

Hilborn, R., Stokes, K., Maguire, J. J., Smith, T., Botsford, L. W., Mangel, M., Orensanz, J., Parma, A., Rice, J., Bell, J., Cochrane, K. L., Garcia, S., Hall, S. J., Kirkwood, G. P., Sainsbury, K., Stefansson, G. and Walters, C. (2004) When can marine reserves improve fisheries management? *Ocean and Coastal Management*, 47(3-4), 197-205.

Hilborn, R., Orensanz, J. M. and Parma, A. (2005) Institutions, incentives and the future of fisheries. *Philosophical Transactions: Biological Sciences*, 360(1453), 1471-2970.

ICMBio (2011) Instituto Chico Mendes de Conservação da Biodiversidade - Dados Gerais das Unidades. Dados Gerais das Unidades de Conservação - outubro de 2010. http://www.icmbio.gov.br/comunicacao/downloads (accessed April 13, 2011).

Jentoft, S. (2003) Co-management: the way forward. In Wilson, D. C., Nielsen, J. R. and Dengbol, P. eds., *The fisheries co-management experience: Accomplishments, challenges and prospects*. London: Kluwer Academic Publishers, pp. 1-13.

Jentoft, S, Chuenpagdee, R. and Pascual-Fernandez, J. J (2011) What are MPAs for: on goal formation and displacement. *Ocean and Coastal Management*, 54, 75-83.

Johannes, R. E., Freeman, M. M. R. and Hamilton, R. J. (2000) Ignore fishers' knowledge and miss the boat. *Fish and Fisheries*, 1(3), 257-271.

Kurien, J. (2001) Forging unity: the agenda. Indian Ocean Conference. Chennai, India: International Collective in Support of Fishworkers (ICSF) and International Ocean Institute (IOI).

Kurien, J. (2002) Some thoughts on moving from unsustainability to sustainability of tropical multi-specie eco-system and livelihood-oriented, small-scale, marine fisheries in developing countries. In Gréboval, D., ed., Report and documentation of the international workshop on factors contributing to unsustainability and overexploitation in fisheries. FAO Fisheries Report, 672. Rome: FAO, pp.161-163.

Kurien, J. (2010) Negotiating fisheries co-management in Aceh Province, Indonesia. Notes on process. OSRO/INS/601/ARC Fisheries and Aquaculture Project. Rome: FAO.

Leite, M. C. F. and Gasalla, M. A. (2010) A method for assessing fek/lek as a practical tool for ecosystem-based fisheries management: seeking consensus in southeastern brazil. *World Small-Scale Fisheries Congress,* Bangkok, Thailand.

Malberg, T. (1985) Territoriality at sea: preliminary reflections on marine behavioral territories in view of recent planning. *Man-Environment Systems,* 15, 15-18.

Maramar (2010). Maramar Institute for Responsible Management of Coastal Zone, Brazil. Environmental Governance Initiative. http://www.maramar.org.br/iniciativas/inga (accessed November 05, 2010).

Moura, R. L., Dutra, G. F., Francini-Filho, R. B., Minte-Vera, C. V., Curado, I. B., Guimarães, F. J., Oliveira, R. F., and Alves, D. C. (2007) Gestão do uso de recursos pesqueiros na reserva extrativista marinha do Corumbau, Bahia. In Prates, A. P. and Blanc, D. eds., *Áreas aquáticas protegidas como instrumento de gestão pesqueira*. Brasília: MMA/SBF, p. 179.

MPA /FIPERJ (2009) Relatorio do Acordo de Pesca: uma possibilidade para a Baía da Ilha Grande/RJ. Brasília: Ministry of Fisheries and Aquaculture Report.

MPA. (2010) Política Territorial da Pesca e Aquicultura. Brasília: MPA. http://www.mpa.gov.br/mpa/seap/Jonathan/mpa3/planos_e_politicas/docs/politica_territorial.pdf

NCSE (2011) *National Council of Solidarity Economy*. http://www.mte.gov.br/ecosolidaria/cons_default.asp (accessed April 13, 2011).

Ostrom, E. (1990) Governing the commons: The evolution of institutions for collective action. Cambridge, UK: Cambridge University Press.

Ostrom, E., Burger, J., Field, C. B., Norgaard, R. B. and Policansky, D. (1999) Revisiting the commons: local lessons, global challenges. *Science,* 284, 278-282.

Oviedo, A., Vasquez, R. and Ruffino, M. L. (2003) Acordos de pesca: A comunidade é quem faz. Brasília: WWF Brasil/IBAMA/ProVárzea.

Pedrosa, B. M. J. (2011) Uniting for Change. *Samudra report,* 58, 36-40.

Pinto da Silva, P. (2004) From common property to co-management; lessons from Brazil's first Maritime Extractive Reserve. *Marine Policy*, 28(5), 419-428.

Prates, A. P. and Blanc, D., eds. (2007) *Áreas aquáticas protegidas como instrumento de gestão pesqueira*. Brasília: Ministério do Meio Ambiente, Secretaria de Biodiversidade e Florestas.

Roberts, C. M. and Hawkins, J. P. (2000) Fully-protected marine reserves: a guide. Washington, D.C.: WWF Endangered Seas Campaign.

Sachs, I. (2006) Desenvolvimento includente, sutentável e sustentado. São Paulo: Garamond.

Santos, M. A. (1996) *A natureza do espaço*. São Paulo: HUCITEC.

Seixas, C. S., Minte-Vera, C. V., Ferreira, R. G., Moura, R. L., Curado, I. B., Pezzuti, J., Thé, A. P. G. and Filho, R. F. B. (2009) Co-managing commons: advancing aquatic resources management in Brazil. In Lopes, P. and Begossi, A., eds., *Current Trends in Human Ecology*. Newcastle upon Tyne: Cambridge Scholars Publishing, pp.156-182.

Silvano, R., Gasalla, M. A., and Pacheco, S. (2009) Application of fishers' local ecological knowledge to better understand and manage tropical fisheries. In Lopes, P. and Begossi, A. eds., *Current trends in Human Ecology*. Newcastle upon Tyne, UK: Cambridge Scholars Publishing, pp. 76-100.

Sumaila, R. (2008) Heath based fisheries management for development. International Institute of Fisheries Economics and Trade's Conference, July 22-25. Nha Trang: Vietnam.

Territories of Citizenship (2009). Territories of citizenship: integration of public policies to reduce inequalities. Brazil: Brazil Government. http://www.territoriosdecidadania.gov.br (accessed February 02, 2010).

UNEP (2010) United Nations Environmental Program. http://www.unep.org/dec/onlinemanual/Enforcement/InstitutionalFrameworks/EconomicInstruments/Resource/tabid/1016/Default.aspx (accessed April 02, 2011).

Vidal, M. D. (2010) Manejo participativo da pesca na Amazônia: a experiência do ProVárzea. *Ciência e Natura, UFSM*, 32(2), 97-120.