

PARTICIPATORY DESIGN OF A MONITORING PROTOCOL FOR THE SMALL-SCALE FISHERIES AT THE COMMUNITY OF TARITUBA, PARATY, RJ, BRAZIL¹

ANA CAROLINA ESTEVES DIAS²
CRISTIANA SIMÃO SEIXAS³

Introduction

This paper aims to discuss the design of a monitoring protocol for the implementation of a Term of Commitment in a no-take Marine Protected Area (MPA) in Brazil, in light of the Ecosystem Approach to Fisheries - EAF (FAO, 2005). This process aimed at integrating fishers' knowledge, scientific knowledge and the practices of organizations related to fishery management - a process defined by Armitage et al. (2011) as co-production of knowledge. The process was based on the Global Socio-economic Monitoring Initiative for Coastal Management (SocMon – BUNCE et al., 2000), method used in more than 30 countries to generate information for coastal management.

The Ecosystem Approach to Fisheries considers the abiotic and biotic components of ecosystems, including humans and their interactions with the environment (FAO, 2005). As management experiences are acquired and knowledge about these interactions is broadened, management strategies are revised and adapted to improve their effectiveness (LINDENMAYER, LIKENS, 2009) and to address conservation and sustainable use of fishery resources (FAO, 2003). See Box 1.

1. The authors thank the fishers from Tarituba and the ESEC Tamoios team for the partnership, and CNPq and CCRN / SSHRC for financial support. We are in debt to Deborah Prado and Natália Bahia for helping fieldwork and Nicole Dillen, Phoebe Stephens and Erin Mills who assisted in the revision of the English version.

2. Graduate Program in Ecology, State University of Campinas, dias.ac09@gmail.com

3. Environmental Studies and Research Center, State University of Campinas, csseixas@unicamp.br

Box 1 - Principles of the Ecosystem Approach (source FAO 2003)
<u>Principle 1</u> : The objectives of management of land, water and living resources are a matter of societal choice.
<u>Principle 2</u> : Management should be decentralized to the lowest appropriate level.
<u>Principle 3</u> : Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.
<u>Principle 4</u> : Recognizing potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context.
<u>Principle 5</u> : Conservation of ecosystem structure and functioning, to maintain ecosystem services, should be a priority target of the ecosystem approach.
<u>Principle 6</u> : Ecosystems must be managed within the limits of their functioning.
<u>Principle 7</u> : The ecosystem approach should be undertaken at the appropriate spatial and temporal scales.
<u>Principle 8</u> : Recognizing the varying temporal scales and lag-effects that characterize ecosystem processes, objectives for ecosystem management should be set for the long term.
<u>Principle 9</u> : Management must recognize that change is inevitable.
<u>Principle 10</u> : The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity.
<u>Principle 11</u> : The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.
<u>Principle 12</u> : The ecosystem approach should involve all relevant sectors of society and scientific disciplines.

Monitoring is the management stage that involves evaluating the effectiveness of implemented strategies and foreseeing possible adjustments to be made and should occur periodically (DANIELSEN et al., 2005). Thus, progress toward conservation can be measured, the outcome evaluated, and changes made if necessary. This is a process of learning through practice (GRAHAM et al., 2006).

Incorporating fishers' knowledge through fishers' participation in management has been considered a way to generate benefits for conservation and human well-being (FISCHER et al., 2015). The involvement of users of natural resources in management requires compliance and understanding of strategies (BERKES et al., 1994), and can be used as a tool to encourage the reflection of actors on the impact of their activities in a given environment (PEREIRA et al., 2013).

Knowledge exchange between users, resource managers and other key actors can occur at all stages of management and should be particularly encouraged in the monitoring stage. Participatory monitoring involves users and other actors who directly interact with the coastal environment and its resources, thus accumulating empirical knowledge of natural phenomena and environmental components throughout their lives and for generations (BERKES, 1999). Participatory monitoring can create arenas of discussion among fishing communities and managers regarding local practices and preservation of local livelihoods, culture and the natural environment (GRAHAM et al., 2006).

In social-ecological systems, the ecological and human dimensions are interdependent. Therefore, monitoring programs that consider both dimensions are more likely to contribute to better management of natural resources. Such programs have the potential

to incorporate a more realistic overview of the usage and dependence of the communities on natural resources (VIEIRA et al., 2005).

Participatory monitoring programs of natural environments and biodiversity vary in scope, ranging from local to global initiatives, and on monitored variables, including ecological and socio-economic aspects (e.g., TOPP-JØRGENSEN et al., 2005; ALVES et al., 2012; ORENSANZ; SEIJO, 2013; ABURTO et al., 2014). Monitoring programs are carried out through the collection of indicators capable of providing information that represents the bigger picture of the system that is being analyzed. This information is carefully selected to provide the necessary inputs required to understand the system and to help achieve the goals of the program (JØRGENSEN et al., 2010). Indicators are measurable components or attributes of a system and can also include the perceptions and attitudes of people. They are used to portray, monitor, or assess environmental conditions or changes as well as management performance (WALZ, 2000; HEINK; KOWARIK, 2010).

SocMon is an example of a global initiative that aims to gather socioeconomic information of coastal communities to inform management decisions (BUNCE et al., 2000). SocMon was used to monitor certain areas in the Caribbean islands, generating a database of social, economic, cultural and political characteristics of these areas, which included information on the impact of Protected Areas on local livelihoods and local support for their implementation. More specifically, in Jamaica, SocMon informed the first Fishery Management Plan of the country (LOPER et al., 2008).

This paper seeks to address the conflicts generated by the implementation of a marine protected area – Tamoios Ecological Station (ESEC Tamoios), in areas traditionally used by the small-scale fishers of Tarituba, at Ilha Grande Bay, Paraty, RJ. To mitigate these conflicts, managers of ESEC Tamoios, in 2012, proposed the development of a Term of Commitment (TC). The TC was prepared by an Advisory Board of the ESEC Tamoios and included a working group throughout 2012 and 2013.

The TC Working Group was composed of representatives of the Tarituba Community, the Paraty Fishers' Union, the Rio de Janeiro State Fisheries Institute Foundation (FIPERJ), the National Agency in charge of Protected Areas (ICMBio) and of the Municipal Secretariat of Fisheries and Agriculture of Paraty. The group ruled for Tarituba small-scale fishing to be allowed on two blocks of islands of the ESEC Tamoios. They also established criteria that defined the beneficiaries, the fishing gear and vessels allowed, as well as the punishments to be meted out in case of non-compliance with the rules. The TC also states the obligations of small-scale fishers and of the ESEC Tamoios, one of which is the monitoring program implemented in the agreed areas.

The TC preparation process started in 2012, but political instabilities and agenda divergences within the ICMBio (DE FREITAS, SEIXAS, 2015) delayed its completion to 2017. The implementation of the monitoring program is still under discussion as of early 2019. In this paper, we analyze the design of a protocol for monitoring small-scale fishing in the community of Tarituba, Paraty, RJ, through a participatory process, and we discuss the obstacles to its implementation.

Study site

Tarituba belongs to the municipality of Paraty, RJ and is located within the Western portion of the Ilha Grande Bay. Tarituba is within the zone of influence of the Angra dos Reis Nuclear Power Plants and within the buffer zone of the Tamoios Ecological Station (ESEC) (Figure 1). The community is composed of about 500 inhabitants (DE FREITAS, 2014), just over 1% of the more than 37,000 inhabitants of the municipality of Paraty (IBGE, 2010).

Figure 1. Delineation of the ESEC Tamoios in dark green and the community of Tarituba. The group of islands I (left) and II (right) of the ESEC Tamoios – within the red rectangle - are part of the Term of Commitment. Source: DIAS, 2015, p 99.



Tarituba is an indigenous Tupi-Guarani word meaning “place of many shells”, which refers to the shellfish that cover the sand strip of the local beach (NASCIMENTO et al., 2004). The beach is of great importance to the local population, whose livelihoods are mainly based on the extraction of fishing resources for both food and income generation. In addition to fishing, tourism and jobs in shipyards are other important sources of income in the community (BEGOSSI et al., 2010).

The national agency in charge of Protected Areas (ICMBio) registered 65 small-scale fishers living in Tarituba; out of these, 25 are classified according to the Fisheries Law (BRASIL, 2009) as commercial fishers and 40 as subsistence fishers. Fishers from Tarituba are associated with the Fisher’s Union of Paraty (Colônia Z18) and are mostly *caiçaras* (DE FREITAS, 2014). Most members of the community in Tarituba are *caiçaras*, defined as descendants of the miscegenation of indigenous peoples, Portuguese and Afri-

cans who inhabit the Southeastern and Southern coasts of Brazil. Their livelihoods are based on the direct use of natural resources, animal husbandry and small-scale agriculture (DIEGUES et al., 2000).

Tarituba's current fishing practices include trawling for white-shrimp (*Penaeus schmitti*) and Atlantic sea bob shrimp (*Xyphopenaeus kroyeri*), using setting gillnets for several fish species and white-shrimp, and a special net for snook (*Centropomus* spp.), among others (BEGOSSI et al., 2010). This last technique for snook fishing is typical of the community and is a combination of two methods: net and diving. The net is launched from a canoe to surround the shoal, followed by fishers who dive to harpoon the trapped fish (NORA, 2013; DE FREITAS, 2014). In addition to these, other gear and fishing techniques used by the Community fishers include: trolling (*corrico*), longlines (*espinhel*), hook and line and diving fishing (BEGOSSI et al., 2010).

The fishing spots most commonly used by Tarituba fishers include the surroundings of Comprida Island (group I of ESEC Tamoios' islands), the Rock of São Pedro and Araraquara Island (group II), Araçatiba Island, Cedro Island, Laje Branca, Ponta dos Meros, Sete Cabeças, Araçatiba, Pelado Island, Sandri Island (which belong to other groups of islands within or in adjacent areas of ESEC Tamoios) and the Bay of Paraty (outside the boundaries of the ESEC Tamoios, belonging to a municipal Protected Area) (BEGOSSI et al., 2010).

ESEC Tamoios is a Marine Protected Area created in 1990 (BRASIL, 1990) in response to the establishment of nuclear power plants in the region (BRASIL, 1980). ESEC Tamoios was created with little participation of adjacent communities. Community needs were therefore not considered during the creation of the MPA. The boundaries of ESEC Tamoios have been enforced since 2006 through surveillance operations, leading to conflicts with users of local marine resources (DE FREITAS, 2014).

Methods

SocMon: methodological approach

From a social-ecological perspective, SocMon – Global Socioeconomic Monitoring Initiative for Coastal Management (www.socmon.org) was developed as a complementary program to the Global Coral Reef Monitoring Network (GCRMN). GCRMN aims to generate biophysical information on coral reef ecosystems, while SocMon focuses on socioeconomic information associated with users of coastal resources. SocMon is a continuous monitoring process to support coastal management under a participatory approach, focusing on building local partnerships and drawing attention to the interactions between coastal communities and local environmental resources, including local livelihoods, resource dependence, and users' perceptions regarding the conservation status of the resources. Socmon is a low cost and flexible program that guides the generation of information relevant to coastal management (BUNCE et al., 2000).

Since 2003, SocMon has expanded its global operations, comprising six tropical regions: Central America, Caribbean, Pacific Islands, the Western Indian Ocean, as well

as South and Southeast Asia. Between 2010 and 2015, a partnership between researchers from the TransForMar Network – Transdisciplinary Research Network in Adaptive Co-management for Ecodevelopment (composed by researchers from the State University of Campinas, Federal University of Santa Catarina, Federal University of Rio Grande, and the Federal University of Paraná) and environmental managers from the National Agency in charge of Protected Areas (ICMBio) decided to include Brazil as the seventh region of SocMon. In Brazil, this partnership between TransForMar Network and ICMBio aims to implement SocMon in federally protected areas with the participation of communities that depend on coastal resources. Three pilot areas were established in Brazil: Environmental Protection Area of Anhatomirim, Ecological Station of Guaraqueçaba and Ecological Station of Tamoios (ICMBio, 2017). This study focuses on the Ecological Station of Tamoios.

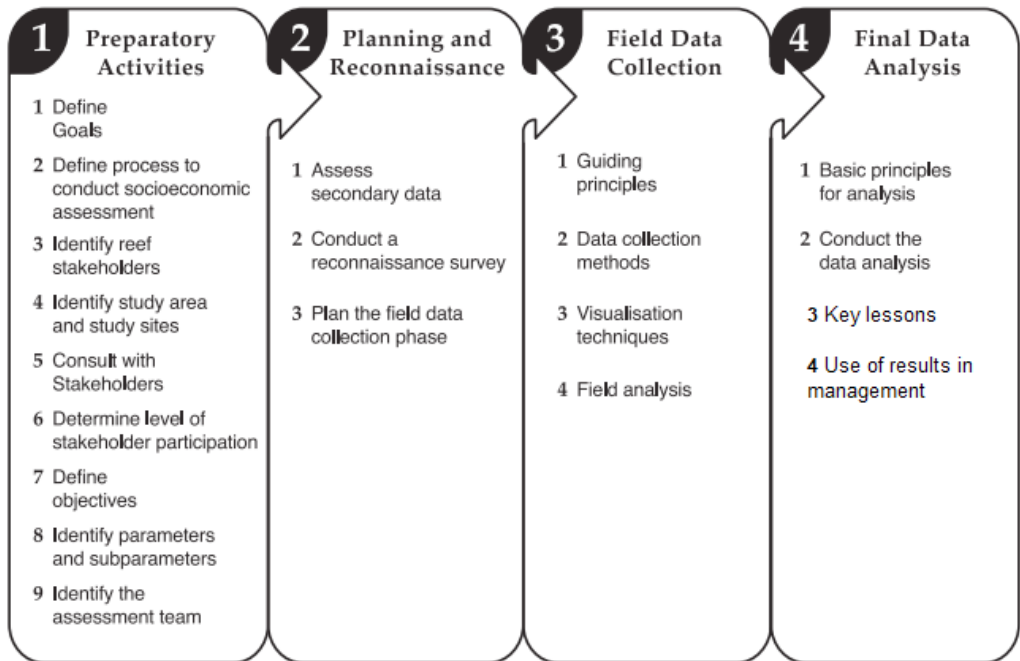
The implementation of SocMon in Protected Areas (PA) facilitates the continuity of the monitoring process and favors participatory management in the PA. In addition, SocMon encourages the integration of the human dimension in the management of PAs in Brazil (ICMBio, 2017). In many cases of fisheries management, the human dimension is not properly considered (LOPES et al., 2013). All parties involved have access to monitoring outcomes, that is, the university or the government are not in charge of monitoring alone. In all stages, local knowledge and users' perceptions of natural resources are relevant (BUNCE et al., 2000).

SocMon has the potential to assist the implementation of PA management tools, such as the Term of Commitment, to reduce local conflicts. This perspective sets itself apart from common approaches to fisheries management because it seeks to meet “the multiple needs and desires of societies without endangering the possibility of future generations benefiting from the full range of goods and services provided by marine ecosystems” (FAO, 2013). Thus, in this paper, we aim to understand the dependence of the community of Tarituba on coastal resources located inside ESEC Tamoios. The potential of SocMon in the Brazilian context from the perspective of the Ecosystem Approach to Fisheries is explored in more detail in the next sections.

SocMon: steps

SocMon is composed of four steps (BUNCE et al., 2000): 1. Preparatory activities, 2. Planning and recognition, 3. Field data collection and 4. Data analysis (Figure 2). These stages constitute an adaptive cycle, making possible the constant revision of each step to favor the adaptation and necessary adjustments to the process. The scope of this article consists of the analysis of the first and second steps, that is, the process of collective design of the monitoring protocol.

Figure 2. Steps of SocMon (Source: BUNCE, 2000).



To evaluate the relevance of carrying out this participatory process, the community was presented with a proposal in 2013 to develop a protocol to monitor fisheries in Tarituba. Data collection in the field was carried out between March 2014 and April 2015 in the community of Tarituba and at meetings of the Management Council at the office of ESEC Tamoios (Table 1). The researchers acted as facilitators in the process of developing the monitoring protocol through data collection, organization, and facilitation of the workshops.

Table 1. Steps and participants.

Activity	Date	Participants
Presentation of the SocMon method for ESEC Tamoios managers and discussion of the proposal	March/2013	ESEC Tamoios management team
Presentation and negotiation of the proposal with the community of Tarituba	March/2013	Fishers of Tarituba
Search, organization and analysis of secondary data	April/2013 to February/2014	Researchers
First field research trip and workshop preparation	March/2014	Fishers of Tarituba, ESEC Tamoios management team, Paraty Secretariat of Fisheries, and Agency in charge of Fisheries of the State of Rio de Janeiro (FIPERJ).
1st Workshop: Presentation of secondary data analysis and definition of monitoring objectives	April/2014	Fishers of Tarituba (27), President and Vice-president of the Paraty Fisher's Union (Z18), FIPERJ representatives (2), Biologist from the Secretariat of Fisheries and Agriculture of Paraty, (1), Environmental managers – ICMBio (3).
Participatory mapping	April/2014	4 experienced fishers
Semi-structured interviews	May-June/2014	22 fishers of Tarituba
2nd Workshop: Presentation of the analysis of primary data and definition of variables, indicators, and monitoring planning	August/2014	Fishers of Tarituba (27), FIPERJ representatives (6), Deputy Secretary of Fisheries of Paraty, Biologist from the Paraty Secretariat of Fisheries and Agriculture (1), Environmental managers – ICMBio (3).

Part of the preparatory activities (definition of the area of study and the demand for monitoring) occurred prior to the described research. They were defined in the scope of the Advisory Board of the ESEC Tamoios. The opportunity to develop the monitoring protocol in partnership with the State University of Campinas was identified by a researcher (DE FREITAS, 2014) who was involved in the beginning of the negotiations for the Term of Commitment (TC) between small-scale fishers of Tarituba and environmental managers of ESEC Tamoios. The TC states that the ICMBio has the obligation to: “*coordinate participatory fisheries monitoring processes in Tarituba, along with committed fishers and partner institutions*” (ICMBio, 2017).

Then, the two-stage consultation of stakeholders on their interest and availability to participate in this process took place in 2013. The proposal was presented to the managers of ESEC Tamoios and the community of Tarituba (Table 1). The initial identification of the study area and the first interactions with stakeholders took place during meetings of the Advisory Board of the ESEC Tamoios and the first visits to the field. At the meetings, it was possible to identify the working group that prepared the

TC. The key stakeholders were the members of the TC Working Group and the beneficiary fishers.

After the research proposal was approved by the managers of the ESEC Tamoios and fishers of Tarituba, we conducted a search for secondary data in online databases. This search focused on information about the social-ecological system of Tarituba and adjacent areas. Altogether, 40 bibliographic references were compiled (see DIAS, 2015); however, little information about the community was found. To supplement this information, we carried out ethnobiological research (ALBUQUERQUE; ALVES, 2016) through field observations, semi-structured interviews with 22 fishers, and a participatory mapping of the fishing areas with four experienced fishers identified through snowball sampling (BRYMAN; BELL, 2016). The ethnobiological research gathered relevant information to prepare the workshops, documenting fishers' knowledge of the target species, their respective areas of occurrence, fishing gear used, and the importance of fishing for the community (see DIAS, 2015 for details).

Although the search for secondary data was classified by the SocMon guide as part of step 2 (Planning and recognition), it was important for this research to perform this search before defining the objectives and variables of the monitoring, since the information that emerged from the search informed the definition of the monitoring objectives and variables. The objectives and indicators of monitoring were defined in two participatory workshops that took place at the school of Tarituba in 2014. Each workshop was split into two days with a total duration of 6 hours each, guided by two researchers with training in process facilitation and conflict mediation (DIAS, 2015).

During the first workshop, participants discussed the concepts of Participatory Monitoring and Indicators, and defined the objectives of monitoring through a brainstorming technique which encourages participants to share their opinions without restraints (CHAMBERS, 2002). Each participant identified their desired monitoring objectives. The shared goals were grouped by the facilitators and the participants reached a consensus of four common objectives. In addition, secondary data was presented by the facilitators, initiating a preliminary discussion on possible indicators considering the defined objectives. These discussions were extended to the second workshop.

In the second workshop, we provided the participants with a booklet containing the main concepts and the objectives established in the previous workshop, as well as presenting the results of the ethnobiological research and the step-by-step guide to define indicators – the main goal of the second workshop. Participants were divided into two groups, each of which was responsible for thinking about possible indicators for two of the objectives. The groups presented their discussions on selected indicators to the full group, and all participants chose the final indicators for each monitoring objective collaboratively. The criteria for prioritizing and choosing the indicators were: (i) simplicity of data collection, since the fishers themselves would collect them, and (ii) the potential to respond to one of the monitoring objectives. In addition, it was established that for each objective the group should choose up to three indicators.

During the second workshop, the planning stage has also started, in order to define how to collect the data as well as who was responsible for data collection. The workshop

concluded with participants' evaluation regarding the participatory process and delivery of certificates of participation. It was also established that, following the approval of the TC, the group should meet again to define the logistics to start and carry out the monitoring.

Results

Secondary data

Secondary data refers to the biodiversity of Ilha Grande Bay and fishing gear used in the region. Specific data for Tarituba community was scarce. Data on fishing landings in the municipalities of Paraty and Angra dos Reis were found in the FIPERJ fishery statistics reports, however specific and updated data for Tarituba were not available. In 2014, a partnership between FIPERJ and the Paraty Fisheries Department hosted a fishing landing data collection site in Tarituba. However, we did not have access to this data because, although it was collected it was not processed in time for the period of this research (from 2013 to 2015).

The nuclear power plants (Eletronuclear) of Angra dos Reis also carry out a monitoring program for Ilha Grande Bay, by collecting biological and physicochemical samples in the areas of ESEC Tamoios nearby the community of Tarituba. However, despite our attempts we were not given access to this data collected over 30 years. In 2016, at the XXXV Ordinary Meeting of the Advisory Board of ESEC Tamoios, the company stated that it was reviewing its monitoring program, however, when asked about the publicity of the data, the company representative said that it did not have a plan for public disclosure them.

Fishing in Tarituba has socioeconomic and cultural relevance for the local community. It is the main economic activity for many families and is also related to religious, social and leisure activities. These findings are confirmed by Begossi et al. (2008) and Hanazaki et al. (2013).

The monitoring program

During the workshops, participants established four monitoring objectives and indicators. Throughout the process, they also started to discuss how monitoring should be carried out (Table 2).

Table 2 - Objectives of monitoring, indicators, and data collection logistics.

Objective	Indicators	Method	Frequency	Sponsor
To prove the importance of fishing spots located within ESEC Tamoiosto local fisheries	% of the amount of each species caught within the discussed area (from total local production)	Landing data collected by municipal government + Fishers' logbook	7 days/month	Municipal government, Fishers, and ESEC Tamoios
	Size of individuals per species (compliance with minimum caught size)	Landing data collected by municipal government + Fishers' logbook	7 days/month	Municipal government, Fishers, and ESEC Tamoios
To contribute to Tarituba fisheries sustainability	List of caught species in each season (compliance with season closure)	Landing data collected by municipal government + Fishers' logbook	7 days/month	Municipal government, Fishers, and ESEC Tamoios
	Amount of capacity building courses offered for Tarituba fishers	Local association and ESEC Tamoios records	Every 6 month	Fishers and ESEC Tamoios
To reduce conflicts between fishers and managers	Perception of fishers on surveillance approach	Participatory assessment	Every 6 month	Fishers and ESEC Tamoios
	Number of notifications to fishers	ESEC Tamoios notification records	Every 6 month	Fishers and ESEC Tamoios
To contribute for valuing, strengthening and uniting fishers	Fishers attendance to ESEC Tamoios meetings	ESEC Tamoios meeting attendance records	Monthly	Fishers and ESEC Tamoios
	Number of meetings conducted by the local association /month	Local association meeting attendance records	Monthly	Fishers

The established objectives aim to foster the sustainability of local fishing, emphasize the importance of fishing for the community, strengthen relations between Tarituba fishers and the protected area managers, and strengthen self-organization of fishers. In order to stimulate the sustainability of fisheries and the conservation of fish stocks, participants suggested that capacity-building courses could be offered to the community. Such courses could be related to fishing sustainability and experiments that could be implemented in the region, such as to verify whether the closed season corresponds to the reproduction season of shrimp and mullet; it could also start an underwater monitoring of fishing grounds. In addition, it was argued that for a fishery to be sustainable, fish stocks should be preserved, fishers shall remain in the fishery sector and their children shall have the opportunity to join this sector when of age. Participants agreed that it should also be ascertained whether restrictions on the minimum catch size of fish species and closed seasons are being respected. The established indicators were the size of the fish caught and the list of the species caught, which should be compared with those provided for in the legislation in force corresponding to the target species.

Participants agreed that each fisher would have a logbook to record his own catch data. Further comments on the environmental conditions and changes in the local marine environment should also be logged. This information can serve as an important reference for establishing a baseline from which to compare data collected on conditions that could interfere with the results, avoiding erroneous interpretations. Tarituba fish market could also contribute to data collection via fish purchasing records. It is worth mentioning that fishery information such as total catch and fishing efforts are complementary data to be considered. These data were already being collected through the fishing landing

monitoring carried out by the Paraty municipal government and therefore were not added to this program.

Participants also agreed that the courses offered to fishers should integrate conservation and fishers' socioeconomic interests. Such courses would be promoted and registered by both fishers and the ESEC Tamoios. Some of the courses are already provided in the context of the Term of Commitment (TC) and have been a part of the monitoring design workshops.

Fishers' perceptions of surveillance approaches would be recorded in participatory meetings among fishers and a mediator by the ESEC Tamoios or an external mediator. These perceptions can be understood as a qualitative indicator regarding the improvement of the relationship between this protected area and fishers. Such an indicator should then be analyzed according to the content of the discussions that will arise at the meetings. These meetings could also be grounds for rapprochement and dialogue between fishers and environmental managers.

The notifications and warnings to fishers should be verified in the surveillance records of the ESEC Tamoios. This number would be a proxy of conflicts between fishers and the surveillance team and would also indicate the degree of compliance with the agreed rules. The number of meetings of Tarituba residents' association would be checked by community members themselves, through the records of meetings and number of participants per meeting.

During the workshops, participants stated that, when implementing the protocol, it will be necessary to consider that in addition to the rights and duties of fishers, the State (i.e., ESEC Tamoios) also has its duties, such as to supervise and control access to areas covered by the TC, among others. Fishers do not have the autonomy to control access to the area, especially when it comes to peers who are not part of the TC, as is the case of fishers from Praia Grande and Araújo Island who share the same fishing areas. Accusing their peers can leave fishers feeling trapped and embarrassed. Ideally, they would like to avoid disagreements with their peers in the surrounding communities. Participants also proposed developing a booklet for surveillance officials and fishers stating the rules and agreements established between the parties involved.

The participatory process

In order to facilitate the participation of the fishers in the design of the monitoring protocol, the workshops took place at the local school, which is considered a neutral location. The researchers facilitated the discussion during the workshops, aiming to engage participants and allowing them to express their opinions and make decisions collectively. Small group activities facilitated interaction amongst participants. These activities were followed by plenary discussions.

Despite the presence of the Secretariat of Fisheries and Agriculture of the Municipality of Paraty and FIPERJ in the workshops, participants agreed that a formal institutional partnership between ESEC Tamoios, Tarituba Community, and the Secretariat of Fisheries and Agriculture would have to be established so that data collected by the latter

would be made available to the monitoring program⁴. In addition, it would be necessary to readjust the information recorded about the fishing spots. Participants discussed the possibility of drawing up a map for landing recording in which to pinpoint areas where they have fished. Another idea that was raised involved the fishers identifying fishing spots according to the local names, and if necessary, mapping these with GPS.

During the workshops, participants agreed that monitoring should be carried out transparently and involving fishers, managers and other key institutions. Those responsible for monitoring are fishers of Tarituba and ICMBio - represented by ESEC Tamoios environmental analysts engaged in the development of TC and the design of monitoring protocol. Thus, the analysis and interpretation of the monitoring data and the decisions taken from these should be carried out jointly by the fishers and ESEC Tamoios as well as supporting institutions (such as the Secretariat of Fisheries and Agriculture, FIPERJ, and research groups). All data generated by monitoring should be compiled and shared among stakeholders in this process. Moreover, the information could be made available for future scientific research and other uses related to conservation and environmental management.

Discussion

Secondary data and the monitoring program

The elaboration of a monitoring protocol is a start point for an Ecosystem Approach to Fisheries in Tarituba. The program is intended to provide information on the different spheres that make up the community's fishing system. The various types of human-nature interaction and the different economic, social, and cultural activities carried out in the region were considered during the workshops to elaborate the monitoring protocol. These interactions should be considered when analyzing the monitoring results to help better understand the environmental issues that are directly or indirectly influenced by them (MEDEIROS et al., 2007; HOON et al., 2008).

The following principles of the Ecosystem Approach to Fisheries (FAO, 2013) were contemplated by the monitoring protocol: number 1 (environmental management as a choice of society), number 2 (decentralized management with local contribution), number 3 (focusing on the ecosystem, not only target species), and number 11 (considering diverse sources of information, including scientific and local). In addition, because this is a process for dealing with conflict, this monitoring protocol aims to provide information to adjust conservation strategies to the local reality, a goal established by Principle 9 of this approach, which affirms that changes are inevitable, and adaptations are necessary. The protocol also considers socio-economic issues related to local fisheries, satisfying Principles 4 and 10.

Secondary data and the discussions during the workshops promoted a broader perception of the participants regarding the challenges and opportunities in protecting

4. However, since early 2015, landings monitored by the municipal government was discontinued. Hence, this partnership must be reconsidered and the data collection method revised.

nature, local livelihoods, and economic development in the region. On the other hand, the practice of governmental agencies of collecting data with public resources but not making the data available to society seems to be common in Brazil, even when researchers propose to sign confidentiality agreements on information use (GARUANA, 2014). One of the foundations of the SocMon method is to use information already documented, whenever possible. The Ecosystem Approach to Fisheries could have a much lower cost if agreements were signed to share social-ecological data collected by various governmental agencies, companies, NGOs, and research institutions.

By establishing the need to collect data to inform environmental management and the monitoring protocol, it is also necessary to define a method of storing, analyzing, and disseminating data, especially when it comes to public data. In Brazil, we observe a lack of strategic vision to make existing data available, a barrier to fulfilling the demand for information for the Ecosystem Approach to Fisheries.

Failure to make public information available may also characterize a strategy of maintaining mastery over information and power over decision-making, since disclosure of data may positively or negatively affect economic activities, enterprises, or conservation efforts in the region. This fact deserves attention because it may be related to forms of corruption and the favoring of sectoral or private interests, to the detriment of conservation and/or public interests.

In designing the monitoring protocol, fishers' knowledge clarified ecosystem processes that govern local-level fishing dynamics – a fundamental aspect for an Ecosystem Approach to Fisheries. The same was identified in participatory fisheries monitoring programs in other regions of Brazil and other South American countries (DIAS, 2015). In a participatory monitoring program in the Southern Bahia Territory, coordinated by researchers from the State University of Feira de Santana, fishers' knowledge allowed for the acquisition of inaccessible data on the reproductive aggregation of local fisheries target species (MALAFAIA et al., 2014). According to Malafaia and collaborators (2014), this was an opportunity to favor the exchange of traditional and scientific knowledge, revealing potential sites of reproductive aggregation of reef species, which can inform the conservation of these resources and the regional fisheries management.

During the selection of indicators, fishers' participation favored the emergence of topics related to local culture and traditional knowledge in the realm of fisheries. In fact, the socioeconomic and cultural relevance of fisheries to the local community was documented in the present and previous research (BEGOSSI et al., 2008; HAZAZAKI et al., 2013). The suggestion to precisely map fishing spots with GPS, for example, should be discussed again with all beneficiaries of the TC, because professional secrecy about the fishing spots of each professional or group of fishers may prevail. The importance of the "secret locations of fishing spots," which are passed on for generations and are associated with the success of the fishery, has already been pointed out by several researchers (FORMAN, 1963; BEGOSSI, 2005; MALAFAIA et al., 2014). Therefore, it is necessary to evaluate whether the exposure of this information has the potential to negatively interfere in the traditional characteristics of the fishing activity and/or its success, compromising the well-being of the fishers and their families.

For the data collection phase, Tarituba fish market is a relevant partner and can provide catch and sale data. Although not included in the monitoring program, data on fish trading, such as selling price, could help to foster a sense of responsibility for fishery resources, both in fishers and consumers. Because Tarituba pursues traditional fisheries that provides fresh and quality products, the value of the environmental conservation of fish stocks can be embedded in the selling price, adding value to the local product. For that, one could think of a local label informing potential buyers that the resource was caught through sustainable fishing. If this happens, even if capturing and selling reduced amounts of fishing resources, fishers can maintain their income, avoiding socioeconomic losses and reducing the pressure on local fishing stocks.

In short, the monitoring protocol has outlined integrated social and ecological aspects and aims to identify ways to conserve the coastal-marine environment of Tarituba, with reduced negative impacts to local livelihoods. Thus, the TC implementation will be an opportunity for new experiments and evaluation of the effectiveness of this proposed management strategy. The management strategy applied by ESEC Tamoios resulting from the TC is innovative in Brazil and can become a landmark in Brazilian environmental management, focusing on both the adaptive management of natural resources and the conciliation of environmental conservation with traditional practices (e.g., small-scale fisheries). The case of ESEC Tamoios is one of the pioneers – along with the Ilha dos Currais National Park in Paraná – among Terms of Commitment signed between small-scale fishers and marine protected areas for which a monitoring program was developed through a participatory approach.

The participatory process

Social-ecological issues are multidimensional and involve people with different cultural backgrounds and life perspectives. Managing protected areas, which aim to integrate environmental conservation with previously ignored local livelihoods, requires creating dialogue among stakeholders and understanding of local life prospects. Thus, the communication between the environmental managers that have technical practice, researchers that favors advances in social-ecological knowledge, and fishers with empirical knowledge regarding local social and environmental dynamics allowed for the design of a monitoring protocol appropriate for Tarituba. In this knowledge co-production process, the participation of the researchers as facilitators of the process favored the communication and knowledge braiding by being neutral parties in the process.

Local knowledge, as well as technical-scientific knowledge, may present gaps, and both are complementary (BERKES et al., 2000). The knowledge coproduction (ARMI-TAGE et al., 2011) and its application to design the protocol of participatory monitoring of the Tarituba small-scale fisheries contributed to the understanding of the complexity of regional conservation issues. In the workshops, fishers played an active role in designing the monitoring protocol. These workshops represented arenas of collective learning and empowerment of fishers in relation to the monitoring process and their livelihoods. In addition to contributing through local and traditional ecological knowledge, the participa-

tion of fishers in management can stimulate conservation actions. Collective discussions on the fishing system, like in the workshops, and potential management measures may favor collective reflection on the relevance of natural cycles of fishing species and the need to review ineffective management strategies in place.

Fostering local participation in decision-making regarding coastal management and conservation through participatory research (TRIMBLE; BERKES, 2013) was clearly achieved in Tarituba. It included the mobilization and commitment of fishers to design the monitoring protocol and communicate with other stakeholders. The long-term collaboration of the University with communities in the region has enabled trust building ties with Tarituba fishers and an accumulation of information about the region⁵. In fact, researchers in many cases facilitate interactions between environmental managers and local communities (SOWMAN, 2009; DIAS, 2015).

Despite its relevance, participation in management is restricted by institutional obstacles, including: (i) the divergence of opinion among environmental managers of the ESEC Tamoios themselves regarding the legality of the TC in the case of Tarituba considering that the community does not live within the ESEC Tamoios but in coastal areas adjacent to this marine protected area; (ii) lack of transparency in the decisions made by different ICMBio spheres, including divergence of understanding from agreements established locally within the Advisory Board of ESEC Tamoios and what is considered acceptable by the ICMBio headquarters; and (iii) the political instability of guidelines established by the Ministry of the Environment, with frequent changes of ministers in power.

The monitoring protocol has not yet been implemented because of the delayed of TC approval. The lack of transparency in the criteria used for decisions made in the various local or federal instances and the lack of alignment of these instances lead to the discrediting of ICMBio and reduce the motivation of fishers to engage in participatory processes.

Final considerations

This monitoring protocol of Tarituba small-scale fisheries was the first effort in Brazil guided by the SocMon method, under the principles of the Ecosystem Approach to Fisheries. Since 2015, other partnerships among ICMBio, researchers and local communities have been built to use SocMon on other pilot areas in Brazil (ICMBio 2017). This method allows engaging resource users in environmental management, emphasizing the importance of conservation of fishing resources and generating useful information to inform protected area management. In addition, SocMon has proven to be a useful tool for improving dialogue between environmental managers and small-scale fishers, and among fishers themselves. By valuing local knowledge and discussing monitoring objectives to meet the demands of both parties (managers and fishers). This tool has helped to strengthen a collaborative process, minimizing some conflicts between the parties, once it fosters collaboration and commitment of both parties in providing and

5. In the research dissemination workshop of a project carried out for five years in several communities in Paraty, community members and managers also reassured the university's commitment to local issues and researchers' facilitation role.

using information. During the design of the monitoring protocol, fishers acknowledged being part of the process and expected to comply much more with the rules agreed on in the TC than with the rules imposed upon them from the top-down implementation of the ESEC Tamoios.

Although there are already tools and methods to develop monitoring protocols for the sustainable use of coastal resources in Brazil, as well as partners interested in designing such protocols, their implementation is being hampered by lack of political engagement, agreement, and clarity on the guidelines established by government institutions (e.g., ICMBio). By failing to commit to long-term participation in environmental management in which users of natural resources are protagonists (as in the process described here), governmental bodies inhibit the engagement of users in other participatory processes.

Fostering sustainability of protected areas requires building and maintaining relationships of trust with users of natural resources. The discontinuity in participatory processes, such as delaying the approval of the TC (i.e., the process started in 2012 and was only concluded in 2017), results in weakening such relations. This delay also highlights the need for alignment between the different management instances (i.e., local – e.g., managers of ESEC Tamoios, and federal – e.g., the ICMBio headquarters). In the case of Tarituba, although the monitoring program was drawn up collaboratively by the efforts of local fishers, managers of ESEC Tamoios and other partner institutions, fishers were discouraged from continuing their participation in management processes of ESEC Tamoios and other protected areas in the region. This results from the fact that the federal government failure to respond for several years to the demand for the TC. This trust weakening and fisher discouragement to enroll in participatory processes can compromise pursuing the Ecosystem Approach to Fisheries in both short and long terms, as it would require time and effort from fishers, with no apparent benefit but further constraints to their livelihoods.

References

- ABURTO, J.A.; STOTZ, W.B.; CUNDILL, G. Social-ecological collapse: TURF governance in the context of highly variable resources in Chile. *Ecology and Society*, v.19 (1), n.2, 2014.
- ALBUQUERQUE, U.P.; ALVES, R.R.N. **Introduction to ethnobiology**. Heidelberg: Springer, 2016.
- ALVES, D.C.; MOURA, R.L.; MINTE-VERA, C.V. Estimativa da captura total: desenhos amostrais para pesca artesanal. *Interciência*, v.3, p.899-905, 2012.
- ARMITAGE, D.; BERKES, F.; DALE, A.; KOCHO-SHELLENBERG, E.; PATTON, E. Co-management and the co-production of knowledge: Learning to adapt in Canada's Arctic. *Global Environmental Change*, v.21, n.3, p.995-1004, 2011.
- BEGOSSI, A.; LOPES, P.F.M.; OLIVEIRA, L.E.C.; NAKANO, H. **Ecologia de pescadores da baía de Ilha Grande**. São Carlos: Rima, 2010.

BEGOSSI A. Fishing spots and sea tenure: incipient forms of local management in Atlantic Forest coastal communities. **Human ecology**. v.23, n.3. p.387-406, 1995.

BERKES, F. **Sacred Ecology. Traditional Ecological Knowledge and Resource Management**. Philadelphia: Taylor & Francis, 1999.

BERKES, F.; COLDING, J.; FOLKE, C. Rediscovery of traditional ecological knowledge as adaptive management. **Ecological Applications**, v.10, n.5, p.1251-1262, 2000.

BERKES, F.; FOLKE, C.; GADGIL, M. Traditional ecological knowledge, biodiversity, resilience and sustainability. In: PERRINGS, C.A.; MÄLER, K.G.; FOLKE, C.; JANS-SON, B.O. & HOLLING, C.S. **Biodiversity Conservation**. Dordrecht: Kluwer Academic Publishers; 1994. p.269-287.

BRASIL. Decreto n.84.973, de 29 de julho de 1980. Dispõe sobre a co-localização de Estações Ecológicas e Usinas Nucleares. **Diário Oficial da Brasília**, DF, 29 jul. 1980, Seção 1, p.15195.

BRASIL. Decreto n. 98.864 de 23 de janeiro de 1990. Cria a Estação Ecológica de Tamoiós, e dá outras providências. **Diário Oficial da União**, Brasília, DF, 24 jan. 1990, Seção 1, p.1714.

BRASIL. Lei n. 11.959, de 29 de junho de 2009. Dispõe sobre a Política Nacional de Desenvolvimento Sustentável da Aquicultura e da Pesca, regula as atividades pesqueiras, revoga a Lei no 7.679, de 23 de novembro de 1988, e dispositivos do Decreto-Lei no 221, de 28 de fevereiro de 1967, e dá outras providências. **Diário Oficial da União**, Brasília, DF, 30 jun. 2009, Seção 1, p.3.

BRYMAN, A.; BELL, E. **Social Research Methods**. Fourth Canadian Edition. Don Mills: Oxford University Press, 2016.

BUNCE, L.; TOWNSLEY, P.; POMEROY, R. & POLLNAC, R. **Socioeconomic Manual for Coral Reef Management**. Townsville: Australian Institute of Marine Science, 2000.

CHAMBERS, R. **Participatory Workshops – a source of 21 sets of ideas and activities**. London: Earthscan, 2002.

DANIELSEN, F.; BURGESS, N.D.; BALMFORD, E.A. Monitoring matters: examining the potential of locally-based approaches. **Biodiversity and Conservation**, v.14, n.11, p.2507-2542, 2005.

DE FREITAS, R.R.; SEIXAS, C.S. Desafios e oportunidades para robustez institucional da pesca artesanal costeira em uma área marinha protegida do sudeste brasileiro. **Anais do VII Seminário Brasileiro sobre Áreas Protegidas e Inclusão Social e II Encontro Latino Americano sobre Áreas Protegidas e Inclusão Social**, p.527-536, 2015.

DE FREITAS, R.R. 2014. **Implicações de políticas de conservação e desenvolvimento na pesca artesanal costeira em uma área marinha protegida da Baía da Ilha Grande**. Tese (Doutorado em Ambiente e Sociedade), Instituto de Filosofia e Ciências Humanas, Universidade Estadual de Campinas, Campinas, SP. 2014.

DIAS, A.C.E. **Monitoramento participativo da pesca na comunidade de Tarituba, Paraty-RJ: conciliando conservação e pesca artesanal.** Dissertação (Mestrado em Ecologia), Instituto de Biologia, Universidade Estadual de Campinas, Campinas, SP. 2015.

DIEGUES, A.C.; ARRUDA, R.S.V.; SILVA, V.C.F.; FIGOLS, F.A.B.; ANDRADE, D. **Os Saberes Tradicionais e a Biodiversidade no Brasil.** São Paulo: Ministério do Meio Ambiente, COBIO/ NUPAUB, 2000.

FISCHER, J.; JORGENSEN, J.; JOSUPEIT, H.; KALIKOSKI, D.; LUCAS, C.M. **Fishers' knowledge and the ecosystem approach to fisheries: applications, experiences and lessons in Latin America.** Rome: Food and Agriculture Organization, 2015. (FAO Fisheries and Aquaculture Technical Paper, 591).

FAO. **The ecosystem approach to fisheries.** Rome: Food and Agriculture Organization, 2003 (FAO Fisheries Management Technical Guidelines for Responsible Fisheries, 4, Suppl. 2).

FAO. **Putting into practice the ecosystem approach to fisheries.** Rome: Food and Agriculture Organization, 2005.

FAO. **Aplicação prática da abordagem ecossistêmica às pescas.** Rome: Food and Agriculture Organization, 2013.

FORMAN S. Cognition and the catch: the location of fishing spots in a Brazilian coastal village. **Ethnology.** v.6, n.4, p.417-26, 1967.

GARUANA, L.S.S. 2014. **Vulnerabilidade na Pesca Artesanal Costeira do Estado de São Paulo frente às Mudanças Ambientais Globais.** Tese (Doutorado em Ambiente e Sociedade), Instituto de Filosofia e Ciências Humanas, Universidade Estadual de Campinas, Campinas, SP. 2014.

GRAHAM, J.; CHARLES, A.; BULL, A. **Community fisheries management handbook.** Halifax: Gorsebrook Research Institute, Saint Mary's University, 2006.

HEINK, U.; KOWARIK, I. What are indicators? On the definition of indicators in ecology and environmental planning. **Ecological Indicators,** v.10, n.3, p.584-593, 2010.

HOON, V.G.; SRISKANTHAN, P.; TOWNSLEY, B.; CATTERMOUL, L.; BUNCE L.; POMEROY, V. **Socioeconomic monitoring guidelines for coastal managers in South Asia, SocMon South Asia.** IUCN/CORDIO, 2008.

IBGE - Instituto Brasileiro de Geografia e Estatística. 2010. **Censo demográfico 2010.** Disponível em: <www.ibge.gov.br>. Acesso em: 03 dez 2013.

ICMBio - Instituto Chico Mendes de Conservação da Biodiversidade, Coordenação Regional 8, Estação Ecológica de Tamoios. Minuta final do Termo de Compromisso. **Informação Técnica n. 21** de 26 de novembro de 2013, Angra dos Reis, 2013.

ICMBio. 2017. **SocMon Brasil: síntese das lições aprendidas.** Brasília: ICMBio. 88p. Disponível em: http://www.icmbio.gov.br/portal/images/stories/comunicacao/publicacoes/publicacoes-diversas/socmon_brasil_sintese_das_licoes_aprendidas.pdf

- JØRGENSEN, S.E.; XU, F.L.; SALAS, F.; MARQUES, J. Application of indicators for the assessment of ecosystem health. In: JØRGENSEN, S. E., XU, F. L., COSTANZA, R. (orgs.) **Handbook of Ecological Indicators for Assessment of Ecosystem Health**. 2 ed. Boca Raton: Taylor & Francis, p.5–65, 2010.
- LINDENMAYER, D.B.; LIKENS, G.E. Adaptive monitoring: a new paradigm for long-term research and monitoring. **Trends in Ecology and Evolution**, v.24, n.9, p.482-486, 2009.
- LOPER, C.; POMEROY, R.; HOON, V.; MCCONNEY, P.; PENA, M.; SANDERS, A.; SRISKANTHAN, G.; VERGARA, G.; PIDO, M.; VAVE, R.; VIEUX, C.; WANYONYI, I. **Socioeconomic conditions along the world's tropical coasts: 2008**. SocMon Global Report, 2008.
- LOPES, P.F.M.; ROSA, E.M.; SALYVONCHYK, S.; NORA, V. & BEGOSSI, A. Suggestions for fixing top-down coastal fisheries management through participatory approaches. **Marine Policy** v.40, p.100-110, 2013.
- MALAFAIA, P.N.; OLAVO, G.; FRANÇA, A.R.; SEARA, F.S.; FREITAS, M.B.O.; ALMEIDA, J.C.; ALENCAR, S.M.; REGO, L.S.; CASTRO, M.S. Experiência de monitoramento participativo a bordo de embarcações da pesca artesanal no Território da Cidadania do Baixo Sul da Bahia, Brasil. **Desenvolvimento e Meio Ambiente**, v.32, p.165-180, 2014.
- MEDEIROS, R.P.; MATAREZI, J. BONILHA, L.E.C.; WAHRLICH, R. 'Se der rebojo de vento vai dar tainha' - elementos para o monitoramento participativo da pesca artesanal - lições do litoral sul do Brasil. In: COSTA, A.B. (org.) **Nas redes da pesca artesanal**. Brasília: PNUD/ IBAMA, p.203-224, 2007.
- NASCIMENTO, A.E.; NETTO, P.J.B.; BULHÕES, S.F. **Vamos indo na ciranda. Mestre Chiquinho de Tarituba: de bailes e histórias**. Rio de Janeiro: DP&A, 2004.
- NORA, V. 2009. **Ecologia e etnoecologia de robalos (*Centropomus undecimalis*, Bloch, 1792 e *Centropomus parallelus*, Poey, 1860) na Baía de Paraty, RJ, Brasil**. Dissertação (Mestrado em Ecologia), Universidade Santa Cecília, Santos, SP. 2009.
- ORENSANZ, J.M.; SEIJO, J.C. **Rights-based management in Latin American fisheries**. Rome: Food and Agriculture Organization, 2013. (FAO Fisheries and Aquaculture Technical Paper, 582).
- PEREIRA, R.C.; ROQUE, F.O.; CONSTANTINO, P.A.L.; SABINO, J.; UEHARA-PRADO, M. **Monitoramento in situ da biodiversidade**. Brasília: ICMBio; 2013.
- SEIXAS, C.S.; DIAS, A.C.E.; De FREITAS, R.R. Navigating adaptive co-management in Paraty, Brazil: winds, turbulence, and progress. In: Charles, T. Armitage, D.; Berkes, F. **Governing the Coastal Commons: Communities, Resilience and Transformation**. The Hague: Routledge, p.157-180, 2017.
- SOWMAN, M. An Evolving Partnership: Collaboration between 'experts' and a net-fishery. **Gateways**, v.2, p.119-143, 2009.

TOPP-JØRGENSEN, E.; POULSEN, M.; LUND, J.F. MASSAO, J.F. Community-based Monitoring of Natural Resource Use and Forest Quality in Montane Forests and Miombo Woodlands of Tanzania. **Biodiversity & Conservation**, v.14, n.11, p.2653-2677, 2005.

TRIMBLE, M.; BERKES, F. Participatory research towards co-management: Lessons from artisanal fisheries in coastal Uruguay. **Journal of Environmental Management**, v.128, p.768-778, 2013.

VIEIRA, PF; BERKES, F; SEIXAS, C.S. **Gestão Integrada e Participativa dos Recursos Naturais: Conceitos, Métodos e Experiências**. Florianópolis: Secco/APED, 2005.

WALZ, R. Development of environmental indicator systems: experiences from Germany. **Environmental Management**, v.26, n.5, p.613–623, 2000.

Submitted on: 10/05/2017

Accepted on: 01/02/2019

<http://dx.doi.org/10.1590/1809-4422asoc0070r2vu19L1AO>

2019;22:e00702

Original Article

PARTICIPATORY DESIGN OF A MONITORING PROTOCOL FOR THE SMALL-SCALE FISHERIES AT THE COMMUNITY OF TARITUBA, PARATY, RJ, BRAZIL

Abstract: This paper aims to describe and analyze the design of the participatory monitoring protocol of Tarituba, a fishing community in Southern Brazil, and to discuss the setbacks for its implementation. The protocol aimed to integrate fishers' scientific and technical knowledge under the ecosystem approach to fisheries, employing a pioneering method prevalent in the Brazilian coastal region: The Global Socioeconomic Monitoring Initiative for Coastal Management (SocMon). Monitoring goals lie in the socioecological sustainability of local fisheries and seek to solve conflicts resulting from fishing restriction due to the establishment of a Protected Area. SocMon was a useful tool to improve communication between and among fishers and managers. The legitimacy of the process was reinforced by participation of the fishers; however, the long waiting period preceding the implementation of the jointly agreed upon term caused frustration and mistrust amongst fishers, compromising future participation.

Keywords: Biodiversity Conservation, Participatory management, Protected Areas, Social-ecological Systems, Tamoios Ecological Station.

Resumo: Este artigo analisa o processo de elaboração do protocolo de monitoramento participativo da pesca artesanal da comunidade de Tarituba, Paraty, RJ e discute os entraves à sua implementação. Este protocolo visou integrar conhecimento local, técnico e científico, sob a perspectiva de Gestão da Pesca com Enfoque Ecológico, experimentando um método pioneiro no Brasil, SocMon. O monitoramento – parte de um Termo de Compromisso (TC) – visa a sustentabilidade socio-ecológica da pesca local, buscando solucionar conflitos resultantes da restrição a essa atividade. O SocMon mostrou-se uma ferramenta útil para expandir o diálogo entre gestores e pescadores, e entre os próprios pescadores. Ao valorizar o conhecimento local, o processo contribuiu para fortalecer um processo colaborativo e a legitimidade do TC, minimizando alguns conflitos entre as partes. Porém, a morosidade governamental gerou frustração e desconfiança por parte dos pescadores podendo comprometer processos participativos futuros.

Palavras-chave: Conservação da biodiversidade, Estação Ecológica de Tamoios, Gestão Participativa, Sistemas Socio-ecológicos, Unidades de Conservação

Resumen: Este artículo tiene como objetivo describir y analizar el protocolo de monitoreo participativo de la pesca artesanal de la comunidad Tarituba, Paraty, RJ y discutir los obstáculos para su aplicación. Este protocolo buscó integrar el conocimiento de los pescadores, técnico y científico, bajo el enfoque ecosistémico de la pesca, utilizando un método nuevo para la costa brasileña: SocMon (Iniciativa Global de Monitoreo Socioeconómico para la gestión costera). Los objetivos establecidos buscan la sostenibilidad de las pesquerías y la resolución de los conflictos provocados por restricciones a la pesca. La participación de los pescadores favoreció la legitimidad del proceso. El SocMon se mostró una herramienta útil para adaptar reglas implementadas sin participación y para mitigar conflictos ambientales entre administradores y los pescadores. Sin embargo, la ralentización del proceso genera frustración y desconfianza por parte de los pescadores, comprometiendo futuros procesos de gestión participativa.

Palabras clave: Administración participativa, Estación Ecológica de Tamoios, Áreas Protegidas, Conservación de la biodiversidad, Sistemas socio-ecológicos
