

## **SPECIAL PANEL:**

### **Common property artisanal fisheries – I**

**Coordination:** Alpina Begossi, Peter May and Valéria Vinha

#### **“Payments for environmental services: applications to coastal fisheries contexts in Rio de Janeiro, Brazil”**

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#### **Abstract:**

Payments for environmental services (PES) have been widely employed to compensate people for the non-use or improved management of natural resources, especially in forestry systems. Such compensation has been used on all continents, particularly in Latin America. PES represent instruments that can be used to compensate users for refraining in part or whole from the process of extraction of natural resources or from cultivating specific areas or cultivating during a specific period of time. PES can serve as a stimulus to gain the support of local inhabitants for the maintenance of biodiversity. PES are of great utility in areas where rural and poor people depend on the use of natural resources for their well-being and for their livelihoods, which is the case for artisanal fishers in Brazil. Small-scale artisanal fisheries are widespread along the Brazilian coast and rivers, and these fisheries generate considerable economic and social value in developing countries. Such fisheries provide a diversity of animal protein through fish resources for local and regional markets. Estuarine and reef fish species, such as snook and groupers, along with the pelagic bluefish, are important sources of protein from Brazilian coastal fisheries. Approximately 50% of all fish production in Brazil comes from artisanal fisheries. In this study, we developed proposals for the application of PES to fishery systems, which was an approach initiated in earlier studies conducted in Arraial do Cabo and in Paraty along the coast of Rio de Janeiro State, Brazil. In the present study, we further develop a PES approach applicable to artisanal fisheries that could employ mechanisms that already exist in Brazilian fisheries, such as the defeso system (off-season salary compensation to artisanal fishers), or that could take other forms, such as partnerships with private enterprises, as developed in Costa Rica. Our proposal to develop PES applied to fisheries considers the following: 1) the importance of artisanal fishing as an economic resource; 2) the importance of the management of artisanal fisheries as part of biodiversity conservation strategies; 3) the occurrence of conflicts between artisanal and industrial fishers; 4) the existence of incipient local property rights definitions to manage artisanal fisheries through rules governing the use of fishing areas; 5) the existence of protected areas; and 6) the possibility of multilevel co-management processes. The system of application of PES to small-scale fisheries takes into consideration co-management instruments that already exist in Brazilian fisheries such as “fishing agreements” (FAs) that can be meshed with PES.

In this analysis, we explore three small-scale fisheries contexts along the coast of Rio de Janeiro: Arraial do Cabo, an extractive reserve; Sepetiba Bay, an industrial area; and Paraty, a major touristic area. For each case, we elaborate examples that could serve as a foundation upon which to base PES in fisheries. In the case of Arraial do Cabo, there is a pre-existing system of co-management, an ‘extractive marine reserve’, managed by local communities and the central (federal) governmental agency for the management of protected areas, ICMBio. Therefore, in this area, there are instruments that can be used to manage the fisheries that are based on governmental support. For the case of Sepetiba Bay, a highly

industrial site, there are approximately 12 fishing communities that are relatively organized into associations or Fishing Colonies. These communities have access to private corporations that impact their activities and have the power to demand monitoring and management, and these communities might be mobilized to develop more elaborate forms of PES. Finally, in Paraty, a major tourism site, local demands from artisanal fishers might be intermeshed with a scheme to protect areas selected for the maintenance of biodiversity. In short, PES can become a flexible mechanism for dealing with the management of small-scale fisheries in different contexts as well as for reducing conflicts between fishers and other users, including governmental agencies and private resource users.

**Keywords:** Payments for Environmental Services; Fisheries; Co-management

### **“Payment for environmental services: a way to involve fishers in cetaceans’ conservation”**

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#### **Abstract:**

The interactions between fisheries and cetaceans have been widely discussed by several authors. Bycatch of small cetaceans is frequent around the world, threatening several species. In Brazil, in two critical areas (Marajó Island and São Sebastião), more than 70% of the local fishers (n= 40 and n=70, respectively) interviewed in a previous study reported bycatch of Guiana dolphin (*Sotalia guianensis*) or Franciscana dolphin (*Pontoporia blainvillei*) in gillnets. Other negative interaction involving fisheries and cetaceans is the entanglement of Southern right whales in fishing nets during their migration along the coast, as reported by 68% of the fishers interviewed in the South of Brazil. On the other hand these interactions result in damage of the fishing gear and great economic losses to the fishers. To minimize these conflicts we suggest the adoption of strategies involving interested fishers in bycatch monitoring programs, where fishers could collect local data on the areas and frequency of dolphins’ accidental catches, consequently increasing their awareness of the problem and providing a better baseline to support educational and regulatory measures related to cetaceans’ bycatch. As a compensation for the time and energy spent in these programs, fishers could receive a “payment for environmental services” (PES), as an economic incentive to their participation, which would contribute to their economic stability as well as to cetaceans’ conservation.

**Key words:** Payment for environmental services, fishers, cetaceans, conservation

### **“Behavioral and environmental influences on fishing rewards in the Lower Tocantins River, Brazilian Amazon”**

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#### **Abstract:**

Few surveys have investigated the factors influencing fish catches in small scale artisanal fisheries, notwithstanding their importance to provide food and income to millions of people worldwide. Our major goal was to analyze the relative influence of environmental (seasonality and habitat) and socioeconomic (fishing community, effort and gear used) factors on the amount of fish catch in the Lower Tocantins River, Brazilian Amazon (downstream from a large dam). We sampled 572 fish landings from five artisanal fishing communities during 67 non-consecutive days in four hydrological seasons. We used General Linear Models (GLM) considering as dependent variable the biomass of fish caught (in kg)/fishing trip. This variable is strongly and positively related to the economic reward (in US\$) of each fish landing ( $r^2 = 0.97$ ;  $n = 572$ ,  $F = 18940$ ;  $p < 0.0001$ ), thus being a proxy for fishers' income and food provision. The independent variables (factors) used in the analyses were: number of fishers, time spent fishing, fishing gear, kind of boat (measures of effort), distance (travel time in minutes) that fishers travelled to fishing grounds, fishing community, season and habitat. The GLM including all these factors accounted for 43% of the variation in the biomass of fish caught ( $r^2 = 0.43$ ;  $F_{17,555} = 26.2$ ;  $p < 0.001$ ). Three factors explained most of the variation in the biomass of fish caught and were positively and significantly related to the biomass of fish caught: time spent fishing (42%,  $F_{1,571} = 97.6$ ;  $p < 0.0001$ ), distance travelled to the fishing ground (12%,  $F_{1,571} = 27.3$ ;  $p < 0.0001$ ) and number of fishers (10%,  $F_{1,571} = 23.4$ ;  $p < 0.0001$ ). All these variables are related to fishers' behavior and fishing effort. The habitat where fishing occurs accounted for 10 % of the variation in fish biomass ( $F_{4,568} = 5.6$ ;  $p = 0.0002$ ): fishers caught more fish in the floodplain lakes (median = 36 kg; lower 25% quartile = 12, upper 75% quartile = 55) compared to all other habitats ( $H = 57.6$ ;  $p < 0.0001$ ). All other factors were significant, but explained a lower percentage of the variation in the biomass of fish caught (<8 %). The GLM analyzing the same set of variables, but including only those fish landings on which fishers used paddled boats ( $n = 462$ , 80 % of total fish landings) showed similar results, except for the fact that season explained more (14 %,  $F_{3,459} = 6.3$ ;  $p = 0.0003$ ) of the variation of fish caught compared with the previous model. Therefore, fishers' behavior related to fishing effort was the major factor influencing fish catches in this large impounded Amazonian river, being more important than the season or habitat where fishing occurs. Such behavioral influence on fishing pressure and economic rewards should be considered when devising fisheries management measures for this and similar regions.

### **“Comparisons of Past and Current Ecosystem Services Reveals Drivers of Change: a study from Paraty, Southeastern Brazil”**

Luiz Eduardo Chimello de Oliveira and Fikret Berkes (*Natural Resources Institute, University of Manitoba, Canada*)

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#### **Abstract:**

Although different frameworks have been developed in recent studies focusing on ecosystem services, researchers have paid little attention at identifying past states of ecosystem services and their evolving relationships with human well-being. The objective of this paper is to provide some insights about how the comparison between past and current ecosystem services can reveal important information about changes in social-ecological systems. In this paper, we define ecosystem services as features of social-ecological systems directly or indirectly used (consumed or enjoyed) by humans to generate well-being. There are four basic categories of ecosystem services: provisioning, regulating, cultural, and supporting. Ecosystem services are intimately related to human well-being because they provide basic material for a good life, health, good social relations, security, and freedom of choice and action. A qualitative approach was used to collect data in Tarituba, a Caiçara (a mixed-heritage group of native Brazilians, Africans and Europeans) community within Paraty municipality. The main data collection procedure was participant observation on the several activities happening at community level. Like in other Caiçara villages, Tarituba is facing faster and more unpredictable changes nowadays. Forest services, such as wood extracted for canoes and house construction, are, for example, less used today than they were in past generations. Also small-scale agriculture has almost disappeared today as a livelihood option, despite of being very important until 1970s. On the other hand, population growth over the last 40

years has increased the demand for water provisioning and sewage treatment. Tourism-related activities have also become an increasing source of income. The construction of the road BR-101 was mentioned by local villagers as a major driver of such changes, along with the creation of protected areas during the last 40 years. Changes in livelihoods practices and use of ecosystem services are related to changes in social organization, towards to a more individualistic way of life. Also, restrictive protected areas have limited freedom of access to traditional fishing territories and resource access. Based on our results, we suggest that diachronic as well as synchronic analyzes of ES and their relationships with human well-being can be helpful to understand changes in complex social-ecological systems. This understanding is essential to think about future management options.

**Keywords:** ecosystem services, human well-being, social-ecological systems, drivers of change, Tarituba, Paraty, Coastal Brazil

**Monday, June 18**

**Scliar Room**

**9:00 – 10:30**

## **SPECIAL PANEL:**

### **Common property artisanal fisheries – I**

**Coordination:** Alpina Begossi, Peter May and Valéria Vinha

#### **“Artisanal fisheries economics of Paraty, RJ: contributions to food security and sustainability”**

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#### **Abstract:**

This study is part of a collaborative project between the FIFO (Fisheries and Food Institute) and IDRC (International Development Research Centre), coordinated by Prof. Dra. Alpina Begossi and Prof. Dr. Fikret Berkes focused on fisheries management and food security of artisanal fishermen in the Atlantic Forest of Brazil. Within this large project, this study focuses on four fish markets of the historic center of Paraty / RJ as representatives of the network's commercial fishing spot. Data collection is performed twice a year, during the summer and winter, being aware of seasonal and temporal changes of the local market. The method of collection includes interviews with questionnaires to the fish stores owners. The information was collected at the moment of the sales and focus on over the counter availability of species, the price of fish, costs and profits of fish stores and also the profile of fish consumers. At the present date and referring to the data analysis it is possible to observe that the fish purchasing is quite complex at the regions of Paraty. That analysis includes the sale to residents, tourists, restaurants and foreign markets, especially CEASA at Rio de Janeiro. Important to mention that CEASA / RJ is also a fish supplier to the domestic market of Paraty. There is a cooperation between the fish stores. The aim of this partnership is to join several fish stores and split the transportation expenses to CEASA/RJ.

## **When fishers' knowledge and fisheries management do not come together: a case study in Paraty, Rio de Janeiro, Brazil**

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### **Abstract:**

Parks created in a top-down way are costly and usually ineffective, unless investments are made to develop local institutions, involve the local users and provide them with stimulus to adopt regulatory management measures, such as payment for environmental services and knowledge about the resources. Conversely, using users' local knowledge and involving them in decision-making processes can decrease the costs (including enforcement and monitoring costs, including in the transaction costs) and increase the chances of management success. Here we compared marine protected areas in Paraty (Rio de Janeiro State, Brazil) with areas that fishers believe should be the focus of fisheries management initiatives. We first interviewed fishers (n=206) about their main fishing targets, gear, season and income, and then we interviewed only the skillful and experienced fishers (n=37) about the five most important commercial fishes (*Epinephelus marginatus*, *Cynoscion* sp., *Caranx crysos*, *Scomberomus cavalla* and *Micropogonias furnieri*). Finally, we held a participatory mapping with fishers from one village (Trindade) to let them point out what they thought should be managed and how, and interviewed 28 fishers from P.Grande/Araújo I. individually on the same topics. Fishing is the only economic activity for 30% of the interviewees. Fishers mostly see negative impacts caused by the parks (76% of the citations), such as forbidding fishing in their traditional fishing spots. Based on the interviews with the experts, 28 specific areas were mentioned as relevant for fish reproduction, but only eight of them are no-take areas, the others being mostly migration/movement routes used by fish, thus a source of conflict for being important for the local fisheries. In the participatory mapping in Trindade, fishers confirmed the relevance of three no-take areas (Cachadaço, Galeta and Joatinga), as long as fishers are allowed the right to pass through them if necessary. Trindade's fishers also requested the right of helping in the enforcement, the establishment of areas exclusive for artisanal fisheries, diving-free areas, and management rules based on fish species (some of these rules are locally enforced by the fishers themselves). This study showed that fishers are willing to cooperate and contribute with ideas for (co-)management schemes, but these have to make sense for them, either by showing that the chosen no-take areas are indeed important conservation sites or by including, after evaluation, the sites that fishers think that are relevant for conservation. Also, the evaluation and posterior use of local existent management measures could be used in the establishment of sound, supported and cheaper initiatives.

### **"Common property rights: a methodological approach for marine extractive reserves in Brazil"**

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**Abstract:**

One of the pillars of neoclassical economics is the central idea that markets are self-regulated and their efficiency assured by free markets. But for this to occur it is necessary that all property rights are clearly established and fully guaranteed. However, for many economic goods, these property rights are not easily established and for this same reason, the market fails in providing such goods. In the case of the majority of common property natural resources, access is open to whatever user – fisheries represent one often used example in the specialized literature – and this indefiniteness of property rights is at the root of environmental problems. The fact that they represent common property open access resources make market solutions difficult; for their resolution government intervention and/or establishment of collective property are needed.

Nevertheless, resource management through common property is not a natural given that emerges spontaneously; rather, it is a social construction, an institutional arrangement among the interested parties. Elinor Ostrom (1991) emphasizes that behind every arrangement lies the condition necessary for there being collective action. That is, common property may be a solution, but it is one that requires the construction of institutions, systems of rules and norms that are accepted and respected by all. In later work, she defended that institutions are rules that people develop to specify "what to do and what not to do" in relation to a particular situation. In relation to common property resources, the institutions define rules regarding who has access to the resource, what and how they can be exploited and who participates in the key decisions about these questions and about the transfer of rights and responsibilities in regard to others. The stimulus for change in institutional arrangements frequently have been struggles about resource distribution. Numerous institutional arrangements were created to attempt to reduce problems of excessive use and over-exploitation, as well as distribution conflicts.

These institutions are here understood as "the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction. In consequence, they structure incentives in human exchange, whether political, social, or economic" (North, 1995). Thus, institutions are important to the degree that they define conditions under which transactions are carried out. The more or less efficient allocation of resources depends in good measure on the institutional arrangements established and on the distribution of property rights among users.

Common property resource management is able to demand effective responses for collective action. Thus, the greater the physical space occupied by the resource, the greater the number of users dependent on the benefits of the use of this resource and, the greater the spatial effectiveness of the technology applied to these resources, the greater will be the externalities caused, whether positive or negative. Under these circumstances, the demands for strategies for collective action to promote the adoption of large scale technologies, for example, and for practices of natural resource management, are generally greater. Institutions for collective action can not only facilitate the management of common resources, but also include inter-community dialogue and conflict resolution. This is not to say that the costs of association, monitoring and enforcement for collective action do not increase, but the costs of coordination, as well as the gains in efficiency to manage large scale common resources, up to a determined level or size, will reduce other costs, making collective action an economically superior alternative, in terms of social costs and benefits (Berkes *et. al.*, 2001).

The objective of this paper is to verify the degree of adequacy of the categories of property rights for common property resource management in marine extractive reserves, a category of Conservation Unit of Sustainable Use existent only in Brazil. For this purpose, the division of the rights will be systematized in detail in accordance with the categorization undertaken in the seminal work of Schlager and Ostrom (1992), which include: rights of access, harvest, management, exclusion and alienation. These authors defend furthermore that "the performance of property-rights regimes in field settings needs to be compared to other regimes in field settings. No real-world institution can win in a contest against idealized institutions".

The case study to be presented is that of the Marine Extractive Reserve of Arraial do Cabo, Rio de Janeiro, that has as its institutional arrangement the co-management of fishery resources. Nevertheless, this management is marked by conflicts among users, related to the lack of clear rules and to the precarious control and monitoring. Principally, however, it is due to the difficulty to extend to all traditional resources users in the reserve the same property rights and common resource uses, since this is a small area, located in an urbanized coastal zone, and an elevated number of users.

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