

DECENTRALIZATION AND FISHERIES MANAGEMENT IN THE BRAZILIAN AMAZON: RESOURCE RIGHTS AND ACCOUNTABILITY

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Introduction

Decentralization has emerged as a mechanism of environmental and development policy in the last three decades (RIBOT, 2003; AGRAWAL; RIBOT, 1999), as well as to enhance public management and governance (SMOKE, 2015). Natural resource management is of concern to local democracy because many local people rely on natural resources for their livelihoods. In decentralization concerning natural resources, governments agencies are transferring management issues and powers to a variety of local institutions (RIBOT, 2003). In the context of fisheries management, decentralization can be expressed as the mechanism by which a more government cedes rights of decision-making over resources to local institutions, such as municipal governments, local fisherman's unions, and civil society organizations (OSTROM, 1990).

The main argument for decentralization is that local institutions have better knowledge about resource use and management, and are more effective in decision-making and establishing norms, leading to a more sustainable development (LARSON, 2002). Local institutions have better access to information on natural resources, and are more easily held accountable by local populations (RIBOT; AGRAWAL; LARSON, 2006). Decentralization advocates also believe that equity, along with local people's ownership of local decisions, will result in more efficient management actions for sustainable development (AGRAWAL; GUPTA, 2005).

Transferring decision-making power to local institutions involves the creation of a cross-sectoral arrangement in which various local stakeholders can autonomously interact (SMOKE, 2015). Decentralization of decision-making power takes multiple forms. Administrative decentralization, also known as deconcentration, occurs when powers are transferred to local agents of the government agencies, who are accountable upwards to a central government (RIBOT, 2003). In contrast, democratic decentralization, also defined

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as devolution, is the process of downward transfer of authority to local representatives and actors (AGRAWAL; RIBOT, 1999). Also, delegation is the process of contracting a central function to a public or private entity (SMOKE, 2015). In these three cases, there is a bundle of powers (RIBOT; PELUSO, 2003) located and constituted within webs of processes and relationships that affect people's ability to benefit from natural resources.

However, decentralization can lead to social conflicts when it involves natural resource use. Studies on this issue report that decentralization reforms have often reinforced government power (LARSON; RIBOT, 2007) and suggest that inter-organizational relations for desired outcomes are rarely observed (AGRAWAL; RIBOT, 1999; RIBOT, 2002). External organizations pursuing decentralization, such as donors and NGOs, are not locally appointed, and are not used to being downwardly accountable (EDWARDS; HULME, 2003). The decentralization proposal can be undermined if local institutions make themselves more susceptible to be captured by local elites. In this case, local interest groups can influence policy-making in their own favor (PRUD'HOMME, 1995).

The ability of accountable local institutions and governments to make and implement decisions is a key feature of any effective decentralization reform (RIBOT, 2003). If local institutions depend on authorization from a government agency, their accountability can be reduced. If governments concede to local institutions the authority to make decisions, but in practice do not support local capacity to do so, then power has not been adequately transferred (CARNEY, 1995).

In addition to decentralization literature, there have been several contributions from studies of inter-organizational partnerships, including references to community-based management (PADGEE; KIM; DAUGHERTY, 2006), NGO-government alliances (BRINKERHOFF, 2002; BATLEY; ROSE, 2011), community-local government cooperation (CHERNELA, 2002; KRISHNA, 2003) and public-private partnerships (BRINKERHOFF; BRINKERHOFF, 2011), whether related to natural resources or other issues. This recent debate highlights the importance of cross-sectoral engagement, as well as of shared collaboration to achieve common outcomes and enhance governance.

Additionally, there is the challenge of designing property rights regimes that are concordant with the functions of the ecosystem. These regimes include the bundle of entitlements defining access to the use of natural resources, and the rules under which benefits are gained, controlled, and maintained (HANNA; JENTOF, 1996). Thus, an important aspect of fisheries of the future is the degree to which their management can build property rights regimes that reflect their ecological and socioeconomic context, therefore sustaining the resilience of the ecosystem (BERKES, 1989). Inattention to the nature of property rights (SCHLAGER; OSTROM, 1992) that government agencies transfer to local institutions means that we do not fully understand which forms of authority at local levels are necessary for successful decentralization.

This article considers co-management of fisheries as a form of democratic decentralization of governance, i.e., the downward transfer of power over fisheries management to local institutions. Co-management of fisheries has improved community quotas, social organization, institutional arrangements and ecosystem health (MCGRATH et al., 2008; GUTIÉRREZ; HILBORN; DEFEO, 2011). In this article we evaluate the degree to which

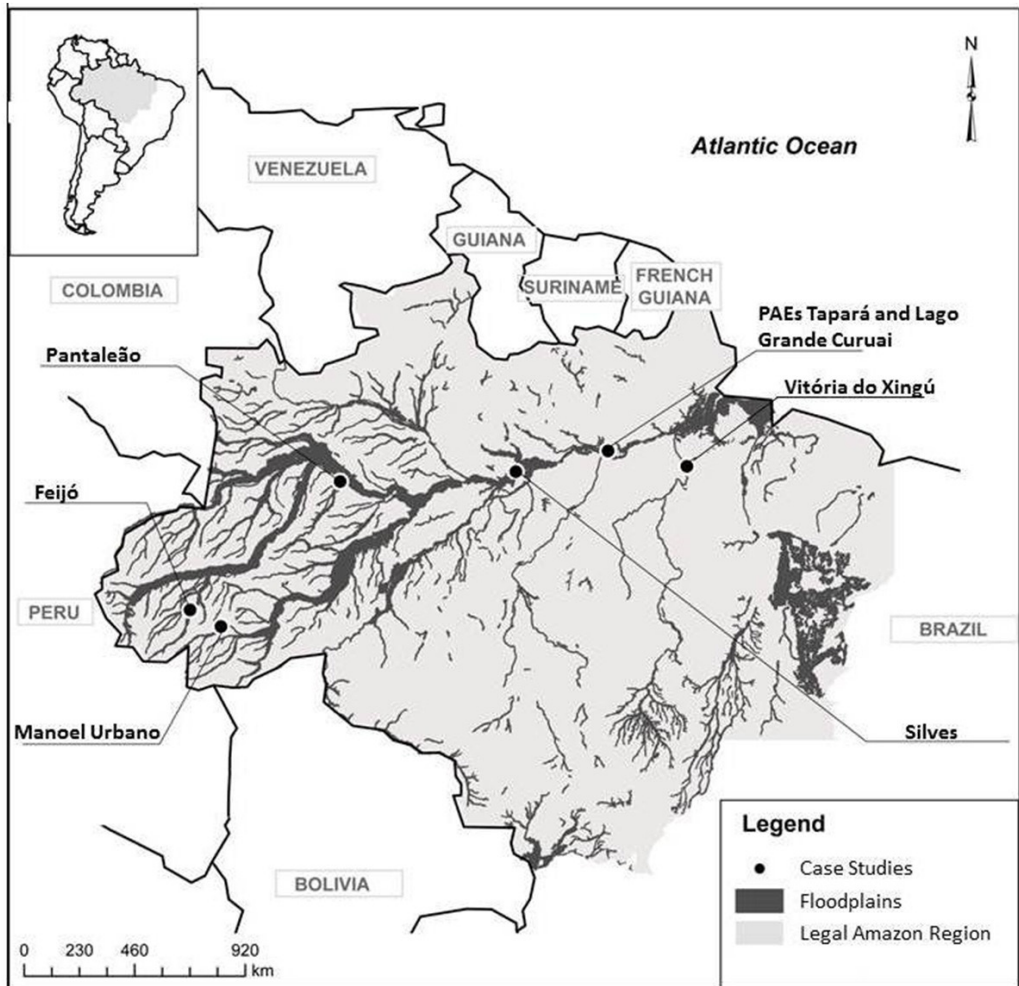
decision-making power of local institutions and property rights being transferred to them constitute democratic decentralization of fisheries.

Methods

This article describes the power of natural resource management systems to make decisions, to create rules, and to enforce the management measures. We use descriptions of accountability as a system or set of mechanisms designed to make sure plans are implemented and performance is monitored (WEBER, 2003). Property rights themselves can be defined as the relationship between actors with respect to things such as natural resources (BROMLEY et al., 1992). These rights are an enforceable claim that is acknowledged and supported by society through Law (RIBOT; PELUSO, 2003). The different regimes of property rights reflect the decision-making process between actors and institutions (AGRAWAL; OSTROM, 2001). We use the concept of a bundle of property rights (SCHLAGER; OSTROM, 1992) to examine systematically how property rights are distributed in five operational-level rights (access, withdrawal, management, exclusion, and alienation). Inside the domain of power, property rights and accountability reflect the control local institutions have over the resource. In this article, characteristics of control that emerge are used as pattern for qualitatively evaluating the degree of decision-making power decentralized to local institutions.

Our selection of case studies in the Brazilian Amazon was non-random and purposeful (LINCOLN; GUBA, 1985). The case studies (Figure 1) were selected with a view to present a range of fisheries management systems as proposals for decentralization. The criteria used for the selection of case studies were: diversity of the government level introducing fisheries management (i.e. federal, state and municipal), ownership (smallholder and communal use), and legal regulation (i.e. open systems with fishing laws and regulations, agro-extractive settlement projects and protected areas). The description and analysis of the case studies aimed to evaluate the performance and interaction of institutions over decentralization proposals. In order to describe and explore these cases, a qualitative research was conducted - our data collection method consisted of integrated questionnaire techniques and secondary data use (BERNARD; RYAN, 2010). Also, our research considered direct observation (BOGDAN, 1972) based on notes taken during twelve events (between 1-2 events per case study), such as fishermen's union assembly, municipal fisheries forum, and community meetings that occurred throughout the course of compiling our case studies. Seven case studies are described (Table 1).

Figure 1. Case studies in Brazilian Amazon.



Source: Prepared by Antonio Oviedo (cartographic base from IBGE).

Table 1. Description of case studies.

	PAE Tapará	PAE Lago Grande Curul	Silves	Pantaleão	Manoel Urbano	Feijó
Vitória do Xingú						
Communities sampled						
Vila Nova. Artisanal and urban fishers	Pixuna, Santa Maria e Costa do Tapará, Artisanal and commercial fishers	Piedade, Piraquara, Soledade, Terra Preta. Artisanal and commercial fishers	Santa Fé, Santa Luzia do Itapani, São João, São Sebastião do Samabani, e Cristo Rei. Artisanal and urban fishers	São José, Várzea Alegre e Nova Olinda. Artisanal and commercial fishers	Santo Antonio, Lago Novo, Lago Grande, e Bela Vista. Artisanal and urban fishers	Porto Rubinho, Aldeia Formoso, Nova Olinda, Canada e Vila Extrema. Artisanal and urban fishers
Number of respondents (community members)	10	11	44	12	21	41
Communal or individual ownership/use	Smallholder use (traditional communities in government-sponsored agroextractive settlement)	Smallholder use (traditional communities in government-sponsored agroextractive settlement)	Communal use (public land - floodplains)	Communal use; Protected Area set aside for traditional communities	Smallholder use (public land)	Smallholder use (public land), indigenous reserve
Management system and legal regulation	Open system with federal law (multi-species fishing rules)	Agro-extractive Settlement Project (PAE) with PAE Use Plan and fishing agreement (multi-species fishing rules and specific rules for arapaima management)	Open system with municipal law and fishing agreements (multi-species fishing rules)	Protected area with management plan and fishing agreements (multi-species fishing rules and specific rules for arapaima management)	Open system with fishing agreements (multi-species fishing rules and specific rules for arapaima management)	Open system with fishing agreements (multi-species fishing rules and specific rules for arapaima management)
Government level introducing fisheries management	Federal government, Fisherman's Union	Federal government, Fisherman's Union and NGO	Municipal government and NGOs	Community association, federal government, Fisherman's Unions (Alvárães and Tefé) and NGO	state government, Fisherman's Union, Pirarucu Fisherman's Association and NGO	state government, Fisherman's Union and NGO

Data collection took place between 2009 and 2014. Interviews were performed with community members and urban fishers. Semi-structured interviews were conducted to extract information on the actual power over the fisheries management actions, governance structures, and benefit-sharing decisions. The list of questions and topics covered in the interview were: Are local institutions deciding on the management of fisheries? Are fishing agreements being discussed? Are government agencies deciding management actions? Who has ownership of the fisheries resource? Who is enforcing management actions? What is the level of participation (and decision-making) by the communities over benefit sharing? Do the benefits reach the community? What is the accountability of fisheries management? Are the institutions accountable to the people affected by their activities? What are signs of success/examples of accomplishments? We describe the nature of reforms by identifying which local institutions are receiving power, and by describing existing accountability mechanisms. Government agents and NGO representatives were also interviewed for additional information on management schemes. A total of 153 interviews were conducted (Table 1). Also, technical reports produced by government agencies and NGOs about each case study were assessed. A review of relevant fisheries policies and norms was undertaken to identify the fisheries' legal and institutional framework in each case study.

A standard narrative guides case description to facilitate transcribing interviews and identifying themes or patterns. We used cutting and sorting techniques (LINCOLN; GUBA, 1985) to arrange quotes or expressions into piles of responses that go together as a theme. The analysis of the emerging themes led to the identification of outcomes and expressions of social rules (GEERTZ, 1989) which supported the description of the decentralization proposals. Qualitative data analysis software MaxQDA was used to manage and code transcribed interviews (VERBI, 2017). Using the tools for text exploration (i.e. counting, coding, word frequencies and interactive world tree), we composed a lexical of categories (or themes). For instance, the word combinations "zoning," "protected area management plan", "PAE use plan", "PAE basic plan" could be assigned to the category "management plan". These categories can be grouped as fisheries-related sources of decentralization (i.e. property rights, decision-making and accountability), which repeatedly came up as important to the respondents. For quantitative analysis, the lexical presents a classification scheme based on which the frequency of the categories is determined.

Results and discussion

Amazon fisheries have played a central role in the economy and subsistence of rural populations. The intensification of commercial fisheries and government policies, during the 1970s and 1980s, contributed to increased demand for fish and pressure on community floodplain lakes. Concerned with the depletion of their fisheries, communities organized to pressure the National Environmental Agency (IBAMA), along the 1980s and early 1990s, to prevent commercial fisheries and negotiate community fishing agreements. By the early 2000s IBAMA's co-management policy was fully operational with

numerous regulated fishing agreements in several states of the Brazilian Amazon. Since 2017, fisheries management policy is shared between the Ministry of Environment and the Ministry of Industry, Foreign Trade and Services. The federal Law 140/2011 specified that the rights to regulate fisheries in the state domain belong to the state government which can exert them directly or grant them to local institutions. The fishery state Law and the resulting Administrative Decrees regulate fishing agreements (Amazonas and Acre states have already implemented state regulation). Additionally, municipal laws support land use planning on fishing areas at municipal level, and protected areas are titled to guarantee traditional and indigenous people social and cultural rights.

Riverine communities studied represent social groups whose cultural diversity is expressed in terms of specific territorialities of land tenure and appropriation of natural resources. The analyses on decentralization and fisheries management considers generalizations about the social group characterized as “caboclos” (PARKER, 1985), and the ecological system of the Amazon floodplains.

Vitória do Xingú: A centralizing government under NGOs and grassroots pressure

In the municipality of Vitória do Xingú, state of Pará, subsistence and commercial access to fisheries is mediated through Laws and Administrative Decrees regulated by federal and state government agencies. The size of the fishing territory is 93,500 ha. Local users do not have any powers to make rules about how fisheries can be used. Representatives of the Fisherman’s Union are present in the official meetings, but they have no influence over decisions. In the absence of participatory processes and enforcement, the legislation had negative impacts. Also, the elites who support agricultural expansion and dam building (Belo Monte) prevent the implementation of conservation projects. Several conflicts were reported by the respondents. There is no monitoring of fish landing data. Local-level officials are more accountable to their respective authorities. The Fisherman’s Union is responsible holding one assembly each year with members, mainly to present budgets and hear local concerns.

Feijó: Decentralization to upwardly accountable local institutions

The state Administrative Decree to promote fishing agreements in the municipality of Feijó, state of Acre, was regulated in 2015, aiming to transfer to local institutions power to manage fisheries within the limits of state legislation. A set of six fishing agreements are coordinated by the municipal Fisherman’s Union, and other four lakes are co-managed with the Kaxinawá indigenous association, where the major objectives are to manage *Arapaima gigas*, reduce overharvesting, and provide greater benefits to local users. The size of the fishing area being managed is 193.8 ha. The annual assembly of the Fisherman’s Union decides the management rules and budget. The rights to manage fisheries are limited by the low level of participation of local users in decision making, and by deficient monitoring (only one fishermen is able to assess arapaima stocks). Income from fish sales is divided among members of management group. Patrolling and enforcement are limited, with

budget constraints and low support of the state and federal governments. Local leaders and government agents are not accountable to the local users.

Manoel Urbano: The ambiguity in policy measures

The institutional framework of the municipality of Manoel Urbano, state of Acre, is the same as Feijó, adding one more local institution - Arapaima Fisherman's Association. The fishing area under the managed scheme is 228.8 ha. The local users of Fisherman's Union participating in formal meetings can propose rules and annual fishing quota to be approved by state government. However, social conflicts between the two local institutions undermine the participatory and decision-making process. There is no regular attendance to sessions of either institution. State government agents did not align with local managements priorities, as the state's emphasis was aquaculture while local users wanted to manage natural lakes. With this, Manoel Urbano experienced decline of arapaima stocks, resulting from lack of enforcement of management rules.

Agroextractive Settlement Project: Local control over natural resources

In 2006, the National Institute for Colonization and Land Reform (INCRA) initiated a new settlement and land tenure policy in the Amazon floodplains. A pilot project was based on a Agroextractive Settlement Project (PAE), originally designed for traditionally settled areas in which local populations engage in both extraction and agriculture (BENATTI, 2005). One condition imposed by the District Attorney's office on the planned new land tenure standards was that they should include pre-existing fishing agreements and institutions. The PAE Regional Fisheries Council is composed by representatives of all communities sharing the same resource system. They take on the responsibility (together with the Fisherman's Union) of defining, approving, and implementing local agreements.

(a) PAE Tapará

PAE land tenure has not been accomplished due to disagreements between INCRA and Secretary of the Patrimony of the Union (SPU) about who will regulate the collective concession. PAE local users decide management rules, within legal limits based on PAE Use Plan and Basic Plan (approved in 2010) and fishing agreement. Tapará is organized into 9 communities and 50 fishing areas, which are managed by 850 families in an area of 11,700 ha. The community is in charge of enforcement, but the actual legitimacy of this role depends on government support. Government enforcement (including patrolling) to illegal fisheries is absent since 2011. Most conflicts involve cattle ranchers. Respondents have reported that the conflict continues in a similar manner to the period before the creation of the PAE. PAE council meets every two months and has endured as a collective organization.

(b) PAE Lago Grande Curuai

Land tenure has not been accomplished due to the same disagreements between INCRA and SPU, as well as to an overlap between a specific region of the PAE and an indigenous territory claim (Cobra Grande). PAE Use Plan and fishing agreement are managed by local users in a fishing area of 250,000 ha. The Regional Fisheries Council and the Community Associations Union (FEAGLE) coordinate the participatory processes for decision making. Lago Grande is organized in 140 communities (30,000 inhabitants). Limited enforcement facilitates several events of illegal commercial vessels entering PAE. Studies show that fish production is close to the maximum sustainable yield (ISAAC *et al.*, 2003). The influence of timber and mining companies, as well as local political interests, modify the release of rural credit, and only a small number of families are having access to it. Local elites finance cattle purchase and perform partnerships with community members who ranch inside the PAE. Public forest policies (IDEFLOR, 2009) are opposed to the interests of local institutions. FEAGLE organizes bimonthly meetings between leaders and members.

Silves: Innovative governance of fisheries

Municipal Law 186/2000 institutes new forms of fisheries management: 5 permanent protection lakes and 16 subsistence fishing lakes, prohibits the entrance of fishing boats from outside Silves in the lakes and rivers, and creates the Municipal Environmental Patrolling Commission, with one coordinator and four patrollers appointed by the mayor (never done). Eight rural communities are organized by the local leadership, and have the right to make the rules for using, protecting, and managing the complex of lakes which occupies a territory of 43,000 ha. The local actors involved in implementing fisheries' management are: Silves Association for Environmental and Cultural Preservation (ASPAC), the Amazon Ecotourism and Environmental Service Cooperative (COOPTUR), and municipal government. 48% of respondents participated in two or more community actions. IBAMA supports technology and knowledge access, but undermines the ability of local institutions to enforce decisions. The commercial fishing fleet is a key variable regarding the presence of conflicts. Patrollers started to get paid by ASPAC in 2000 to overlook year-round protection of the lakes.

Pantaleão: Decentralization to downwardly accountable local institutions

The Amanã Sustainable Development Reserve was established by state decree in 1998. It is situated in the mid-course region of the Solimões River, where a sector (São José) of rural communities have gained the power to develop a management plan for the fisheries within their boundaries (Pantaleão lake complex with 14,569 ha); to determine whether or not commercial exploitation would take place; and to zone 7 permanent protection lakes, 3 subsistence lakes, and 24 commercial lakes. The licensed fishermen of Tefé and Alvarães Fisherman's Union could benefit in the commercial exploitation

of fisheries if they agree to implement regulated management rules. If they develop a management plan, they are designated to approve annual fishing quota for arapaima. Community members decide on monitoring and sanctioning to enforce their own rules. A group of 14 patrollers is responsible for patrolling the lakes. Income from fish sale is divided among members of the management group, according to the contribution to collective actions. A set of actors is responsible for co-managing the reserve: Mamirauá Institute, IBAMA, Amanã deliberative council, municipal Fisherman's Unions, state secretary of environment, and São José community groups. There are several accountability interactions between the residents and these actors. The main mechanism of accountability of co-management institutions to local users is the sectors' meetings in which management rules are constituted.

Analysing decentralization proposals

The analysis of case studies demonstrates the challenge of implementing in practice a decentralization in fisheries. The respondents reported outcomes that helped to describe the mechanisms or actions that positively influence decentralization, as well as weaknesses of the process. Emphasis by fishermen and rural producers as respondents was a way to reduce biases in the quality of responses. However, we recognize that, as Bord, Fisher and O'Connor (1998) point out, accurate interpretation of opinion surveys is a major challenge. The literature shows that the responses obtained during questionnaire surveys tend to exaggerate the concerns of respondents (STERNGOLD; WARLAND; HERRMAN, 1994) and that some "socially desirable" topics are emphasized (KIDDER; CAMPBELL, 1970).

Table 2 summarizes the outcomes of the case studies. The case studies demonstrate variations that are possible within the two broad forms of decentralization (i.e. administrative decentralization and democratic decentralization). Pantaleão, PAEs, and Silves illustrate democratic decentralization. The case studies suggest that management plan, participation, efficiency in management system and accountability mechanisms can shape or influence the mechanisms that may help decentralization (Table 2). In these cases, considerable powers of decision and rule-making over fisheries management have been transferred to local institutions (AGRAWAL; RIBOT, 1999). The level of community participation for resource use and decision-making increased in these three case studies (IDSM, 2011; AZEVEDO; APEL, 2004; CHERNELA, 2002). These institutions also share numerous responsibilities with the federal government (IBAMA), such as technical assistance, fishing rules inspection, and implementing management plans. Excepting Silves, these institutions are accountable to community members. However, PAEs and Silves suffer critical problems regarding conflict resolution and patrolling against commercial fishing fleet, which undermine effective decentralization. Manoel Urbano, Feijó and Vitória do Xingú can be seen as instances of deconcentration and government-community partnership. In these case studies, state government and local institutions choose to become partners on opening decision-making processes to promote broader operationalization of fisheries management (BRINKERHOFF, 2002). State government defines specific rules

to fishing and powers are transferred to local agents of the government agencies (RIBOT, 2003). The involvement and participation of local institutions is greatly reduced. Due to the government's limitations in law enforcement this form of decentralization is not enough to improve environmental and social conditions. The continuity of the reform suffers limitations in capacity building, effective devolution of management rights, ambiguity and conflicts for policy implementation. Institutional changes and initial improvement of production systems achieved in the first stage of the case studies are not sufficient to constitute a sustainable decentralization.

Table 2. Categories of decentralization framework.

	SOURCES OF DECENTRALIZATION									
	PROPERTY RIGHTS			DECISION-MAKING				ACCOUNTABILITY		
	Subsistence fishery (92%)*	Commercial fishery (76%)*	Operational level rights	Management plan (56%)*	Participation (61%)*	Efficiency in management system (37%)*	Enforcement (78%)*	Benefits reach community (72%)*	Inter-organizational relations (48%)*	Accountability mechanisms (36%)*
Vitória do Xingu	Y	Y	1, 2	N	N	N	N	Y/N	N	N
PAE Tapará	Y	Y	1, 2, 3, 4	Y	Y	Y	N	Y	Y	Y
PAE Lago Grande Curuai	Y	Y	1, 2, 3, 4	Y	Y	Y/N	N	Y	Y	Y
Silves	Y	N	1, 2, 3	Y	Y	Y/N	Y/N	Y	Y/N	Y/N
Pantaleão	Y	Y	1, 2, 3, 4	Y	Y	Y	Y	Y	Y	Y
Manoel Urbano	Y	Y	1, 2, 3	N	Y/N	Y/N	N	Y/N	Y/N	N
Feijó	Y	Y	1, 2, 3	N	Y	Y	N	Y	Y/N	Y/N

Note: Y indicates that the community has power over a theme; N indicates that it does not. Y/N indicates that the community has access over some mechanisms but not others, or that they are meant to have a certain access but do not have it in reality. Operational level rights are: 1-access, 2-withdrawal, 3-management, 4-exclusion, and 5-alienation. * Percentage of respondents that considered the category.

The categories of decentralization reported by the respondents are, in some cases, management plans as decision-making process for area delimitation with optimum size and rules for the use of natural resources, along with the adaptation of institutions (SMITH, 1985). Mechanisms of access control and maintenance also reinforce the importance of small units of governance (RIBOT; PELUSO, 2003). As observed in Tapará where the zoning of lakes according to proximity (and use) of target communities reflected the perceptions of local decision-makers of how to best manage fisheries. While subsistence fishing limits are regulated by federal law, committee assemblies in Silves and Pantaleão have also decided which lakes will be permanent fisheries reserves, and which will be managed; this is well-regulated internally. In both cases these committees manage a significant geographical area. In contrast, spatial limitations on the access by government authorities and local institutions (i.e. huge areas of Vitória do Xingu and Lago Grande Curuai) are an important element in which the effects of decentralization are contained (RIBOT, 2002). Recognizing that management areas of different sizes may involve different perceptions of decision-making and amount of maintenance effort, prioritization of smaller areas does not mean that smaller parcels necessarily provide a better deal for decentralization. However, by assessing the amount of territory over which local institu-

tions can exercise powers and maintenance, it becomes possible to assess the extent of decentralization (RIBOT; AGRAWAL; LARSON, 2006).

In Silves, both federal and municipal governments, as well as NGOs, took significant initial steps toward decentralization of fisheries management. In the first phase, between 1993 and 2004, respondents reported few significant results: protection of two permanent protection lakes, promotion of environmental awareness and a positive attitude toward conservation policies in the municipality. Also, they indicated a decrease in the incidence of commercial fleets in the regions in the early 2000s compared to records about the early 1990s. When asked about the proportion of community members complying with the rules, 62% stated that more than half the community complied rules. In phase two, between 2005 and 2014, capacity building and structural characteristics of ASPAC and COOPTUR compromised their ability to act as leading institutions to implement the decentralization, such as: limited knowledge of a sustainable development approach that links the duality between conservation and development; development of kinship-based groups within the organizations; and inter-organizational relations. Continued patrolling of diverse zoning categories with little input from communities and broader geographical range required a greater source of funds and organizational support. The financial weakness of ASPAC has led to reduced accountability. The transfer of land planning and management tasks without corresponding funds to effectively implement them was also reported by Larson (2002).

In environmental affairs, decentralization is said to improve the efficiency with which natural resources are sustainably managed (MARGULIS, 1999). The examples of Pantaleão and Tapará demonstrate how validated access to knowledge can be applied to restore arapaima fisheries (IDSM, 2011). Knowledge of and commitment to sustainable management regimes, active local organizations, and federal and state government implementation of supportive policies were key elements observed in Pantaleão. As a leader from the São José sector reported, there was positive impact on arapaima production, where sustainable harvests increased by 47% between 2008 and 2011. He also highlighted the years 2002 to 2004 as an important period before the devolution of management rights, i.e., the negotiation and collective agreement between the two Fisherman's Union (which include commercial fishing fleet) and the representatives of the São José. In Tapará, arapaima management should generate significant results in terms of population recovery in about 5 years if the rules are enforced. This has been observed in previous studies in Brazil (ARANTES; SERQUEIRA; CASTELLO, 2006).

While the case for decentralization lies on greater efficiency, more local participation also contributes to shape reforms (AGRAWAL; OSTRUM, 2001). In Tapará, through an interactive process in which agreements are developed at the community level, discussed at the council, made into a common proposal, evaluated and amended, a definitive version is finally reached, and it is approved by the PAE council and participating communities. Each community has four representatives inside PAE council. While this does not guarantee adequate representation, it does insure that all communities have roughly equal participation and provides abundant opportunities for anyone to participate.

In the case studies of Manoel Urbano and Feijó, local users obtained good results in recovering arapaima stocks (OVIEDO; BURSZTYN, 2016), but the absence of participation resulted in high investments in monitoring and surveillance. This was reported by respondents from Manoel Urbano (65%) and Feijó (43%), regarding the presence of illegal arapaima fishing. Since 2009, state government has given priority to an aquaculture program and canceled support for natural lakes management. Coupled with weak enforcement and the illegal market of juvenile arapaima (created by aquiculture farmers), this situation led to illegal access and population decline, i.e., a reduction of 89.7% between 2009-2013 in Manoel Urbano (OVIEDO; BURSZTYN; DRUMMOND, 2015). It transferred operational property rights of access and withdrawal, but ambiguity between public policy and local demands allowed individuals to take advantage of different agendas to acquire short-term income returns, as well as not stimulating local users to seek long-term management goals.

Legal ambiguities make it difficult for a local institution to act because it may reduce inter-organizational relations (RIBOT; AGRAWAL; LARSON, 2006), undermine the performance of each stakeholder (BRINKERHOFF, 2002), and reduce the interest in decentralization due to divergence between governance and development goals (SMOKE, 2015). Similar to Manoel Urbano, Lago Grande Curuai suffers with ambiguity in public policies, i.e. IDEFLOR (2009), competing and sometimes conflicting claims over natural resources reduce the ability of local institutions to carry out sustainable managements.

Local institutions rights and capacity to design and implement policies, including law enforcement, are important aspects of decentralization. In Manoel Urbano, Feijó, and Vitória do Xingú cases, federal government agencies are in charge of enforcement - and have little efficiency. In some cases (i.e. Silves and Pantaleão), this resulted in community volunteer agents patrolling fishing activities through formal systems, and setting up management groups to monitor fishing and levy penalties. In Pantaleão, high levels of enforcement resulted in substantial local decision-making power. Even though Pantaleão is quite large, local patrollers have made a significant difference on the level of illegal harvesting. Interaction between volunteer agents from the community and those from federal and state government improves decision-making power of local institutions (i.e. Administrative Decree No. 19/2009). The improved service delivery (coverage, efficiency, equity) and the enhanced governance reflect a primary outcome of decentralization (SMOKE, 2015) in Pantaleão.

The bundle of property rights transferred to local institutions, as examined in our case studies, are central for successful decentralization (OSTROM, 1990). It shows that property rights over fisheries clearly results in use for subsistence and commercialization. But the adequate bundle of property rights only exists in the case of PAEs and protected areas. None of the case studies presented the operational level right of alienation. In Manoel Urbano, social conflicts due to illegal access have increased as a result of transfer of management rights without financial resources to carry them out, and without participatory processes that would stimulate local institutions to decentralization reforms. Local institutions did not obtain the necessary financial resources for system management, and the number of members has been decreasing over time. The literature reports re-

centralization activities in both resource depletion and policy conflicts (SMOKE, 2015). Experience from Vitória do Xingú indicates that access and withdrawal of property rights alone are not a recipe for sustainable fisheries. The lack of management rights results in most respondents (83%) relating the reduction of fish production in Xingú river.

While Feijó fishermen have exercised management by designing rules that define withdrawal rights, they do not have the authority to decide who can and who cannot enter managed lakes. Without property rights to exclude others, local users fear that any effort made to limit harvesting will benefit others who do not participate in the management system. Conversely to the case studies of Manoel Urbano and Feijó, fishermen of Pantaleão and PAEs have exclusive rights over managed lakes. In these two cases, local institutions that design a zoning system limiting various types of access and withdrawal rights in distinct areas are exercising their fisheries' management rights (OSTROM; SCHLAGER, 1996) and improving fishing outcomes (CASTELLO; PINEDO-VASQUEZ; VIANA, 2011). The claim for the creation of PAEs and protected areas was, according to the respondents, partially related to the need of guaranteeing the right of exclusion for the residents.

Finally, another set of categories related to the effectiveness of decentralization can be attributed to the characteristics of local institutions that exercise their accountability relations (RIBOT; AGRAWAL; LARSON, 2006). If the outcome of decentralization depends on the extent to which these institutions are well informed and accountable, then inter-organizational relations and capacity building of local institutions makes a positive impact. In all of the case studies presented in this article, huge investment in capacity building has been transferred to local institutions. Also, mechanisms of accountability are present, such as municipal forums, community assemblies, performance awards, and budget reporting. This may be one of the elements that counts as democratic decentralization (SMITH, 1995), even if we find that it is not completed or effective.

In PAEs, members of the Council are not elected as individuals but as community representatives. Federal government (INCRA) regulates how much control the officially accountable entity actually has over management activity, and it helps accountability (SMOKE, 2015). The inter-organizational relations and the outcomes achieved (i.e. PAE use plan, assemblies and budget report) represent critical tool for assessing whether the public policy is matched by reality. In Manoel Urbano and Feijó, local government agents are selected by the secretary of the state of Acre, and there are no formal mechanisms that make them accountable to local institutions. In these two case studies, state government agents based in the municipality maintain strong upward relationships to their former employers, and influence the implementation of the state government's political agenda. Additionally, community leaders are more accountable to government agencies and NGOs (e.g. progress reports and meetings). This has limited the ability of local institutions to respond to demands from the fishermen. In Silves, although some accountability mechanisms exist, such as the Municipal Environmental Patrolling Commission, they are not effectively working if community users are unable to benefit from them. Multiple lines of accountability for local service delivery (i.e. fishery, tourism, lake patrolling) and without clarity on labor

division, community members are uncertain about which actor to hold accountable (AGRAWAL; RIBOT, 1999).

On the other hand, evidences from Pantaleão showed that formal mechanisms and local staff capacity were enhanced and contributed to downward accountability (IDSME, 2011). Environmental assessment by outside institutions increases transparency, and the interdisciplinary approach to fisheries management is viewed as essential to broad-based accountability. Local data from fisheries management can be used by local institutions in meetings and in participatory decision-making process for management rules (RIBOT, 2003). Local institutional innovations observed in this case study facilitate reforms, such as transparency, participatory planning/budgeting, complaint and appeals boards.

Conclusion

The experiences analysed in this study contribute to public policies and natural resources debates, given that the studied local institutions not only cover a wide range of topics, but also challenge the role of government agencies, especially traditional modes of service delivery. The objectives of these decentralization proposals are to establish an environment of trust, and to foster participation and initiatives which establish legal and economic security, and to democratize administrative power. The key to effective decentralization is improved participatory management in local institutions. However, when evaluated in detail, inter-organizational relationships of local natural resource management often lack representative authorities and sufficient powers. The case studies suggest that fisherman's unions and regional offices of government agencies (i.e. IBAMA, INCRA, state secretaries) are key institutions to improve the system.

Power over natural resources is being transferred to unaccountable or upwardly accountable local institutions. In fisheries, the inter-organizational relationships for decentralized management involve the creation of local committees with direct relation to federal and state government. These committees are constituted to make decisions on behalf of the local people, or simply administer government decisions. A common problem is that the committee does not implement monitoring systems or share information with local people. Often, local information does not feedback the effectiveness of management decisions.

The case studies involve formal local institutions, municipal fisherman's unions, and government offices. Most management plans and fishing agreements had a long history of interaction, as well as accumulation of knowledge and trust that led to the emergence of more formal rules. This context helps to produce enduring decentralization. We conclude that the presence of recognized rights of natural resource management contributes to sustainability in decentralized proposals. Certain operational-level rights (if they exist) can help local institutions and users to agree upon, maintain, and enforce management actions. The adequate bundle of property rights only exists in the case of PAEs and protected areas. Local expectation associated with the clear property rights regime would create a governance structure able to reduce transaction costs for monitoring and enforcement, hence facilitating the collective goal of fisheries management. The resulting

inter-organizational relations within the arrangement of the decentralization process are more related to incentives alignment. Further studies must evaluate why some property rights are not transferred.

We highlight that decision-making power transferred to local institutions without transferring powers to monitor and enforce them can be ineffective. Decision-making and enforcement are complementary. Environmental auditing and information sharing are important to the emergence and maintenance of collaborative decision-making and enforcement. It may be necessary that local institutions themselves do the environmental auditing, but it should be institutionalized via some means that are agreed with government agencies. Local institutions' performance is improved when they provide access and resource-level information to local users and when they develop standard operating procedures. In short, local institutions can be a mechanism for translating top-down regulations into a site-specific form without violating them.

Finally, the case studies illustrate the adoption of both forms of decentralization – deconcentration and democratic decentralization – as a crucial aspect to understand fisheries management. The type of decentralization varies according to specific conditions, and leads to different degrees of success in terms of the empowerment of local institutions. Lessons learned through the cases studied in this article can serve as a useful call for broader participation in natural resources management. Participatory management share power and information among stakeholders, emphasize rules (i.e. management plan) in exchange for greater rigor in monitoring systems, rely on accountability mechanisms for better information, and seek out creative compromises providing positive solutions for community and government agencies. In short, democratic decentralization and its associated participatory management component make explicit the connection between public policies and management of natural resources and seek to channel the political dynamic accompanying regulatory decision-making into institutional arrangements delivering more efficiency in public policies.

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DECENTRALIZATION AND FISHERIES MANAGEMENT IN THE BRAZILIAN AMAZON: RESOURCE RIGHTS AND ACCOUNTABILITY

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Abstract: Decentralizing management is often mentioned as a good strategy to make fisheries sustainable. Prior to evaluating the consequences of the decentralization process, there is a need to consider the degree to which decentralizing the management and decision-making of fisheries is happening. This article presents case studies of inter-organizational management of fisheries in the Brazilian Amazon to examine how effective the decision-making power of local institutions and smallholders over fisheries resources is. We propose a method for mapping relevant patterns of decision-making rights, property rights, and accountability. We highlight the fact that while the government maintains significant control over fisheries resources through regulating extraction, local institutions have growing control over fisheries management decisions.

Key Words: *decentralization; fisheries management; property rights; participatory management; Brazilian Amazon.*

Resumo: A descentralização é frequentemente mencionada como uma boa estratégia para tornar a pesca sustentável. Antes de avaliar as consequências do processo de descentralização, é necessário considerar até que ponto a descentralização da gestão e da tomada de decisão do setor pesqueiro está sendo realmente implementada. Este artigo apresenta estudos de caso sobre a gestão interorganizacional da pesca na Amazônia brasileira para analisar a eficácia do poder de decisão das instituições locais e dos pequenos produtores. Propomos um método para mapear padrões relevantes de tomada de decisão, direitos de propriedade e responsabilização (*accountability*). Ressaltamos que, enquanto o governo mantém um controle significativo sobre os recursos pesqueiros por meio da regulamentação da extração, as instituições locais têm um controle crescente sobre as decisões do manejo da pesca.

Palavras Chave: descentralização; gestão pesqueira; direito de propriedade; gestão participativa; Amazônia brasileira.

Resumen: La descentralización es una estrategia frecuentemente mencionada como opción válida para tornar la pesca sustentable. Pero antes de evaluar las consecuencias del proceso

de descentralización, se hace necesario considerar hasta que punto esa descentralización y la toma de decisión en el sector pesquero está siendo realmente implementada. Este artículo ofrece estudios de casos sobre administración inter-organizacional en el sector pesquero de la Amazonia brasileña, con el objetivo de examinar la efectividad del poder de decisión de las instituciones locales y de los pequeños productores. Se propone un método para mapear los patrones relevantes de derechos de decisión y de propiedad, así como de responsabilidad (*accountability*) de los actores involucrados en el proceso. Se enfatiza el hecho de que, si bien el gobierno mantiene un control significativo sobre los recursos por medio de la regulación de la extracción, las instituciones locales están ganando un mayor poder de decisión sobre la pesca.

Palabras Clave: descentralización; administración pesquera; derechos de propiedad; administración participativa; Amazonia brasileña.
