

NOW UNDER NEW ADMINISTRATION: FISHING AGREEMENTS IN THE BRAZILIAN AMAZON FLOODPLAINS

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1. Introduction

This text analyzes recent experiences of participatory grassroots management of fisheries in the Brazilian Amazon basin. It describes and interprets major provisions of specific fishing agreements. The approach reports to common pool resource theory, as developed by Ostrom (1990). Participatory management is defined as mutually agreed natural resource uses, designed with community participation, and aimed at securing resource availability in the contexts of ecological balance, sustainable economic output and community welfare. The goals are (i) to present experiences in which community initiatives are adopted into an evolving institutional framework for co-management; (ii) to evaluate their progress to date; and (iii) to outline the key issues to be addressed in order to improve and consolidate these initiatives, and similar ones.

Intensive fishing in Amazonian floodplains generates conflicts in two complementary dimensions. The first is related to the sustainability of the resource, reflecting the contradiction between economy and ecology. The second expresses the distinct interests and perspectives of local stakeholders in respect to outsiders who have access to the resource. In this context, traditional forms of managing the commons are vulnerable. This calls for new and more effective arrangements.

Participatory management (or co-management) of fisheries in the region falls, locally, under the general designation of **fishing agreements** (“acordos de pesca”). They are generated and recognized by some Amazonian communities and are valid for selected lakes. They are an important tool to control unregulated access and the resulting degradation of the resource. Agreements are a step in the direction of achieving a compromise between individual and collective interests, generating benefits in both dimensions. IBA-

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MA (Brazil's major environmental agency) and the Ministry of Fisheries and Aquaculture (MPA) had not yet created effective regulations designed to limit access to lakes.

This issue has increasing relevance to public policies that try to define access rights to aquatic resources in lakes and rivers throughout the ecosystem (Oviedo & Ruffino, 2003). Both state control and privatization of resources have been advocated, but neither has succeeded in solving common-pool resource problems. Over the last two decades, a growing number of authors and organizations, in different contexts around the world, have developed grassroots management models.

Participatory management, by incorporating resource users, is seen by some as the most effective way of solving many of the problems associated with the conventional scientific model of fisheries management. Agrawal *et al.* (2013) analyzed the effects of norms, organizations and their rules in forestry communities. They argued that with an appropriate network structure of management, a small group can generate sustainable use of common-pool resource. This is particularly valid for cases involving resource depletion, conflicts among user groups and the design of adequate policies (McGoodwin, 1990; Jentoft & McCay, 1995).

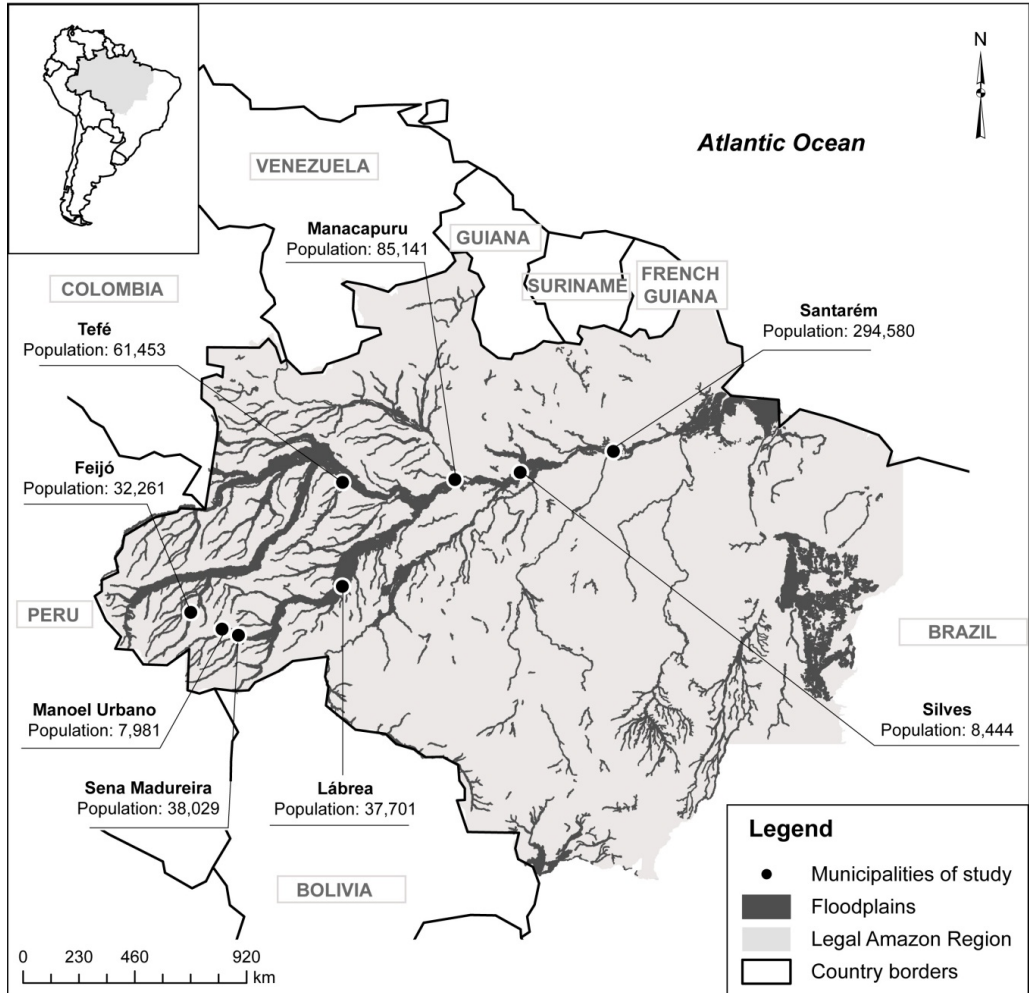
The modes of participatory management that evolved in the Amazonian floodplains result from social learning processes involving local initiatives, governments, universities, NGO's and international funding agencies (Oviedo, 2011). Social learning has created opportunity for improved understanding of resource conservation innovations and for reduced hierarchy among actors. It has also created space for the application of both indigenous and scientific knowledge in the innovation process (Dessie *et al.*, 2013). Though still largely an experimental approach, being tested in a few areas, implementation has advanced enough to allow the examination of the main outlines of this emerging system.

This article is based on specialized literature and on empirical observations and surveys made in several sections of the Amazon region, Brazil.

2. Geographical and institutional settings

Each year, the Amazon River and its tributaries overflow the banks of their extensive lower sections and flood an immense area estimated at 64,591,108 hectares (Figure 1). These floodplains are the most extensive on Earth. For almost six months of the year, waters rise 10 to 15 m (Junk *et al.*, 1989), submerging the surrounding forests and creating an aquatic ecosystem uniquely dependent upon such periodic flooding. Floodplains are used by unique creatures such as the world's largest freshwater fish, "pirarucu" (*Arapaima gigas*), the pink river dolphin (*Inia geoffrensis*), the giant river otter (*Pteronura brasiliensis*), the black caiman (*Melanosuchus niger*) and the Amazonian manatee (*Trichechus inunguis*), besides scores of fruit-eating fish species that dwell in between the partially submerged tree trunks. Researchers have catalogued hundreds of species of fish and birds, a wide range of mammals, reptiles and amphibians, and an exceptional diversity of trees to be found in this unique ecosystem (Henderson & Robertson, 1999; Ayres, 1994; Borges, *et al.* 2004; Goulding, 1980).

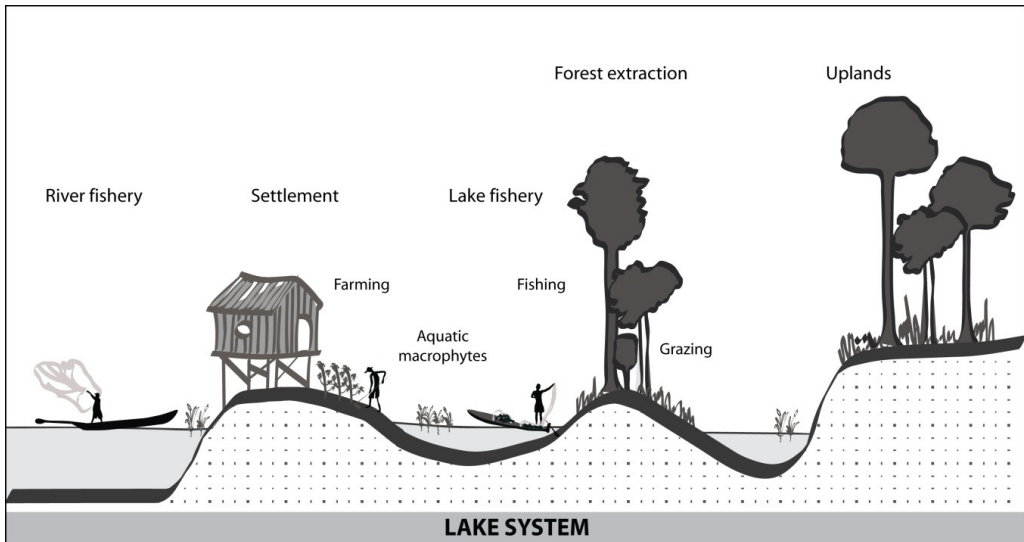
Figure 1: Floodplains in the Brazilian Amazon



Source: IBGE Census 2010

From the perspective of Amazonian riverside populations engaged in resource management, floodplains have four major landscape components: main river channels, forested natural levees bordering these channels, permanent floodplain lakes occupying much of the floodplain interior, and seasonally inundated grasslands that cover the transitional zone between levees and lakes (Figure 2). Lakes actually form networks, varying in size and permanence (some dry out during the non-flood season). They can cover quite large areas and vary considerably in size, environmental characteristics and resource abundance.

Figure 2: Environment and land uses in the lower Amazon River floodplains



Source: Adapted from McGrath *et al.* (2000) by S. Nasuti.

Land tenure reflects the patterns of resource use. Private property is generally legitimized. Properties are measured in terms of meters of frontage along the flooded rivers and extend inland to include lakes or canals. This system guarantees that each household will have access to the four aforementioned ecotopes. While private properties are recognized, there is a gradient from private to collective property land use as one moves inland from levees to interior lakes. Levees, where virtually all household infrastructure is concentrated, are clearly demarcated. Grasslands, while nominally private property, tend to be treated as a commons on which all owners may graze their cattle. Inland lakes are also regarded as the common property of those who own the land around their borders, either communities or large ranchers (McGrath *et al.*, 2000). Authors such as Castelo *et al.* (2013) claim that there is an urgent need to shift the Amazon conservation paradigm, broadening its current “forest-centric” focus to encompass the freshwater ecosystems that are vital components of the basin.

Public policies that seek the conservation of aquatic and fishery resources in the Amazon region have been polarized between using the strong arm of state intervention and plain omission in which individual initiatives flourish in the absence of state regulations. We are still far from knowing with an acceptable degree of confidence the real resource potentials and limitations of the Amazon region (Sayago *et al.*, 2003). Community-based solutions have been underestimated on account of the prevalence of individualistic behaviors and practices, typical of situations in which state regulations are not effective. In this context, the metaphor of the “tragedy of the commons” proposed by Hardin (1968) is an important reference (McGrath, 2000). The implementation of strategies that integrate conservation and development is a real challenge in this kind of natural environment. Small-scale fishing communities are often left out of governmental

strategies, either because they lack organization, or they are mobile, or because planners do not duly appreciate the importance of fisheries to them.

Also in accordance with historical patterns, fish is a crucial component of the diet of riverside populations. Modern capture and conservation techniques and more efficient modes of transportation have allowed fishing to move from the limited spheres of subsistence and local markets to larger commercial markets. As a result, since the 1990s both the quantity and the quality of catch in the region are decreasing. Stocks of some of the most traditional species, such as the “pirarucu”, “tambaqui” (*Colossoma macropomum*), and the catfish “piramutaba” (*Brachyplatystoma vaillantii*) are now suffering a fishing-down process (Castello *et al.*, 2011a; Castello & Stewart, 2010; Isaac *et al.*, 1998; Welcomme, 1999; Isaac & Ruffino, 1996; Barthem & Petrere, 1995; Neves, 1995; Barthem, 1990). In addition, stocks of regionally important species such as the small catfish “mandi” (*Pimelodus cf. Altipinnis*) in Acre state are threatened by overfishing (Oviedo, 2011).

3. A new fishing management model

The currently dominant model in the Brazilian fishing sector was established in the 1960s and maintained all the way to the late 1990s by the federal Fishing Authority – SUDEPE and its successor agency, IBAMA. It was concerned above all with increasing production, with little if any concern with the sustainability of fishing stocks. The model did not address social, cultural and environmental dimensions. This mode of regulation was based on incomplete statistics and reflected the weak regulatory control over the activity. Governance had two traits during this period: political authoritarianism and the prevalence of economic growth strategies over all other aspects (Oviedo, 2006).

Since the mid-1980s, though, re-democratization brought about changes in the role of the government. There has been a strong trend towards the decentralization of several public policies previously under the sole responsibility of the federal government. In a country of continental proportions, the end of the dictatorship prompted the belief that governability would be more effective if it was more focused on regional and local levels. Laws and norms on matters such as forestry, hunting, fishing, land use, conservation, environmental protection and pollution control became increasingly decentralized. This has been an opportunity for introducing more effective governmental action in terms of regulation, execution and control.

IBAMA was created in 1989 and inherited, among other functions, SUDEPE’s role in the regulation of fisheries. Despite its track record of administrative discontinuity and institutional fragility, IBAMA was forced to assume a more dynamic role, in order to respond to strong social and political demands. The agency adopted management models aimed at the integrated or participatory administration of activities, carried out in specific ecosystems. In this context, in 1992 IBAMA’s Fishing and Aquaculture Department (DEPAQ) implemented the River Basin Fishing Organization Program. During the first years of the DEPAQ program, adequate instruments were not clearly known. Actions focused on federal fishing regulations. However, there emerged the perception of the need to include the relevant federal, state and municipal institutions, and civil society organizations in the decision-making process.

The 1934 Brazilian Water Code (Decree 24.643, July 10, 1934, still valid for many purposes) defines floodplains, wetlands, river embankments, canals and lakes as public areas, allowing their use by riverside populations, especially small farmers and dwellers, as long as their activities does not interfere with the public interest. The more recent Water Resources Law (Law 9.433, January 9, 1997) established a new national water policy based on the following principles: water is to be treated as a public good pertaining to the public domain; it is endowed with economic value; its availability is limited; its priority use is for human consumption; catchment basins are the basic planning and management units; planning and management should allow for multiple uses and should be decentralized, involving government, users and local communities. Other laws, issued in 1967 and 1998, regulate fishing activities and empower IBAMA to produce specific ordinances.

Starting in 1996, local IBAMA offices gained more autonomy to set fishing regulations. An example is the 2002 ordinance issued by IBAMA's Amazonas state office, dealing with sport, recreational and subsistence fishing. Another example is the 2002 rule that establishes a zoning of lake systems in the municipality of Lábrea (Figure 1), defining which lakes are to be set aside for stock maintenance and breeding, besides associated user rules and penalties. Such decentralization has reached the municipal level, as happened, for example, in the municipality of Silves (Figure 1). In 2000 IBAMA published a local ordinance zoning the lakes within its territory. It designated different lakes for different roles, such as breeding, subsistence fishing and commercial fishing. This statute also created a Municipal Control Council, in charge of enforcement and application of penalties. In 2005, the municipal government of Manoel Urbano (Figure 1) organized a local fishery forum to collect proposals from community representatives and draft fishing agreement proposals to be submitted to IBAMA. The proposals established multi-species management rules and specific regulations for "pirarucu" management in target lakes (Oviedo, 2006).

Difficulties in enforcement limit the effects of these regulations. IBAMA and the Ministry of Fisheries and Aquaculture (MPA) have overlapping roles and related responsibilities. This confusion was clarified with the Fisheries Law of 2009 and the Law 140 of 2011, which transfers responsibility for managing inland fisheries to state governments. Also, both institutions are usually short on human and financial resources and lack the energy to maintain effective control in a region as vast as Amazonia. In 2000, IBAMA took an important step towards the implementation of participatory management of floodplain resources in the region. Supported by international organizations, the Ministry of the Environment and IBAMA initiated the Natural Floodplain Resources Management Project - Pro-Várzea. Its goal was to create technical and political bases for the conservation and management of floodplain resources (Santos, 2005).

It should be noted that, by law, all floodplains are public property. Only user rights can be recognized in them; land-use regulations are quite restrictive (Benatti, 2005). However, with no government authority to enforce rules, individual landowners cannot be forced to enter into collective agreements and comply with provisions that they oppose.

The Pro-Várzea Project identified land tenure as a strategic issue for the sustainable management of the floodplains. Its staff argues that there is a need for a new land

tenure policy that recognizes jointly individual and collective use rights to floodplain lakes and grasslands. This policy must also reinforce co-management arrangements and institutions developed over the previous decade. In July 2006, INCRA (National Institute for Colonization and Land Reform) initiated a new settlement and land tenure policy in a floodplain area. A pilot project was then initiated in the Santarém (Figure 1) area. It was based on a “Agro-extractive Settlement Project” model (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. Previously existing local institutions designed for the co-management of floodplain resources are thus being adapted to the new policy and institutional framework represented by the PAEs.

The MPA has gone through five ministers since its creation in 2008 – one per year. There has been a predictable lack of continuity in its policies. As a consequence, its action is weak and its experience in implementing and evaluating policies targeting the sustainability of fishery stocks or the financing of infrastructure is far below expectations. In 2015, the MPA was abolished and its functions transferred to the Ministry of Agriculture (industrial fisheries) and the Ministry of Agrarian Development (artisanal fisheries). Pilot initiatives examined in this article are an opportunity for the improvement of innovative fishery policies.

4. Examining selected experiences

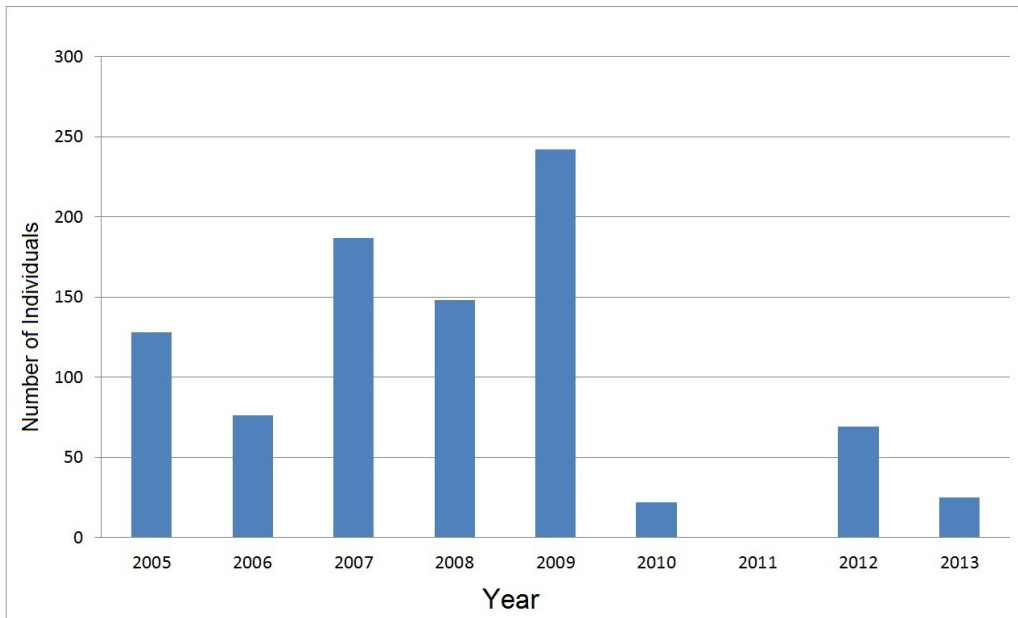
Our research shows that fisheries management in the Amazon basin, in general terms, has been inefficient, as it stipulates rules but does not enforce them. The Federal Government experiments with participatory management, i. e., with the decentralization of decision-making and management, but it hurts innovation by holding on to a centralizing role typical of command and control instruments. Within this model, governmental agencies do not have enough human and financial resources to carry out participatory management and fail to respond adequately to social demands. At the same time, they are typically tardy or absent, even in the matters related to command and control (Otsuki, 2011).

In 2001 IBAMA created a Voluntary Environmental Agents Program that helps its activities in the fields of environmental education and management of protected areas. This legislation was also extended to voluntary community agents engaged in the enforcement of fishing agreements (IBAMA, 2001). The program started with investments in training and empowering voluntary agents, but it came to a virtual end after several conflicts involving IBAMA, voluntary agents and community members.

Figure 3 displays the decline of “pirarucu” stocks resulting from lack of patrolling and enforcement of management rules. The three fishing agreements regulated in the municipality of Manoel Urbano in early 2005 brought an increase of 89% in populations of “pirarucu” between 2005 and 2009. Since 2009, the state government has given priority to an aquaculture program and canceled supporting the management of natural lakes

and fishing agreements. Coupled with weak enforcement of IBAMA, illegal access and use of “pirarucu” reserves led to social conflicts and the decline of these populations, i.e. a reduction of 89.7% between 2009-2013.

Figure 3. “Pirarucu” stocks recorded in managed lakes located in the municipality of Manoel Urbano, 2005-2013



Source: SEAPROF/AC.

In this context, conflicts involving local subsistence fishermen, “outside” commercial fishermen, and floodplains landowners proliferated. Riverside communities then moved towards informal community agreements. From 1987 to 1996, at least 35 informal fishing agreements were recorded among 72 communities belonging to a single user organization, the Z-20 Fishermen Colony, in Santarém. Most agreements were signed specifically for low water seasons, when pressures on stocks increase. However, there is a crucial point: the exclusion of fishermen from other regions is not legally supported, as Brazilian law considers rivers as public rights of way. Nobody can close them down to any actor (Azevedo & Apel, 2004).

Aquino (2007) evaluated fishing agreements implemented in the state of Amazonas. From 1995 to 2006, 35 fishing agreements were undersigned by IBAMA. A sample of 214 fishermen involved in their implementation responded that participatory management improved (60%), conflicts were reduced (58%), and fishing productivity increased (72%). However 71% responded that patrolling and enforcement were inexistent or inefficient.

The IARA Project – Management of Fishery Resources in the Middle Amazon, carried out by IBAMA, was important for managerial improvement (IBAMA, 1995). It

was implemented in the Amazonian states of Pará and Amazonas, from 1991 to 1995. Other organizations have collaborated, as was the case of national research institutes, local governments and Fishermen Colonies. As a by-product, it developed an important socio-economic and environmental database and empowered local institutions.

From 1994 to 2013, a partnership between the non-governmental organizations IPAM (Amazon Institute for Environmental Research) and WWF supported the Várzea Project in the development of a fisheries co-management system for the Lower Amazon region. This effort went through three overlapping phases. In the first, the Várzea Project personnel worked with IBAMA to develop criteria and procedures for transforming community fishing agreements into formal regulations. In the second, this model was adapted to cattle ranching on floodplain grasslands, the second major common pool resource of the floodplain. In the third, these two kinds of co-management regulations were integrated into new land tenure and settlement policy for floodplain communities, based on the Agro-extractive Settlement Project (the aforementioned PAE), a type of settlement designed for rubber tappers and other traditional communities (McGrath *et al.*, 2008).

Together with IBAMA, the Regional Fishing Councils, created by the Várzea Project, have an important role in command and control. Initially, IBAMA resisted these agreements, considering them a threat to its authority. However, given growing conflicts and thanks to research results that allowed the improvement of management systems, IBAMA concluded that a more participatory approach was acceptable (IBAMA, 2003a).

In 2003, IBAMA published an ordinance defining criteria for undersigning fishing agreements. Agreements were defined as “a set of specific norms, resulting from consensus agreements among the users of fishing resources found in a certain geographical area, or [...] a set of rules established by riverside communities in order to define access to and forms of use of the fishing resource in a specific region” (IBAMA, 2003b). IBAMA’s ordinance 29/2003 acknowledged community-based fishing management initiatives and opened the way for their integration into the formal regulatory structure. It forbids rules that exclude “outsiders”, but supports the adoption of rules accepted by both locals and “outsiders

The goal of these agreements is to control fishing pressure on local lake systems. Rarely do they specify catch limits or minimum fish sizes, measures that are more difficult to enforce. While few agreements seek to ban commercial fishing entirely, many seek to inhibit it. A central concern of floodplain fishermen is to maintain satisfactory productivity with the gear at their disposal (McGrath *et al.*, 2004).

A second important feature of the agreements is that, in contrast with conventional policies that protect fish during spawning seasons, most target the low water season, when fish are trapped in smaller water bodies and thus more vulnerable to overexploitation. Local fishermen believe that rising water levels that coincide with the spawning season provide adequate natural protection. Typical measures during the low water season include the banning of gill nets and, in some cases, restrictions on sales outside the communities. Restrictions on fishing gear during the flood season, on the other hand, are rare and tend to be site specific (McGrath *et al.*, 2002).

Agreements in effect in Santarém include regulations on the use of floodplains for fisheries, agriculture and ranching. Studies show that water buffalo herds grew fourfold in less than ten years, causing significant impacts on floodplain soils and on crops in the low water season (Azevedo & Apel, 2004). “Buffalo agreements” are being discussed with the communities, in order to achieve the integrated management of floodplain resources. In response to complaints from communities unable to solve cattle conflicts, a working group was formed by the Public Attorney’s office in the pilot region of Santarém. The goal was to adapt the approach adopted for co-management of lake fisheries to the regulation of cattle grazing. Under the supervision of the Public Attorney’s office, legally binding contracts, called “Terms of Conduct Adjustment”, are negotiated between cattle owners and other residents, defining rules for raising cattle and water buffalo on floodplains. These agreements define periods for cattle grazing in community grasslands and specify compensation for crop damages caused by cattle (McGrath *et al.*, 2008).

5. Advances and challenges

Regulating fishing activities in the Amazon region is no easy task. Any measure issued by the government tends to fail if it lacks a strong participation of resource users. The main cause of non-compliance is the lack of ownership by users who are not considered in planning, management and monitoring processes, traditionally carried out by the state. Fishing agreements mean that civil society is developing an alternative to the conventional model.

Surprisingly, most agreement documents are fairly sketchy about how monitoring and enforcement should happen. Few define exactly who is responsible for enforcement and how control is to be carried out, at the most mentioning vaguely the role of community members or leaders (McGrath *et al.*, 2004). Agreements that predict sanctions frequently specify progressively heavier penalties, from verbal warnings given to first-time offenders to apprehension of gear and formal filing of complaints with IBAMA, in the case of repeat offenders. Frequently, gear is either held until the end of the “no catch season” or turned over to the local Fisherman Colony or IBAMA (McGrath *et al.*, 2003).

The main limitations of these agreements are their weak organizational base, the absence of mechanisms to insure representation of all major stakeholders, and the lack of an explicit organizational structure for monitoring and enforcement. A related problem is how to achieve representation in the process of defining and approving agreements. Typically, interested individuals initiate the process, involving members of neighboring communities. A mutually acceptable document is eventually produced, but opponents and non-participants tend not to recognize the agreement (McGrath *et al.*, 2004). If commercially oriented fishermen are the opponents, agreements are fatally flawed at the inception.

To address the combined problems of the organizational base and representation, the Várzea Project focused first on creating intercommunity councils for major lake systems (McGrath *et al.*, 2004). These Regional Fisheries Councils are composed by representatives of all communities sharing the same lake system. They take on the responsibility (together with the Santarém Fishermen Colony) for defining, approving and implementing

local agreements. Through an iterative process in which proposals 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 approved by the Regional Council and participating communities. 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 (McGrath *et al.*, 2003). Azevedo & Apel (2004) recorded an increase in the number of representatives and involved communities in the Regional Councils created, as well as an expanded degree of organization and ability to solve conflicts.

Another challenge lies in monitoring and enforcement. As noted earlier, most agreements do not detail relevant procedures. Monitoring tends to be haphazard. It depends on the irregular patrol of lakes, typically conducted by a few community members, while the great majority evades the task. While this may work for dealing with the occasional incursions of outsiders, it is insufficient for dealing with “inside” violators - members of the community itself. In this case, the informality and lack of representation of patrols and leadership leave those who identify violators vulnerable to charges of partiality, confusing the issues and eroding credibility.

Policy-oriented learning plays an important issue for decision-makers who are confronted with complex social problems. Linking policies to implementation and expected outcomes of the agreements, which then in turn can be monitored, can support learning. Unfortunately, the use of monitoring information is often diffuse and indirect (Hermans *et al.*, 2013)

As a participant of one of the nine fishing agreements in force in Santarém, the community of São Miguel island exemplifies a extreme situation in which commercial fishing and some fishing gear have been banned for more than fifteen years. Studies focusing the “pirarucu” show that the output in these managed lakes climbed to 4.7 times higher than in unmanaged lakes (Crossa, 2002). In general, Santarém lakes protected by agreements have a 60% higher productivity then that of unmanaged lakes (Almeida *et al.*, 2002).

In the Sustainable Development Reserve of Mamirauá, between 1999 when the system was implemented and 2007, the adult pirarucu population in managed lakes almost tripled from 4500 to 12 000 individuals, while the number of fishers more than doubled from 40 to over 100 (Castello *et al.*, 2011b). The Maraã fishery, also in the RDS Mamirauá, increased from 50 fishers and a total catch of 5.5 tons/year, to 510 fishers and a total catch of 119 tons between 2002 and 2009 (Amaral *et al.*, 2011).

The lessons learned in the Sustainable Development Reserve of Mamirauá were replicated in two other reserves in the state of Amazonas. The first was the Baixo Juruá Extractive Reserve, where “pirarucu” stocks increased by 142% (between 2006 and 2011) and income reached about US\$ 26,000, in 2011, involving 50 families. The second was the Jutáí River Extractive Reserve, where stocks increased by 147 % between 2005 and 2011.

The Pyrá Project – Aquatic and Floodplains Resources Integrated Program – in the municipality of Manacapuru (Figure 1), generated two ordinances, in 2002, regulating the use of two local lakes. Each agreement involves about ten riverside communities

and creates a “Local Council for the Use of Lakes”, in charge of regulating fishing (gear restrictions and three-year bans on the “pirarucu” catch), timber extraction, the burning of grass, and the use of pesticides (Rodrigues, 2011).

The Upper Purus Project – Adaptive Management of Community Fisheries – started to operate in 2003 in the municipalities of Manoel Urbano and Sena Madureira (Figure 1), along the Purus River. The institutional improvement of the local Fishermen Colony and the training of state-employed extension technicians allowed a participatory assessment that helped set community agendas, later discussed in a Municipal Fishing Forum. These fora – bringing together fishermen colonies, IBAMA, the state government of Acre, municipal governments and NGOs – approved six proposals for fishing agreements and suggested a system of voluntary monitoring. In Manoel Urbano lake productivity increased, i.e., there was a 44.79 % increase in catchment per unit of effort (CPUE), considering the period 2005-2008 (Oviedo, 2011). Participants and user groups are now trying to apply this methodology to other communities in the state of Acre. The first such initiative happened in the municipality of Feijó (Figure 1), in which six proposals for fishing agreements were regulated by the state environmental agency (IMAC). “Pirarucu” management started there in 2008. By 2015, a stable population of pirarucus around 378 individuals was recorded. Thus, many agreements have had positive effects on stock maintenance, catch increase and conflict avoidance/resolution.

6. Final remarks

Participatory management systems tend to have fairly high opportunity costs from the perspective of users, when compared to conventional systems. They must engage actively in the management process, attend meetings, draft rules, maintain infrastructure and patrol lakes. The challenge is how to deter or detain violators. In the Amazon region, these activities tend to be quite costly, for several reasons. Many lake systems are huge, up to 100 km across, and fuel is expensive and hard to obtain. Participation in local management activities thus demands a considerable investment of time in collective decision making, harvesting, processing, patrolling and travelling to and from meetings. It also involves significant financial expenses. There are no mechanisms for covering these costs. Funding agencies usually have no interest in proposals for regional (or community) management systems of natural resources. They are focused on high scales and widespread threats such as commodity depletion, deforestation and climate change.

A second challenge is the requirement that local lake fisheries remain open to outsiders. While agreements specify **how** and **when** to fish, they cannot specify **who** can fish. As stated, Brazilian law considers all water bodies open to navigation. However, this interpretation confuses two fundamentally distinct issues: navigational rights and access rights to the fish in the water. Navigation has no specific effect on the resource, while fishing does.

There are reasons for insisting on some degree of accessibility by outsiders, especially by urban-based commercial fishermen. IBAMA’s veto to the exclusion of outsiders,

although based on the law, undermines two basic tenets of the theory of collective action (Ostrom, 1990; 1998): (1) the clear-cut definition of the group of users and (2) the right of users to the results of their own labor, without competition from *free riders*. As the matter stands now, anyone can fish in managed lakes and can have access to their improved resources, but outsiders do not share the obligations and costs of maintaining the system. Thus, those who invest in lake management compete with all other users to obtain a share of whatever benefits their efforts generate. From a theoretical perspective, this uncertainty alone is enough to ensure the failure of the entire management effort, as in the case of the *free riders* that undermine collective action (Olson, 1965).

As mentioned earlier, restrictions on gear and boat size may induce outsiders not to travel long distances to fish in a particular lake. The downside is that these kinds of restrictions also affect the efficiency of local fishing efforts (as local fishermen must spend time controlling outsiders) and thus impose an additional cost on those participating in fishing agreements. Furthermore, the present system has no mechanisms by which outsiders could share maintenance costs. In fact, managing groups are specifically barred from charging user fees. Such fees would make outsiders pay their share for resource management and could be used to compensate community members for the time invested in management activities. In the absence of such a mechanism, managing groups resort to fundraising events, such as raffles, bingo and soccer games.

INCRA's pilot initiative for a new land tenure policy in Amazonian floodplains, the PAEs, could solve the main structural problems plaguing the co-management system - namely enforcement and the impossibility of excluding outsiders. The exclusion of outsiders and user fees would reduce free riding and insure compensation for those who invest in the system, two basic conditions for long-term institutional sustainability.

Logistical and financial difficulties are exacerbated by problems involving enforcement. Efficient mechanisms for punishing violators and solving conflicts are thus another challenge for participatory management. Voluntary agents and IBAMA field staff have not met the challenge. This can be attributed in part to the lack of resources to undertake patrols, but, more importantly, it reflects the fact that IBAMA agents do not easily accept sharing authority with community members.

An additional challenge concerns monitoring and evaluating the status of the fishery and the impact of rules. Collecting information is a vital part of creating a local sense of ownership and an understanding of how regulations help attain concerted goals. This information is also essential for achieving performance indicators, so that users can see the impacts of their efforts, reinforcing their motivation for managing the system. Fishing agreements usually do not include information-gathering procedures. Agreements do not allocate funding for performance monitoring in order to determine whether they are working. This may be due to the fact that local populations do not collect data on a regular basis and to the extra costs implied by data collection. Their perceptions rely mostly on non-systematic empirical observations. However, government agents do not engage in monitoring either, nor have specific funds and tools been set-aside for this purpose. The NGO IPAM is working with the Federal University of Pará, in the municipality of Santarém, to train community members, based on the "barefoot ecologists" approach

(Prince, 2003), in which community members collect field data on a regular basis, with the support of university tools and protocols.

The major finding is that considerable progress was made over the last ten years in the direction of a participatory management system for fisheries in the Brazilian Amazon region. This provides an important example of how diverse groups - communities, Fishermen Colonies, NGO's, government agencies, international donor agencies, and international conservation organizations - can work together to develop a new grassroots approach to management, defending local resources and livelihoods. It also illustrates the capacity of participants to learn from the process and to adjust the model.

Implementing fishing agreements is a long-term process. There is no single solution for the Amazon region as a whole. Nonetheless, there is a network of institutions and arrangements - formal, and informal - operating in many different and complementary areas. The current legal and institutional framework is mostly favorable to participatory solutions. Some sensitive aspects have been identified and should guide future research - what to do with users who lack favorable conditions of access and participation (especially commercial fishermen), how to ensure the continuous commitment of local fishermen, and how to implement a participatory monitoring system.

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NOW UNDER NEW ADMINISTRATION: FISHING AGREEMENTS IN THE BRAZILIAN AMAZON FLOODPLAINS

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Abstract: Fisheries become undermined as floodplains suffer increasing pressure from infrastructure, pollution, changes in climate and over-extraction. For Amazonian riverside communities, less fish in the rivers and lakes means empty pockets and empty stomachs. This article uses common pool resource theory to analyze the origins and workings of collective fishing agreements in the Brazilian Amazon floodplains. As commercial fisheries expanded in the mid-1990s, experiences in community-managed lakes emerged in several locations, as a promising example of participatory grassroots management. Findings show that agreements yield considerable improvements, although their effectiveness is threatened by the weak vigilance and monitoring and by the lack of effectiveness of land tenure regulation. The article suggests that governmental agencies should support these agreements by developing (or adapting) mechanisms aiming at the decentralization of public decisions and management. Their failure may lead to changes in ecological processes, reduction of fishing stocks, and social-environmental conflicts.

Key words: participatory management / fishing agreements / grassroots management / common pool resources / Amazon region / Brazil

Resumo: A pesca fica prejudicada quando as várzeas sofrem crescentes pressões de infraestrutura, poluição, mudanças climáticas e sobrepesca. Para comunidades ribeirinhas da Amazônia, isso pode significar menos peixes nos rios e lagos, o que leva a bolsos e estômagos vazios. Este artigo usa a teoria dos recursos comuns para analisar as origens e o funcionamento dos acordos coletivos de pesca assinados por habitantes das várzeas da Amazônia brasileira. Como a pesca comercial se expandiu em meados dos anos 1990, as experiências envolvendo lagos geridos pelas comunidades locais surgiram em vários locais, como um exemplo promissor de gestão participativa de base. Os resultados mostram que os acordos geraram melhorias consideráveis, embora a sua eficácia esteja ameaçada pela fraqueza do monitoramento e da fiscalização e pela falta de eficácia da regulamentação da posse da terra. O artigo sugere que as agências governamentais devem apoiar estes acordos

por meio do desenvolvimento (ou adaptação) dos mecanismos que visam a descentralização das decisões públicas e da gestão. O fracasso deles pode levar a mudanças nos processos ecológicos, à redução dos estoques pesqueiros e a conflitos sócio-ambientais.

Palavras-chave: Gestão participativa; Acordos de pesca; Gestão comunitária; Recursos comuns; Amazônia; Brasil.

Resumen: La pesca se ve perjudicada cuando las llanuras de inundación sufren presiones crecientes de infraestructura, contaminación, cambio climático y sobrepesca. Para las comunidades ribereñas de la Amazonía, esto puede significar menos peces en los ríos y lagos, lo que provoca bolsos y estómagos vacíos. Este artículo usa la teoría de los recursos comunes para analizar los orígenes y el funcionamiento de los acuerdos colectivos de pesca firmados por habitantes de las llanuras de inundación de la Amazonía brasileña. Como la pesca comercial se expandió a mediados de los años 1990, en varios lugares surgieron experiencias de lagos gestionados por las comunidades locales, como un ejemplo prometedor de gestión participativa. Los resultados muestran que los acuerdos generaron mejoras considerables, aunque su eficacia esté amenazada por la debilidad del control y vigilancia y por la falta de eficacia de la regulación de la tenencia de tierras. El artículo sugiere que las agencias gubernamentales deben apoyar estos acuerdos mediante el desarrollo (o adaptación) de los mecanismos que buscan la descentralización de las decisiones públicas y de la gestión. El fracaso de dichos acuerdos puede desencadenar cambios en los procesos ecológicos, la reducción de los estoques pesqueros y conflictos socioambientales.

Palabras clave: Gestión participativa; Acuerdos de pesca; Gestión comunitaria; Recursos comunes; Amazonía; Brasil.
