

**Development of a formal co-management system for floodplain fisheries
in the Lower Amazon Region of Brazil.**

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**Formalisation of access and trade in land and natural resources:
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Abstract

A major trend in the global trade in tropical forest products is the implementation of importation policies to promote the sustainable management of natural resources in the countries of origin. In many cases, efforts to ensure sustainable origins involve requirements that small scale rural producers and managers cannot meet. These agro-extractivist groups are often only partially integrated into the formal economy. Many lack the basic documents required to engage the government bureaucracy, and most production, local processing and marketing take place through informal channels that are outside government regulatory frameworks. This is especially true of small scale extractive activities such as artisanal fisheries. They face four major problems: 1) community management systems rarely produce the verifiable information on the sustainability of resource use required by import regulations; 2) The small scale, diffuse and informal nature of local fisheries means that there is minimal documentation of origins and the networks through which products pass before entering formal markets; 3) extraction, storage and processing technologies rarely meet government sanitary requirements, and 4) government regulatory processes impose excruciating costs on those attempting to comply with bureaucratic requirements. Given this situation, importing countries' efforts to ensure the sustainable origins of products entering their markets are likely to have the unintended consequence of accelerating the exclusion of these community fisheries from access to all but local markets. Rather than helping artisanal fishers, these policies could simply contribute to their demise. This paper examines the evolution of community managed floodplain fisheries in the Lower Amazon and parallel processes of formalization of floodplain households, their communities and management systems, in order to evaluate the extent to which the ongoing process of formalization strengthens the ability of artisanal fishers to participate in national and international markets.

Keywords: co-management, fisheries, market formalization, Amazon

1. Introduction. A major trend in the global trade in tropical forest products is the implementation of importation policies to promote the sustainable management of natural resources in the countries of origin. In many cases, efforts to ensure sustainable origins involve requirements that small-scale rural producers and managers cannot meet. In most cases, these agro-extractivist groups are only partially integrated into the formal economy. Many lack the basic documents required to engage the government bureaucracy, and most production, local processing and marketing take place through informal channels that are outside government regulatory frameworks. This is especially true of small-scale extractive activities such as artisanal fisheries. They face four major problems: 1) community management systems rarely produce the verifiable information on the sustainability of resource use required by import

regulations; 2) The small scale, diffuse and informal nature of local fisheries means that there is minimal documentation of origins and the networks through which products pass before entering formal markets; 3) extraction, storage and processing technologies rarely meet government sanitary requirements; and 4) government regulatory processes impose excruciating costs on those attempting to comply with bureaucratic requirements. Given this situation, importing countries' efforts to ensure the sustainable origins of products entering their markets are likely to have the unintended consequence of accelerating the exclusion of these community fisheries from access to all but local markets. Rather than helping artisanal fishers, these policies could simply contribute to their demise.

This paper examines the evolution of policies and institutional arrangements for the co-management¹ of floodplain (or "várzea") fisheries in the Brazilian Amazon involving floodplain communities and government management agencies, in order to evaluate the extent to which the ongoing process of formalization strengthens the ability of artisanal fishers to participate in national and international markets and meet FLEGT-type requirements. Three case studies are presented that illustrate different trajectories in the development of formal co-management systems in the Amazon (Fig. 1): 1) development of co-management policies and institutions for fisheries in the state of Pará, with a focus on the Lower Amazon region; 2) development of fisheries co-management policies in the state of Amazonas; and 3) the development of policies for the community-based management of the pirarucu (*Arapaima gigas*), an economically important species of fish endemic to Amazonia. These three case studies illustrate many of the problems as well as the potential of certification of artisanal fisheries as a means of ensuring the sustainable management of local fisheries and improving the quality of life of artisanal fishers, their families and communities.

2. Development of fisheries policies and institutions in the Brazilian Amazon

2.1 History of fisheries sector, 1800–1990. Fisheries have played a central role in the Amazon economy since early in the colonial era, providing the major source of animal protein for rural and urban populations. While dried-salted fish, especially the pirarucu, known as the *bacalhau* or cod of the Amazon, have been exported from the Amazon for centuries, fish were more important as a regional trade good that traders and local merchants exchanged for forest products, such as rubber and Brazil nuts, sought by the export market (Veríssimo 1970; Weinstein 1983). For much of Amazon history commercially oriented fishing was quite seasonal, practiced more in the low-water season when fish migrate upstream in dense schools or become concentrated in lakes and channels that do not completely dry out as river waters recede. At this time of year, fishers would gather to catch fish on lake margins or on the shore of the river where schools of fish were passing. After salting and drying, the fish were traded to local merchants in exchange for a diverse range of manufactured goods including liquor, salt, sugar, flour, cloth, metal pots and pans, iron tools and guns and ammunition. For centuries

¹ Co-management refers to management systems in which user groups and government management agencies collaborate in defining, implementing, monitoring and, in some cases, enforcing regulations for access to and use of a natural resource.

floodplain fisheries helped to sustain a dynamic river-based economy in which dried fish, turtle meat and oil from turtle eggs helped to maintain extractive labor in headwater regions of the basin (Weinstein 1983).

This system began to undergo significant changes in the 1960s as a result of technological innovations resulting, in part, from government policies, as well as from broader changes in the Amazon economy (Meschkat 1960). Key technological innovations included the adoption of diesel engines, the introduction of synthetic fibers for nets and, with the construction of ice-making plants, the storage of fish in Styrofoam™-lined ice chests. These innovations enabled fishers to travel further, and catch and store larger amounts of fish (McGrath *et al.* 1993). At the same time government development policies were contributing to the rapid growth of Amazon cities and investments in processing plants exporting frozen fish to other parts of Brazil. These changes transformed Amazon fisheries from a seasonal activity involving the production of dried-salted fish to a year round activity providing fresh, iced fish to urban and export markets. In addition, these changes in Amazon fisheries led to the rise of a class of full-time professional fishers, known as *geleiros*, based in the main fishing ports and travelling increasingly longer distances to exploit fish stocks in floodplain lakes and the upper portions of tributary rivers (Goulding 1983, Smith 1985).

The intensification of commercial fisheries brought unprecedented pressure to bear on floodplain lake fisheries. Concerned that local lake fisheries were being depleted, communities organized to prevent commercial fishers from entering lakes, resulting in the proliferation of fisheries conflicts throughout the basin. In some cases these confrontations escalated to armed conflict (Chapman 1989, Hartmann 1989, Junk 1984).

The growing conflict between floodplain communities and outside commercial fishers had its origins in broader regional social movements that gave rise to the Rubber Tapper and Forest People's Movement (Allegretti 1995, Hall 1997, McGrath 2000). This broader movement was to a large extent the product of efforts by Catholic Church Programs such as *Movimento Educacional de Base* (MEB) (Mainwaring 2004). These programs were heavily influenced by Liberation Theology, with its emphasis on community, the rights of the poor, subsistence rather than market orientation and, in the case of fisheries, preservation of nature. MEB and related Church programs transformed rural settlements into communities with a Catholic Church and community center, and also created community organizations including community governing councils, mothers' clubs, youth clubs, catechism groups and soccer clubs. MEB also invested heavily in developing rural leadership and a whole generation of rural labor leaders grew up, who had been trained by the Catholic Church in the 1970s and 1980s.

The work of Catholic Church organizations laid the foundations for the rural labor movements that developed in the 1980s (Esterci 2004, Mainwaring 2004). Both the Forest People's and Lake Reserve Movements were a response of rural communities to forms of rural transformation that threatened their way of life, and both contributed to the transformation of government policies regarding traditional peoples and the management of key forest and floodplain resources (Hall 1997; Lima 1999; McGrath 2000).

2.2 Fisher organizations

The main formal organization of Brazilian fishers is the *Colônia de Pescadores* (Fishers' Colony). The *Colônia de Pescadores* is an institution that was created by the Brazilian Navy in 1917 (Campos 1993, Hurley 1933). The *Colônia* had both humanitarian and strategic objectives. From a humanitarian perspective, *Colônias* were created to provide fishers with access to basic health care and other government social services. From a strategic perspective, *Colônias* were created to enlist fishers in the monitoring of coastal waters, serving as a first line of defense against potential enemy ships and submarines. *Colônias* were traditionally led by local naval commanders or members of the local elite such as politically influential ranchers or merchants. In both cases *Colônias* were paternalistic organizations designed to serve the interests of the local elite rather than those of local fishers.

Municipal *Colônias* were integrated into state and federal organizations called *Federação de Pescadores* (Federation of Fishers or Fisheries Federation), which ostensibly had the mission of promoting fishers' interests at state and federal levels. These organizations were also firmly under the control of state and federal elite. This began to change in the 1980s as regional grassroots organizations began to make deliberate efforts to take over Rural Labor Unions and some *Colônias* (Leroy 1991).

Originally, the *Colônias* were outside the formal institutional structure of unions created during the Vargas era (1930–45). In the 1988 Constitution, however, the legal status of *Colônias* was changed to bring them into the formal government union structure so that today they are equivalent to the rural labor unions, which represent smallholders and agricultural laborers. In the past, membership in a *Colônia* was not required and access to government benefits was not conditional on *Colônia* membership. However, membership became mandatory with modifications to the Closed Season Unemployment Insurance Program, known as *Seguro Defeso*, implemented in 2003. In addition, the revised Aquaculture and Fisheries Law signed in 2009 gave *Colônias* the right to organize the marketing of their member's fish catch either directly or through cooperatives or other kinds of organizations (Brasil 2009).

Other fisher organizations. At the same time that social movements in some regions were seeking to take over *Colônias*, national efforts were underway to create an alternative institutional structure to replace the government-controlled Fisheries Federation² system. This process led to the creation of MONAPE, *Movimento Nacional dos Pescadores Artesanais*. In Pará movement leaders created MOPEPA, the *Movimento dos Pescadores do Pará* (Campos 1993). MOPEPA was composed of representatives of those *Colônias* that were taken over by fishers involved in regional social movements. Ultimately, MONAPE was not able to replace the state and Federal Fisheries Federation structures and today the two parallel institutional structures co-exist.

コメント [LP1]: This has not been mentioned before – needs to be introduced somewhere.

² Federação Nacional de Pescadores do Brasil

Important Church-related institutions involved in fisheries issues are the *Comissão Pastoral da Terra* (CPT) and the *Comissão Pastoral da Pesca* (CPP). The CPT was created by the Catholic Church to address primarily land tenure issues on the Amazon frontier. However, in the state of Amazonas, which was little affected by frontier expansion until recently, the CPT has been the lead organization in addressing fisheries conflicts and has promoted the Lake Preservation Movement (CPT 1992a & b). The CPP has played an important role in fisheries issues in northeast Pará but has had little involvement in fisheries issues in the Lower Amazon region until quite recently (Rocha *et al.* 1996).

コメント [JJS2]: Does this refer to reference a or b?

2.3 The *Colônia de Pescadores* and the Closed Season Unemployment Benefits (*Seguro Defeso*) Program. One of the main national fisheries regulations is the Law for the *Defeso* (closed season), which requires that commercial fishing of key species be suspended during a 3–4 month spawning season, which in the Amazon is defined as extending from November 15 to February 28. This measure was rarely taken seriously in the Amazon because it coincided with the beginning of the flood season when fish populations dispersed in an expanding volume of water (Goulding 1983, Isaac *et al.* 1993). In 1991 the *Seguro Defeso* Program (Closed Season Unemployment Insurance) was created with two objectives: to protect mature fish during the spawning season and to compensate fishers for lost income as an incentive to respect the closed spawning season (Abdallah and Sumaila 2007, Brasil 1991, Teixeira and Abdallah 2005). Initially, to be eligible for the benefit a fisher had to have had his professional fisher's license for at least 3 years, be registered with the Social Security Program and be up to date with monthly social security payments. The law did not require membership in the *Colônia*. In 2003, shortly after President Lula took office, the 1991 law was substituted by Law No. 10.779, of November 25, 2003, which changed some elements of the original law. It substituted the professional license issue the *Instituto Brasileiro de Meio Ambiente e Recursos Renováveis* (IBAMA) with one issued by the Secretary of Aquiculture and Fisheries (SEAP) and reduced from 3 to 1 year the period before a fisher was eligible to receive the *Defeso* insurance. Subsequently, fishers were required to be members of the *Colônia* of their municipality with their dues up to date. These changes facilitated access to *Defeso* insurance and strengthened the relationship between fishers and their municipal *Colônia*.

Initially, this program had limited impact because the requirements for eligibility were quite rigorous and few fishers were paid up on their *Colônia* dues and therefore eligible for the benefits. Consequently, the numbers of fishers receiving the benefit grew slowly. However, after the government loosened requirements, the number of fishers receiving the benefit and the total volume of funding involved increased more rapidly, almost six fold between 2003 and 2008 and doubling between 2008 and 2011, so that by 2011 the total volume of payments to fishers in Brazil exceeded 1.2 billion reais.

2.4 Community fishing agreements. The evolution of a formal policy and institutional framework for the co-management of floodplain fisheries grew out of the conflicts between floodplain communities and more capitalized outside commercial fisheries. As previously mentioned, isolated conflicts occurred as early as the mid-1960s when the technological and commercial transformation of Amazonian fisheries began (Hartmann 1989). They increased in

frequency in the 1970s and 1980s as the number of commercial fishers and market demand increased. The growth of regional grassroots movements inspired by Liberation theology, land conflicts and opposition to the military dictatorship also fueled fisheries conflicts, as community and inter-community organization was strengthened through the efforts of MEB and related educational programs. In addition, a decline in demand for jute, the mainstay of the *várzea* economy from the 1950s through the 1980s, led many floodplain residents to shift from commercial agriculture to commercial fishing, increasing dependence on local fisheries as a source of both income and subsistence. The added pressure on local fisheries exacerbated competition between local and outside fishers resulting in more and more conflicts over access to and control over local fisheries (Brabo 1981, McGrath *et al.* 1993).

Floodplain habitats, resource use and tenure rights. The Amazon floodplain or *várzea* varies considerably over its extent so that any description of the floodplain landscape must of necessity be restricted to a particular segment of the river. In the Lower Amazon the predominant features are the presence of large shallow lakes, ranging in size from a few hundred square meters to hundreds of square kilometers, and a vegetation cover that is 90% natural grasslands and 10% forest (McGrath *et al.* 2008a). The lakes are actually networks of lakes, varying in size and frequency of annual permanence. The resulting lake systems can cover large areas and have considerable spatial variability in environmental characteristics and resource abundance.

From the perspective of smallholder resource management, there is a horizontal zonation of habitats and resources, and associated patterns of settlement, economic activity and land tenure rights. Extending from the main river channel to the *terra firme* (literally “solid ground”, i.e. ground that does not regularly flood) shore we can distinguish four main habitat types: the major river channels, forested natural levees bordering these channels, permanent floodplain lakes that occupy much of the floodplain interior and seasonally inundated grasslands that cover the transitional zone between forested levees and permanent lakes (Fig. 3).

Household economic strategies exploit the resources of each habitat type. Settlements are located on the levees and most annual and perennial crop production is also concentrated on these sites. Cattle are grazed on the seasonally inundated grasslands. Households fish in floodplain lakes and on a more seasonal basis in river channels. Properties are defined in terms of meters of frontage and extend inland to the lakes and canals that occupy the floodplain interior. This system gives each household access to all the main ecological zones as well as to the river (Fig. 3; McGrath *et al.* 2008a).

Floodplain communities recognize a gradation in land tenure rights from individual to collective as one moves inland from the levee. Levee sites are considered to be individual property with lateral boundaries clearly marked and usually fenced. Individual tenure rights are more fluid in the seasonally inundated grasslands inland from the levee. Lateral boundaries, though recognized, are rarely fenced and cattle are allowed to move freely across properties in this zone. Lakes are considered to be collective property and individual rights are not recognized.

However, the community bases its claims for ownership of neighboring lakes on the fact that community lands surround much of the lake. There are then two major floodplain commons, the seasonally inundated grasslands and the interior lake system. It should also be noted that the logic of the community's claim to rights over local lake fisheries is the same as that of ranchers who claim ownership of lands surrounding a floodplain lake system. These varied and potentially conflicting tenure rights are key elements in the evolution of the floodplain co-management system (Benatti 2005, McGrath *et al.* 1999).

Community lake management agreements. The co-management system developed out of the regional grassroots movement to take control over access and use of lake fisheries and limit commercial fishing pressure in lakes claimed by one or more communities (McGrath *et al.* 1993). While the original motivation was usually to exclude outside commercial fishers, it soon became evident that excluding outsiders was not sufficient and that it was also necessary to define rules for fishing by community members. Beginning in the early 1980s, floodplain communities throughout the region began developing collective fishing agreements, called *acordos de pesca*, to define rules of access and use of local lake fisheries (Castro 2000).

The general objective of fishing agreements is to control fishing pressure in local lake systems. They typically seek to achieve this objective indirectly by restricting the type of gear (e.g. fishing nets) that can be used, storage capacity and/or the sale of catch. Few, if any, of these agreements specify catch limits or minimum size requirements, measures that would be more difficult to enforce. While few agreements seek to prohibit commercial fishing entirely, many do seek to contain it. A central concern of floodplain fishers is to maintain the productivity of local fisheries at satisfactory levels with the gear they have. While the discourse is preservation and/or conservation, another underlying motive is to promote equal conditions of access to the resource (Almeida *et al.* 2009). Floodplain fishers typically engage in a number of economic activities, including annual cropping, small animal husbandry and cattle raising, and do not have either the time or the resources to compete with full-time commercial fishers (Castro and McGrath 2003, McGrath 2000).

2.5 Development of Amazon Fisheries co-management policy: 1990–2006. In the early 1990s IBAMA's Iara Project, a bilateral collaboration between the German and Brazilian governments began working with local non-governmental organizations (NGOs), the Municipal Fishers' Union and floodplain communities to develop a co-management system for regional fisheries that incorporated the collective fishing agreements described in the previous section into the formal structure of fisheries management (IBAMA 1995, McGrath *et al.* 2004). Integration of fishing accords into the formal institutional framework for fisheries management involved several steps whereby IBAMA moved from its initial position – i.e. that the collective fishing agreements were illegal – to one in which they have become a fundamental component of the new co-management system for Amazon fisheries.

The construction of this co-management system had to deal with three major challenges in formalizing community fishing agreements. First, while most communities had some form of elected leadership, very few had the capacity to actually organize and implement anything but

isolated, short-term activities. Furthermore, with the exception of those areas where the Catholic Church and the Fishers' Union provided a regional organizational framework and leadership, there were no multi-community organizations to serve as the institutional base for fishing agreements. Second, communities have difficulty ensuring equitable representation in the process of defining and approving fishing agreements. Third, most collective fishing agreements did not describe in adequate detail procedures for organizing the monitoring of fishing agreements nor for judging those accused of infractions. Monitoring tended to be haphazard with irregular patrols of lakes typically conducted by a few community members while the great majority have shirked their responsibilities.

Formalization of fishing agreements. The first attempt at defining a co-management policy based on collective fishing agreements, was released as an internal memorandum in 1997. This memorandum specified criteria and procedures for the legal recognition of the agreements, making possible their transformation into formal fishing regulations via *portarias complementares*.³ Three criteria were especially relevant to the subsequent development of the co-management system: 1) the fishing agreement cannot specify who can and who cannot fish in a lake; 2) a collective fishing agreement must be proposed by an organization that represents all the communities located within a lake system's boundaries and that takes responsibility for implementing the accord once it is approved; and 3) no local organization can charge any type of fee for fishing in the lake. While only an internal memorandum, this document provided the basis for development of regional co-management systems based on collective fishing agreements.

To address the combined problems of organizational base and representation, efforts in Santarém focused on creating intercommunity councils for the major lake systems. Called Regional Fisheries Councils, they are composed of representatives of all the communities sharing a common lake system. These councils were created to take responsibility for organizing the process of defining, approving and implementing fishing accords for their respective lake systems. Through an iterative process in which proposals for a fishing accord are developed at the community level, taken to the Regional Council for discussion and development of a common proposal, evaluated and where necessary amended by participating communities, a definitive version is finally developed and approved by the Regional Council and participating communities. While this process does not guarantee adequate representation, it does ensure that all communities have roughly equal representation in developing the regional fishing accord and provides abundant opportunities for anyone to participate in the process.

Once a fishing accord became law, IBAMA was obligated to enforce it. However, merely legalizing the accord does not address the problems that have limited IBAMA's ability to enforce fisheries legislation, namely the lack of personnel, equipment and funds for maintaining an effective presence in the field. To resolve this problem IBAMA created the position of

³ This document served as the basis for the definitive *Instrução Normativa* published in January, 2003 (IBAMA 2003).

Volunteer Environmental Agent (VEA) (IBAMA 2001a, c, 2005). These agents are community members who receive training in environmental legislation and enforcement procedures and are responsible for monitoring local compliance with environmental regulations. They do not have the power to make arrests or confiscate equipment, but only to issue citations, which they subsequently turn over to IBAMA field agents who decide whether to pursue it or not. IBAMA organized training courses for VEAs of regions that have legal fishing accords and certified those who successfully completed the program. Each community could choose one or two people to participate in the training.

With the creation and training of the VEAs, the main components of the co-management system were now in place. The major lake systems of the floodplain in the Santarém area were transformed into Regional Fisheries Council districts, and the Fisheries Councils were composed of representatives of all the communities of a given lake system. The Council defined a fishing agreement that listed the management regulations and submitted the document to the regional IBAMA office. If the agreement met IBAMA's criteria for approval it was forwarded to the national office in Brasília for final review, signed by the President of IBAMA and published in the official government registry as a complementary law valid for 1–3 years. Once the agreement became law, IBAMA would train VEAs who, after certification, assumed responsibility for working with community members to monitor compliance and organize regular patrols. When violators were apprehended, VEAs would issue citations and report the incident to IBAMA's enforcement office, which would pursue the case as deemed appropriate.

By 2001 the basic elements of the regional fisheries co-management system had been constructed. Seven Regional Fisheries Councils (eight if the Santarém Urban Council is included) had been created covering some 2600 km² of Lower Amazon floodplain and including 180 communities and roughly 40 000 people. With these changes a regional co-management system was created in which Regional Fisheries Councils formulate lake management agreements and submit them to IBAMA for evaluation. IBAMA evaluates the agreements and if approved transforms them into administrative decrees (*Instrução Normativa*). The Regional Fisheries Councils together with the VEAs are responsible for implementing fisheries agreements at the community level once approved by IBAMA.

2.6 Evaluation of the performance of the co-management system. By 2002 the system had been functioning for several years and it was possible to evaluate its performance in terms of providing an effective system for sustainably managing fisheries, and in terms of its institutional sustainability efficiency and sustainability. Towards this end, several studies were conducted to evaluate the performance and impacts of the co-management system.

Ecological performance. Almeida (2006a) undertook a comparative study of fishing and fishing productivity (catch per unit effort, CPUE) in nine pairs of managed and unmanaged community lake fisheries. She found that while fishing activity in the two types of lakes was essentially the same, on average, fishing in managed lakes was 60% more productive. Since there was no significant difference in fishing activity between the members of each pair, the difference in productivity seemed to be due primarily to the exclusion of larger commercial fishing boats

from managed lakes. Her results support the idea that lakes can be effective management units for floodplain fisheries and that fishing agreements can have a positive effect on floodplain fish populations, despite large seasonal variation in water level and the movement of fish between floodplain and river over the course of the year.

Institutional performance. Co-management systems tend to have fairly high transaction costs from the perspective of users when compared to the conventional resource management model (Pereira 2002). This is because users must participate actively in the management process, attending meetings to decide the rules for fishing activity, patrolling lakes and apprehending those breaking the rules. In the Amazon case, these costs tend to be quite high for several reasons. Furthermore, enforcement can be very stressful, especially when violators are neighbors and relatives.

A critical problem with the co-management system developed by IBAMA was the requirement that communities maintain local lake fisheries open to outsiders. While fishing agreements can specify how to fish, including what gear may be used, they cannot specify who can fish. While there are good reasons for insisting on some degree of accessibility for outsiders, the position taken by IBAMA undermines two basic tenets of the theory of collective action: clear definition of the group of users and the right of that group to the fruits of its own labor without competition from free-riders (Olson 1965, Ostrom 1990). As it stands now, anyone can fish in a given lake and so gain access to the benefits generated by community managers, but they do not have to share in the obligations of maintaining the system. Thus, those who invest in managing the lake must compete with all other users to obtain a share of whatever benefits their efforts generate. From a theoretical perspective, this attribute alone is sufficient to ensure the eventual failure of the collective enterprise. Furthermore, this co-management system contains no mechanisms through which outsiders could share in the cost of maintaining the system. In fact, Fisheries Councils are prohibited from charging user fees, an attribute of the federal government (IBAMA 2003). Nor can they force individuals to participate in lake patrols and other regulatory activities. By charging such fees, it would be possible to compensate members for the time they invest in management activities. In the absence of a mechanism such as user fees, Fisheries Councils have had to resort to sponsoring events, such as raffles, bingo and football competitions, to raise funds. While this may solve the immediate financial problem of generating resources to cover management costs, it is an exogenous solution divorced from participation in the lake fishery. Thus it tends to separate economic and regulatory interests, making returns from management even more diffuse and difficult to protect from free-riders (see Jentoft and McCay 1995).

Another problem is the distribution of costs between communities and IBAMA. Inhetvin (2004) estimated the costs incurred by meetings, patrols and training sessions. Total costs for the co-management system were estimated to be 1.6 million reais per year. This figure is equivalent to about 20% of the value generated by the regional fishery. In addition, roughly 83% of the total cost was borne by communities, five times IBAMA's level of expenditure. Clearly, the implementation of the co-management system had shifted much of the cost of enforcing the system from IBAMA to the communities.

2.7 Changes in federal and state fisheries policies and institutions. Beginning in the 1960s, the policy and institutional framework for fisheries management and development have undergone several major changes. The modern phase in the evolution of federal fisheries policies began with the creation of SUDEPE in 1966. SUDEPE adopted a strongly development-oriented approach with a focus on modernizing Amazon fisheries through the development of industrial-scale fisheries and the modernization of artisanal fisheries (McGrath *et al.* 2008b, SUDEPE 1988). This phase extended from 1966 to 1989, though by the late 1970s this policy had been largely discredited. In 1989 SUDEPE was absorbed into the new federal institute IBAMA, which assumed responsibility for environmental regulation and management of renewable resources. SUDEPE's absorption into IBAMA also marked a shift from a development to a conservation-oriented approach in national fisheries policy. This conservationist-orientation dominated fisheries policy through the 1990s.

In 1998 the fisheries industry succeeded in having a development-oriented Department of Aquaculture and Fisheries created within the Ministry of Agriculture. The director of the department was recruited from the marine-fisheries industry. With the election of the worker's party candidate to the presidency in 2002, the department was transformed into the Secretary of Aquaculture and Fisheries (SEAP) with the status of a ministry and linked directly to the Presidency. Subsequently, SEAP was transformed into the Ministry of Fisheries and Aquaculture (MPA). While the Department of Aquaculture and Fisheries was oriented towards the interests of industrial fisheries, SEAP and its successor the MPA were oriented towards artisanal fisheries. In fact, SEAP was created in recognition of the importance of the artisanal fisheries movement within the broader coalition that had helped to elect the Workers' Party (PT) candidate, Luis "Lula" Inácio da Silva to the Presidency. Consequently, while SEAP and its successor the MPA had a clear development orientation, there was also a strong emphasis on supporting the artisanal fisheries sector. Towards this end, artisanal fishers obtained access to subsidized credit programs such as PRONAF (*Programa Nacional de Agricultura Familiar*), which were originally designed for small-scale farmers, and could now use these lines of credit to finance the purchase of fishing boats and gear. It should be noted that these programs did not fund management initiatives. Cooperatives with facilities for ice production, refrigerated storage space and, in some cases, limited fish processing capabilities, were constructed in some parts of the country. Most failed in a fairly short time since *Colônias* and other fisher organizations generally lacked the administrative and organizational skills needed to run such operations efficiently.

The creation of the MPA resulted in considerable confusion regarding the division of responsibilities within the fisheries sector. Initially, it seemed that the MPA would be responsible primarily for fisheries development and IBAMA⁴ for fisheries management. However, the MPA insisted on taking responsibility for all fisheries-related activities and

⁴In 2006 IBAMA was divided into two institutions with the creation of the Instituto Chico Mendes de Biodiversidade (ICMBIO), responsible for the national reserve system, and IBAMA, responsible for environmental licensing of federal infrastructure projects.

gradually took over management functions as well. The problem with this position was that the MPA had little technical capacity in fisheries management. State level supervisors were often chosen from the artisanal fishers' movement and MPA programs tended to focus on issues of importance to artisanal fishers, with much less concern over the status of fisheries resources. Furthermore, while offices with a core staff were established in each state, the MPA had virtually no presence in the field and no enforcement authority.

The question of responsibility for fisheries management began to be defined with the passage of the 2009 law, which established the National Policy for the Sustainable Development of Aquaculture and Fisheries (Brasil, 2009), which replaced the 1967 Fisheries Code as the basic fisheries legislation for Brazil. The 2009 National Policy had four main objectives: 1) sustainable development of fisheries and aquaculture, 2) fisheries management, 3) conservation of fisheries and aquatic environments, and 4) socioeconomic development of fishers and their communities. With regard to fisheries management, the 2009 law states that management policies should reconcile sustainability of fisheries resources with improvements in social and economic well-being. It transfers responsibility for fisheries management from the federal government to the states, though it is more ambiguous regarding responsibility for enforcement. It should be noted that no mention is made of co-management, nor of fisher participation in defining fisheries regulations. The 2009 law also establishes that all commercial fishers must be registered with the General Registry of Fishing Activity (*Registro Geral da Atividade Pesqueira*, RGP) and the Federal Technical Register (*Cadastro Técnico Federal*, CTF). These requirements were also present in previous legislation, but the MPA has now made the implementation of this Registry a priority for 2012-2013,⁵ together with efforts to clean up the membership rolls of *Colônias* throughout the country (Sr. Albertinho pers. comm.).

Complementary legislation passed in 2011 specified more clearly the responsibilities of the federal, state and municipal governments in environmental management and has been interpreted as transferring to the states responsibility for managing inland fisheries (Brasil 2011). This legislation consolidates the process of decentralizing environmental management functions from the federal government (IBAMA) to state environmental agencies (*Secretaria de Meio Ambiente*, SEMA), including environmental licensing (except for federal infrastructure projects), monitoring and enforcement. The degree to which these state agencies have taken on fisheries management and enforcement functions and the degree to which they have adopted co-management policies vary from state to state, as will be seen in the two case studies discussed later. In this regard, the restructuring of the government fisheries sector that began with the creation of the SEAP significantly disrupted the further development of the policy and institutional framework for fisheries co-management. Even where states have adopted co-management policies, in most cases they do not have the physical presence

⁵ An article in the on-line version of the *O Globo* newspaper states that in the first 10 months of 2011 the registration of 87 160 people had been cancelled due to fraud. <http://oglobo.globo.com/politica/bolsa-pesca-paga-sem-controle-pelo-governo-usada-ate-como-moeda-eleitoral-2744078#ixzz2AEY4ABF9>

throughout their respective territorial jurisdictions to support local co-management institutions in monitoring and enforcing local fisheries agreements.

In 2012 the MPA has been the victim of the complex process of alliance formation in preparation for the October 2012 municipal elections. To strengthen support among protestant evangelicals, the Ministry was given to the head of a major evangelical party. On taking office the new minister admitted that he had no experience with fisheries and did not even know how to bait a hook.⁶ The choice of a Minister with no connections with the fisheries sector is an indication of the political weakness of fisheries interests in state and national politics. It is increasingly evident that for the foreseeable future, any further development of fisheries co-management policies will depend on state level initiatives.

2.8 Conclusions. In conclusion several points can be made regarding the evolution of federal policies for artisanal fisheries in the Amazon. First, through the 1990s the basic elements of a co-management policy and institutional framework were developed for Amazonian fisheries in response to conflicts between floodplain communities and outside commercial fishers. This policy suffered from structural problems, specifically the question of access restrictions and prohibitions on charging fees and fines, as well as, operational problems, the lack of support to communities for monitoring and enforcing community fishing agreements. Subsequent changes in the institutional structure and orientation of fisheries management disrupted the development of co-management policies. While the MPA assumed formal responsibility for managing artisanal fisheries, in practice no institution, state or federal, has been able to fill the space left by transfer of regulatory responsibility from IBAMA to the MPA and state-level Secretaries of Environment. Consequently, the continued development of fisheries co-management policy is stalled at the federal level and further development seems now to depend on state-level initiatives.

During the period analyzed here, there have also been important changes with regard to the integration of artisanal fisheries into the formal economy and social services bureaucracy, including the *Seguro Defeso* benefit, other government social programs (*Bolsa Família*, retirement, etc.), access to government loan/credit programs such as Pronaf (*Programa Nacional da Agricultura Familiar*). Here the main vehicle responsible for this process has been the implementation of the Closed Season Unemployment Insurance, especially after the less restrictive requirements for access to the benefit were adopted in 2003. The incentive of obtaining *Defeso* Insurance benefits led increasing numbers of fishers to obtain the basic government documents that define citizenship: birth certificate, social security card and identification card. Fishers also became more involved in the formal economy, acquiring bank accounts and obtaining government loans. Finally, another important factor has been the improvement in education in rural areas, beginning in 1996, including more schools, more grades per school, and better qualified teachers, so that most students can now study through

⁶ "Crivella toma posse como novo ministro da Pesca," <http://www1.folha.uol.com.br/poder/1056209-crivella-toma-posse-como-novo-ministro-da-pesca.shtml>. Accessed November 28, 2012.

the equivalent of 8th grade in their or an adjacent community. Consequently, not only has the educational level of the rural population improved considerably, but the younger generation of artisanal fishers today is better educated and better prepared to deal with government bureaucracies and participate in formal economy. While these changes are important, they are far from providing the policy and institutional framework needed for the modernization of artisanal fisheries so that fishers and fisher communities are able to participate effectively in increasingly formal domestic and export markets.

3. Case studies

While the previous description of the development of fisheries co-management policies and institutions was focused on the Lower Amazon region of the state of Pará, the co-management policies developed by IBAMA were also being applied in the state of Amazonas. In fact, from a fisheries perspective, the two Amazon states are linked ecologically by the Amazon River system, economically through their exploitation of the same basin-scale fishery, socially through regional grassroots social movements for floodplain lakes, scientifically through the community of scientists studying fisheries at key institutions in Belém and Manaus, and in terms of policy development, since the Provárzea Program of the PPG-7 based in Manaus, began as the Iara Project in Santarém (IBAMA 1995, 2001b). Despite these common characteristics, the two neighboring states, Pará and Amazonas, have followed quite different paths in developing co-management systems for their inland/floodplain fisheries.

There are two distinctive characteristics of the process of formalization of sustainable fisheries management systems in the Brazilian Amazon. First, the process has been driven by community-based fisher/smallholder movements that seek to obtain control over local resources, especially fisheries. This situation contrasts with that in many other countries where the process of formalization is largely a top-down process that is being imposed on informal sector activities. Second, a key element in this process is the involvement of a few NGOs: IPAM in the Lower Amazon and the Instituto Mamirauá in Tefé, among others. These NGOs have worked closely with floodplain communities and the leadership of fisher organizations (*Colônias*) and also with key government agencies: IBAMA, the Public Ministry, and INCRA at the federal level and SEMA, SEPAQ and EMATER (Empresa de Assistência Rural) at the state level. They have in effect taken over the role once played by Catholic Church organizations such as MEB.

These NGOs have played a leading role in defining and implementing long-term strategies for developing sustainable management systems, building the technical and organizational capacity of fisher and community organizations, negotiating with government agencies to develop policies and legislation. They have provided crucial continuity in the development of policies and institutional arrangements while government agencies come and go. A crucial role played by these organizations has been in taking advantage of government initiatives and policies to mold them to the overall objectives of developing and consolidating the policies and institutions for formal co-management of fisheries.

In the case of Pará, while the state government has taken important steps towards developing the institutions and policies for co-management including the creation of SEPAq, thus far little progress has been made in developing a state level co-management system. Consequently, the state has played a limited role in the evolution of the Lower Amazon co-management system, though that may change. Instead, the co-management system has evolved into a settlement-based system that involves other government institutions. In the case of Amazonas, the state government developed an ambitious fisheries management program focused on the large network of state and federal reserves, building on the very successful experience of the Mamirauá Sustainable Development Reserve (Queiroz and Crampton 1999). In the following two sections we describe the basic elements of the two systems.

3.1 Case study 1: Development of fisheries co-management in Pará

Beginning in 2005, the state of Pará passed legislation creating mechanisms for the co-management of inland fisheries (Pará 2005, 2006). This legislation follows IBAMA's national co-management policies and does not recognize agreements that seek to exclude outsiders, charge user fees or control marketing of fish caught in community lakes. In 2007 the state created a Secretary of Fisheries and Aquaculture (SEPAq), one of the first state level fisheries departments in Brazil (Pará 2007). Despite this progress in developing legislation, the state made little or no progress in developing co-management agreements or even in implementing a state-wide fisheries management policy, which continued to be regulated by the federal government.

In this regard, the major innovations in community-based fisheries management were a result of the continuing evolution of the co-management system developed by IBAMA in the Lower Amazon. Here communities adapted the idea of collective agreements to deal with the problem of unregulated cattle grazing on floodplain grasslands, this time in collaboration with the Public Ministry. Then in 2006, INCRA, the National Institute for Colonization and Agrarian Reform, began implementation of a new settlement and land tenure policy for the floodplain based on the Agro-extractive Settlement Project (Acronym PAE in Portuguese) a type of settlement designed originally for rubber tappers. Some 41 PAEs were created on the Lower Amazon floodplain incorporating the territories of one or more communities. Community members were granted long-term use rights and the Public Ministry required that pre-existing co-management agreements for lake fisheries and cattle be incorporated into Utilization Plans regulating land and resource use within the PAE. INCRA also recognized that PAE residents had exclusive rights to lake fisheries and other resources within their territories. PAE associations could also charge user fees and organize marketing of fish. The PAE, then, seemed to resolve many of the deficiencies of IBAMA's co-management system, while also taking a more holistic, ecosystem-based approach to the floodplain land and resource use. These floodplain PAEs had the potential to become the basic territorial units for a regional co-management system covering most of the Lower Amazon floodplain.

While state fisheries legislation and the INCRA PAEs that have now been created constitute a promising base for development of certifiable community-based fisheries. There has is no

evidence that either the state or federal fisheries agencies plan to invest in such policies. The only such initiative now under discussion involves aquaculture and not the management of wild fish populations. This is surprising given the fact that the state's fisheries are one of the most important in the country and that it has the largest number of artisanal fishers.

3.2 Case study 2: Formalization of floodplain fisheries in the state of Amazonas

The development of fisheries co-management in the state of Amazonas was part of the same region-wide social and governmental processes that led to the development of fisheries co-management policies in the state of Pará. The state of Amazonas has been actively supporting community fishing agreements since the early 1990's, and passed legislation giving a state agency responsibility for fisheries in 2001 (Amazonas 2001). A state decree was passed in 2011 outlining the main elements of the state co-management policy (SDS 2011). As in the case of Pará, the co-management policy closely follows that developed by IBAMA in the 1990s and formalized in regulations passed in 2002 (IBAMA 2003). With the passage of this legislation, the SDS has begun revising the 49 agreements recognized between 1995 and 2011. As of the end of 2011 only 14% had been approved and were in the process of being re-implemented. Of the remaining 86%, 11% are being revised (late 2012), 71% are to be revised and 4% have either been revoked or are in the process of being revoked (SDS 2011). A program of VEAs was initiated in 2008 by the State Council of the Environment. While the program is intended primarily for monitoring state conservation units, VEAs also have been certified to work in areas of pirarucu management. Following the federal legislation VEAs can only issue citations and do not have the power to arrest those who do not comply with management rules.

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In summary, the state of Amazonas has implemented a fairly comprehensive policy and institutional framework for the co-management of state fisheries within the context of the broader program for the conservation of biodiversity and sustainable development of natural resources within the state. Consequently, the fisheries program has a strong conservation orientation and is focused primarily, though not exclusively, on the network of state and also federal reserves. The high level of integration of fisheries into a broader state-wide program is evident in the annual report of the SDS that presents the results of the entire program for the year 2011 (SDS 2011). But while the SDS has a greater presence than does its counterpart in Pará, fisheries management suffers from the same problems of enforcement as does management in Pará. Finally, the state is clearly interested in certifying managed fisheries and other natural resources. To a greater extent than any other Amazon state, with the possible exception of Acre, Amazonas is committed to developing sustainable management systems that could eventually meet FLEGT-type requirements.

3.3 Case study 3: Development of a certifiable management system for the pirarucu in Amazonas and Pará

Perhaps the best example of the potential for developing a management and marketing system that can provide the documentation needed to show that products originated in sustainably managed community lake systems is the management system and supporting policies now

being developed for pirarucu. Pirarucu has been one of the most important commercial fish species in the Amazon for at least 100–150 years. Until recently fish were filleted upon capture, salted and dried for storage and marketing, earning the fish the nickname of “*bacalhau* (cod) of the Amazon”.

The pirarucu has several characteristics that make it well suited for community management. It is sedentary and spawns in floodplain lakes. It surfaces to gulp air at regular intervals and forms pairs that care for their young during the first 4–6 months after eggs are fertilized. Researchers at the Mamirauá Sustainable Development Reserve have developed simple, field-based monitoring techniques that take advantage of these characteristics of the species and the skills of pirarucu fishers to count pirarucus in floodplain lakes. With these techniques, fishers can make reliable estimates of the numbers of adult and juvenile fish in a lake and use these estimates to determine sustainable catch quotas for the annual harvest (Castello 2004).

Teams of community fishers have been trained to undertake annual counts of the number of fish in community lakes and to use this information to develop and implement management plans that establish quotas for the sustainable harvesting of fish while also enabling populations to recover. Between 1999 when the system was implemented in the RDS Mamirauá and 2007, the adult pirarucu population almost tripled from 4500 to 12 000 individuals, while the number of fishers doubled from 40 to over 100 (Fig. 16; Castello *et al.* 2009, 2011). In the neighboring reserve of Maraã the managed pirarucu fishery 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 community-based pirarucu management system is probably the most successful community management system currently utilized in the Amazon basin. It is also the most promising from the perspective of developing sustainable artisanal fisheries management systems that could meet the requirements of FLEGT-type import policies. In addition, community management of the pirarucu can stimulate the sustainable management of other floodplain fish species, as well as providing incentives to improve habitat for other aquatic species, such as turtles and caiman. Through certification of pirarucu and development of national and international markets, the community-based management of pirarucu could drive efforts to conserve floodplain habitat and aquatic biodiversity throughout the Amazon River system.

There are, however, a number of problems that will have to be resolved before this potential can be realized. While the state of Amazonas has put in place the main elements of a certifiable system, the system is rudimentary and the reliability of the system is precarious. For example, although the SDS is formally responsible for fisheries management, including the management of pirarucu, the Amazonas Superintendency of IBAMA, which no longer has formal responsibility for fisheries management, continues to be responsible for authorizing quotas, issuing transit documents and tags. There is no statewide training and certification system for fish counters. There have been a number of cases of deliberate overestimates of lake fish stocks, and the monitoring system for quotas and transit documents and tags are too

precarious to provide a reasonable guarantee that the origin of any given unit of pirarucu product is correct (Bessa and Lima 2010). Better and more systematic monitoring and enforcement of authorized management systems are needed to ensure that: 1) fishers have been adequately trained as counters; 2) counts are accurate; 3) harvested fish actually come from the lakes where the census was conducted; and 4) transit documents and tags are not used for fish that are not part of the authorized quota.

In summary, while the pirarucu has enormous promise for meeting FLEGT-type import requirements, state governments must make significant investments in monitoring and enforcement before that potential can be captured. In addition, the state government and/or firms interested in marketing sustainably managed pirarucu outside the Amazon must develop marketing campaigns to educate consumers in potential markets about the pirarucu, how to prepare it and the important social and ecological benefits of purchasing certified pirarucu products. The development of these markets would greatly stimulate the sustainable management of not just the pirarucu, but many other floodplain fish species, providing incentives to conserve the habitat responsible for the high productivity of floodplain fisheries.

4. Conclusions

Artisanal fishers are often on the margins of national societies and the formal economy and have limited access to government social services and subsidized credit programs. Furthermore, as a group they are relatively unorganized, with seasonal or intermittent engagement in the local fishery, and are dispersed in small rural communities with highly fragmented marketing structures. Artisanal fishers are a group which by definition would have great difficulty in complying with the requirements of FLEGT-type programs. Consequently, despite the good intentions of this kind of policy, FLEGT-type systems of verification and regulation could further the advantage of larger scale and more highly capitalized fishing and aquaculture operations, which can provide fish products in the quantities, and with the quality and reliability required by large formal markets.

In the Brazilian Amazon, none of the basic components of fisheries commodity chains from management and capture through to national and international markets can be completely documented. There is not yet a reliable government registry of artisanal fishers. The policy and institutional framework for monitoring and enforcing management regulations and ensuring the sustainability of local fisheries ranges from precarious to nonexistent. Finally, the market channels from fisher to fish processing plants and urban wholesale and retail markets, is largely outside the formal economy.

On the other hand, this report shows that significant, though variable, progress has been made in many key elements of the formalization process, including the construction of the basic legal/regulatory framework for the co-management of artisanal fisheries and the integration of fishers and their families into the formal economy. However, even in the state of Amazonas there is still a long way to go before artisanal fisheries are ready to meet the requirements of a FLEGT-type system. Unless federal and state fisheries agencies make it a priority to work with

fisher organizations to prepare the artisanal fisheries sector for compliance with the requirements of formal markets, artisanal fishers will find themselves increasingly marginalized as the formalization of local regional and national fisheries proceeds. In the process fish from wild stocks will be replaced by aquaculture production and the link between sustainable fisheries and the conservation of floodplain habitat and the ecosystem services these wetland environments provide will be lost.

Figures:



Figure 1: Map of Brazilian Amazon, showing states of Amazonas and Pará.

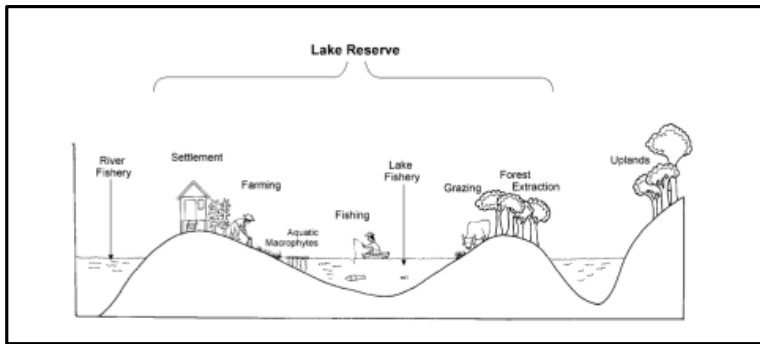


Figure 2: Main habitats and land use activities of Lower Amazon floodplain

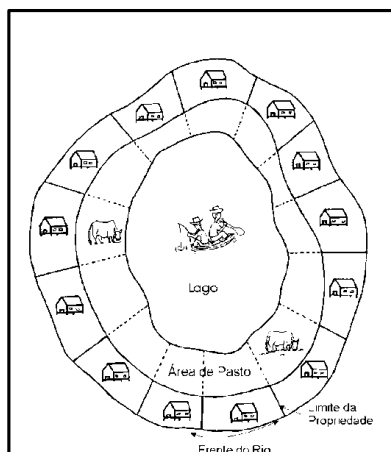


Figure 3: Main habitats and gradient of property rights of the Lower Amazon floodplain.

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