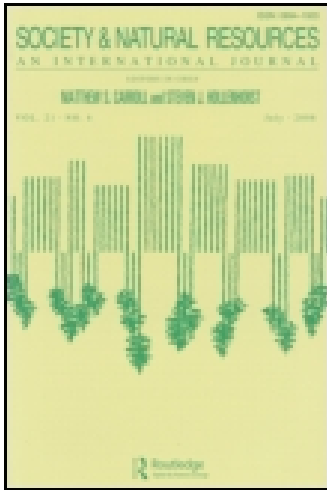


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Market Formalization, Governance, and the Integration of Community Fisheries in the Brazilian Amazon

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A major trend in global trade in forest, animal, and agricultural products is the implementation of importation policies and development of private sector standards and certification mechanisms to promote the sustainable management of natural resources in the countries of origin. In many cases, ensuring sustainable origins involves requirements that small-scale rural producers and fishers cannot meet. This article investigates the formalization of community-based floodplain fisheries in the Brazilian Amazon, including (a) the development of federal and state fisheries management policies, (b) the parallel development of community management systems, and (c) the role of these processes in the evolution of fisheries management in the Lower Amazon region. We argue here that market-oriented solutions, such as third-party certification, are insufficient. Government support for and collaboration with producers and industry are essential to creating conditions that enable fishing communities to sustainably manage their fisheries.

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Keywords Amazon River, fisheries certification, fisheries co-management, floodplain fisheries, market formalization

Over the last two decades, there has been a growing trend toward the use of trade and market mechanisms to suppress commodities that have been illegally or unsustainably produced or extracted, and to promote those that demonstrate sustainable origins (United Nations Environment Programme (UNEP) 2009; Walker et al. 2012). Several kinds of certification systems have been developed requiring varying degrees of “due diligence” to verify origin, promote good practices and ensure social equity. These include government import restrictions, such as the Lacey Act (2008) in the United States and Forest Law Enforcement, Governance and Trade (FLEGT: 2003) in the European Union (EU), private-sector third-party certification schemes such as Forest Stewardship Council (FSC: 1993) and Marine Stewardship Council (MSC: 1996), and commodity roundtables and government certification programs (Reardon et al. 2009; UNEP 2009; Gale and Haward 2011; Walker et al. 2012). The incentives include higher prices for certified products, increased demand, or simply access to major international commodity markets, such as the EU, which are increasingly conditioning market access on some form of verification of origin.

Critics have questioned the effectiveness of these certification systems in terms of their impact on the sustainability of land use and forest and fisheries management, the economic benefits of certification for producers, their orientation toward developed world producers and markets, and their potential impacts on informal, small-scale farming, fishing, and other extractive activities in developing countries (Kaiser and Edwards-Jones 2006; Gulbrandsen 2009; Pérez-Ramírez et al. 2012). Numerous authors have noted that efforts to demonstrate sustainable origins involve requirements that small-scale farmers, fishers, loggers, and forest collectors cannot meet (Gulbrandsen 2009; Blackman and Rivera 2011; Pérez-Ramírez et al. 2012; Wynberg et al. 2015; Spiegel 2015). Many lack the basic documents required to engage with government bureaucracies, and most production, local processing, and marketing take place through informal channels that are outside government regulatory systems. As formalization spreads throughout national and international markets, these groups could be increasingly marginalized within regional and even local markets (Reardon et al. 2009; Barrett et al. 2012). Given the huge numbers of people involved, the social consequences for rural populations could be disastrous, and often in contradiction with the stated social objectives of these certification schemes (Béné, Macfadyen, and Allison 2007; Dugan et al. 2010).

However, the trend toward conditioning market access to internationally accepted standards of hygiene, sustainability and social equity is unlikely to fade away, nor should it. So, the challenge to these agro-extractivist populations, to policymakers in developing countries, to international development agencies, and to those who are promoting these market standards is how to close the gap between small-scale production and management systems and the criteria and procedures through which they are certified. Using the case of community-managed fisheries in the Brazilian Amazon, we argue here that market-oriented solutions, such as third-party certification, are by themselves insufficient (Grafton et al. 2006). Effective state regulation and collaboration with fishers and local fisheries industries are essential to creating the governance conditions needed for communities to sustainably manage their fisheries (Pomeroy and Berkes 1997; Grafton et al. 2006).

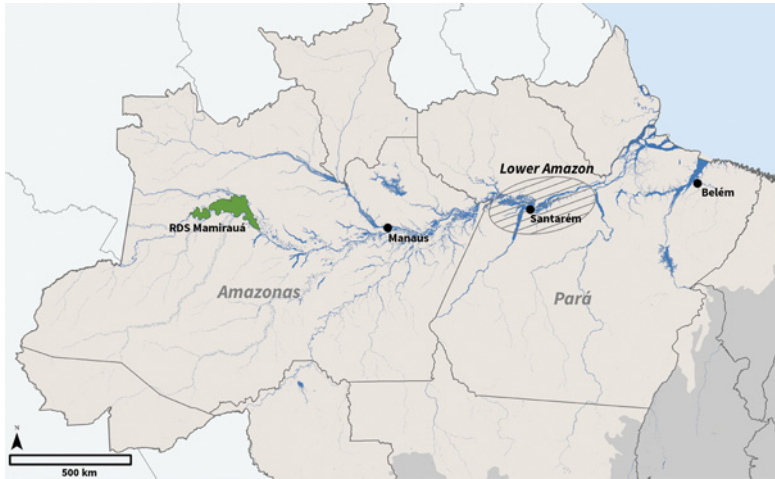


Figure 1. Location map of the Brazilian Amazon.

This article examines the evolution of policies and institutional arrangements for the co-management¹ of floodplain (or *várzea*) fisheries in the Brazilian Amazon, a process involving floodplain communities, government management agencies, local nongovernment organizations (NGOs), and national and international donors (Figure 1). We evaluate the extent to which federal and state government policies support community efforts to sustainably manage their fisheries and how the degree of state commitment to fisheries management can affect outcomes for community fisheries. The article is organized into several parts. We begin with a brief discussion of certification and issues raised with regard to the certification of small-scale artisanal fisheries in the developing world. We then present a case study of Amazon fisheries management and policy. We briefly outline the rise of grass-roots movements in support of community management of floodplain fisheries. Next we trace the development of federal fisheries management policies and the parallel development of management policies in two Amazon states, Pará and Amazonas. In the following section we trace the development of policies for the community-based management of the pirarucu (*Arapaima* spp.), an important commercial fish species endemic to the Amazon. We then examine the interaction between fisheries management policies and development of community-managed fisheries in the Lower Amazon region of the state of Pará. In the Discussion section we draw on this material to show how different levels of government support for the sustainable management of community fisheries have led to quite different outcomes in the two states.

Formalization of Trade and Certification

A large number of government, industry, and third-party initiatives have developed to evaluate various aspects of the origins, sustainability, and quality of seafood products, including those from capture fisheries and aquaculture (UNEP 2009). Two major third-party initiatives dominate certification of marine and inland capture fisheries: the Marine Stewardship Council (MSC) and the Friends of the Sea (FOS) (UNEP 2009). The MSC currently has 200 certified fisheries with a further 100 under evaluation and 100 in the preassessment phase. The 200 MSC certified

fisheries produce around 7 million tons of fish, about 13% of world catch (Dias and Vigiúé 2013). The Friends of the Sea has certified at least 85 fisheries.

The MSC's theory of change is based on the idea that a system for certifying fisheries as sustainable, which is supported "by major global buyers of seafood," creates incentives for fisheries industries to sustainably manage their fisheries and obtain certification. This process "enables many fisheries to better compete in a global marketplace that increasingly demands proof of sustainability" (sentence paraphrased from MSC 2011a). The transformations generated by MSC certification are "an unprecedented example of markets transforming fishing practices for a sustainable future" (MSC 2011a; see also Ponte 2012).

The certification assessment is conducted by an outside certifier accredited by the MSC. A confidential preassessment is conducted, which provides the organization requesting certification with information on what changes are required to qualify for certification. If adjustments are needed, a Fisheries Improvement Plan (FIP) is negotiated that specifies the recommended adjustments. Once any recommendations in the preassessment have been completed, the fishery undergoes the definitive assessment process, as well as a second assessment of the chain of custody (Dias and Vigiúé 2013).

Both MSC and FOS have developed principles and indicators for assessing the sustainability of marine capture fisheries that follow Food and Agriculture Organization (FAO) guidelines for responsible fisheries (FAO 1995; UNEP 2009). The MSC bases its sustainability standards on three main principles: (1) the status of target stocks, (2) the effects of fishing on the ecosystem, and (3) the effectiveness of the management system for the fishery (MSC 2010; Dias and Vigiúé 2013). For each principle there is a set of performance indicators on which the fishery is evaluated.

While much of the discussion has focused on the management system, the MSC chain of custody assessment can also be problematic for small-scale fisheries (MSC 2011b). This certification is based on four principles: (1) the existence of a system that ensures adequate documentation of the chain of custody standard, (2) a traceability system for the entire supply chain, (3) the ability to demonstrate that there is no substitution of certified with uncertified products, and (4) the system ensuring that all certified products are identified.

As noted by numerous researchers, MSC certification is designed primarily for industrial/large-scale fisheries that are managed according to the precepts of scientific management and have the capacity to adequately monitor and enforce management regulations. In the evaluation of the management system the sections on documenting ecosystem impacts and on the effectiveness of the management system can be problematic for small-scale fisheries. Assessment of the chain of custody can be even more problematic, since small-scale fisheries rarely have the organizational capacity to manage their supply chain, ensure traceability, and guarantee that all products with the MSC logo have their origin in the certified fishery. In fact, to pass the chain-of-custody assessment, it is probably best that a fishery already be integrated into a formal supply chain and be working closely with a major fisheries industry.

While both certification systems are global in scope, the great majority of certified fisheries are concentrated in the developed world (less so for the FOS) (Pérez-Ramírez et al. 2012; Ponte 2012). In response to criticisms of its developed-world bias, the MSC created the "Developing World Program," which provides financial and technical assistance to artisanal fisheries in the developing world and is increasing its involvement in these fisheries (Dias and Vigiúé 2013).

Providing funding for assessments may not be enough, however. Critics have argued that the great majority of certified fisheries have similar characteristics: They are highly selective, exploit stocks in areas for which they have exclusive national access rights, and are well regulated and managed (Kaiser and Edward-Jones 2006). Gulbrandsen (2009) contrasts this situation with that of most developing-world fisheries in which fishers often share the resource with other fishers and have little control over how fish resources are exploited. He argues that “this feature of open access resources effectively excludes developing country fisheries that meet most other MSC criteria” (Gulbrandsen 2009). He goes on to emphasize that because most fish stocks are under government control, their conservation depends on government enforcement of fisheries regulations and territorial rights, two major problems that plague artisanal fisheries throughout the developing world (Pomeroy and Berkes 1997). This then is the contradiction at the heart of the certification strategy: While certification is a private-sector initiative designed to use market forces to promote sustainable fisheries management, eligibility for certification depends to a large extent on the effectiveness of government efforts to sustainably manage the fishery prior to certification.

Background on Amazon Fisheries Development and Grass-Roots Movements

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 (Crampton et al. 2004). This system began to change in the 1960s as a result of technological innovations that enabled fishers to travel further and catch and store larger quantities of fish (McGrath et al. 1993). At the same time, government development policies contributed to increased demand for fresh fish through growth of urban consumer markets and investments in processing plants exporting frozen catfish to other parts of Brazil. As a result of these changes, Amazon commercial fisheries were transformed from a seasonal activity supplying dried salted fish to frontier settlements, to a year-round activity supplying urban and export markets with fresh, iced fish (Goulding 1983; Smith 1985).

The intensification of commercial fisheries greatly increased pressure on *várzea* lake fish populations. Concerned with the depletion of their fisheries and the absence of state enforcement, communities organized to prevent commercial fishers from entering their lakes, leading to the proliferation of fisheries conflicts throughout the basin (Chapman 1989; Hartmann 1989). These community responses to outside pressures coalesced into regional grass-roots organizations known as the Lake Preservation Movement in the State of Amazonas and as the Fishing Accord Movement in the state of Pará. Like the better known Rubber Tappers' Movement, these movements were a response of rural communities to transformations that threatened their way of life. Both movements contributed, in turn, to the transformation of government policies for managing forest and floodplain resources (Hall 1997). Pressure on IBAMA (Instituto Brasileiro de Meio Ambiente e Recursos Renováveis), the institution responsible for fisheries management, grew through the 1980s and early 1990s, as a growing number of floodplain communities negotiated collective fisheries agreements to regulate local fisheries and increasingly sought government recognition and support for enforcement (McGrath et al. 1993).

Evolution of Fisheries Co-Management Policies

Federal Fisheries Management Policy

Modern fisheries management policy in the Brazilian Amazon began with the creation in the mid-1960s of the Superintendency for Fisheries Development (SUDEPE), the federal institution responsible for the development of Brazilian fisheries. In 1989, SUDEPE was absorbed into a new institution, IBAMA, which became responsible for environmental regulation and enforcement. Reflecting its origins in SUDEPE, IBAMA's fisheries management policies were based on the scientific management model in which government technocrats and field agents design, implement, and enforce fisheries management regulations. Consequently, IBAMA initially regarded community fishing agreements as having no legal validity because communities had no right to regulate local fisheries.

By the early 1990s, co-management approaches were gaining influence among Brazilian fisheries managers and scientists. There was growing interest in these community agreements as the basis for a co-management system that resolved the problem of fisheries conflicts (Hartmann 1989). The main official vehicle for development of such a policy was the Iara Project, a German–Brazilian collaboration that began in the early 1990s. The main NGO working with the Fishers' Union and floodplain communities was the Instituto de Pesquisa Ambiental da Amazônia (IPAM) with funding from the international conservation organization the World Wildlife Fund (WWF). The IARA Project and IPAM were part of a network that included IBAMA, the Municipal Fishers' Union (*Colônia de Pescadores or Colônia*), and floodplain communities. These organizations worked to develop co-management policies and institutional arrangements based on community fishing agreements (IBAMA 1995; McGrath et al. 2008a).

By 1997 IBAMA had defined criteria and procedures for the legal recognition of community fishing agreements and an institutional structure for their negotiation, approval, and implementation (IBAMA 2002). IBAMA also trained and accredited Volunteer Environmental Agents (VEAs), who were responsible for organizing community monitoring activities and working with IBAMA agents to enforce local fishing agreements (IBAMA 2001a). By the early 2000s IBAMA's co-management policy was fully operational with numerous legally recognized community fishing agreements in several states of the Brazilian Amazon.

In 2001 the *Provárzea* Program (*Projeto Manejo dos Recursos Naturais da Várzea—Provárzea*) of the Pilot Program for the Protection of Tropical Forests (PPG7) was launched to continue the work begun by the Iara Project (IBAMA 2001b). Though *Provárzea* supported a number of important research and co-management initiatives, it ended in 2007 without having succeeded in implementing a region wide policy and institutional framework for the co-management of Amazon fisheries.

Restructuring Federal Policies and Institutions

In the late 1990s, the fisheries industry succeeded in establishing a development-oriented fisheries department in the Ministry of Agriculture. With the election in 2002 of the Workers' Party candidate, Luiz Inácio Lula da Silva, the department became a Special Secretary of Aquaculture and Fisheries (SEAP). Subsequently, SEAP was transformed into the Ministry of Fisheries and Aquaculture (MPA). The MPA has

a development-oriented approach to the fisheries sector, with a strong emphasis on policies and programs for artisanal fisheries.

The creation of the MPA led to considerable confusion regarding the division of management responsibilities within the government fisheries sector. The confusion was clarified with the Fisheries Law of 2009, which transfers responsibility for managing inland fisheries to state governments (Brasil 2009, 2011). This legislation does not mention co-management, or fisher participation in defining fisheries management regulations. Initially, there was an expectation that the MPA would continue *Provárzea* initiatives to develop a national policy framework for the co-management of artisanal fisheries. However, it soon became apparent that this was not a priority for the MPA. With the restructuring of the government fisheries sector, development of federal co-management policies for artisanal fisheries has stalled.

Development of State Co-Management Policies

Beginning in the early 2000s, individual states began to develop fisheries regulations based on federal legislation. While the two largest Amazon states, Pará and Amazonas, passed similar legislation, they have followed different paths in implementing fisheries management policies.

Pará

In 2005 Pará passed state legislation for fisheries and aquaculture that closely followed federal legislation (Pará 2005, Law 6713, January 25). While the 2005 fisheries law did not specifically mention collective fishing agreements, the intent is clearly to implement a co-management policy based on the framework developed by IBAMA in the 1990s (IBAMA 2003) and includes most of the basic legal instruments needed to implement a co-management policy. The legislation states that fisheries management regulations will be enforced by communities under the direction of volunteer environmental agents who have been trained and certified by the government. There is also a provision for certification.

This legislation was modified in 2007 by the incoming state government, which made several changes to the institutional structure for fisheries and environmental policy (Pará 2007). A Secretary of Environment (SEMA) was created and assumed responsibility for environmental management and enforcement including fisheries, though it did not have the capacity to regulate state fisheries. A Secretary of Fisheries and Aquaculture (SEPAq) was also created to coordinate fisheries and aquaculture policy.

Amazonas

To a far greater extent than in Pará, the grass-roots Lake Preservation Movement described earlier has had a major influence on the development of co-management policies in Amazonas. The state has implemented an ambitious green development strategy involving the creation of a network of Sustainable Development Reserves. The state's fisheries co-management policy has been developed within the context of this reserve-based approach to environmental management and sustainable development (Secretary of Environment and Sustainable Development [SDS] 2011).

During the 1990s the Amazonas State Superintendency of IBAMA took a proactive approach in support of community fishing agreements. Between 1995 and 2000, 15 agreements received legal recognition, and between 2000 and 2011, another 38

agreements were legalized (SDS 2011). These figures do not include the large number of informal fishing agreements that were never recognized by the government.

The development of fisheries legislation in Amazonas started earlier and has progressed further than in Pará. In 2001 the state passed legislation giving the Amazonas State Institute of Environmental Protection (*Instituto de Proteção Ambiental do Amazonas*, IPAAM) responsibility for fisheries management (Amazonas 2001). In 2007 a second law created the Secretary of Sustainable Development (SDS) (Amazonas 2004), and in 2010 a Fisheries Nucleus was created within the SDS to coordinate fisheries management policies (SDS 2011). Legislation for a fisheries co-management policy, including procedures and criteria for legal recognition, monitoring, and enforcement of collective fishing agreements, was passed in May 2011 (SDS 2011). As in the case of Pará, this policy closely follows that developed by IBAMA in the 1990s (IBAMA 2002). Although Pará has yet to implement its legislation, Amazonas has made a significant commitment to developing policies and institutional arrangements for fisheries co-management. Community fishing agreements are being legalized and a VEA program is operational. While staff and resources are limited, the state is working with VEAs and community management institutions to monitor and enforce local fishing agreements. Though fragile, Amazonas does have a functional regulatory system that provides a base for addressing the third major principle of MSC certification.

Community-Based Management of Pirarucu

Perhaps the best example of a community management system that could meet the requirements for MSC type certification is the one developed for the pirarucu (*Arapaima* spp.) (Castello 2004). The pirarucu, known as *paiche* in Spanish, has been one of the most important commercial fish species in the Amazon for at least 150–200 years. Until recently fish were filleted upon capture, salted, and dried for storage and were a major trade good within the Amazon, earning the pirarucu the nickname “*bacalhau* [cod] of the Amazon.” The documented annual trade in pirarucu exceeded 1 million kg of dried, salted fillets well into the 20th century (Crampton et al. 2004). Landings declined drastically from the 1960s on, however (Bessa and Lima 2010). A minimum size limit of 150 cm was set in 1989, and a closed season extending from December 1 to May 31 was established in 1991 (IBAMA 1991). In addition, a 5-year moratorium was placed on commercial pirarucu fishing in Amazonas (Castello et al. 2011a).

The pirarucu has several characteristics that make it well suited for community management. It is sedentary and spawns in floodplain lakes (Castello 2008). It is an obligate air breather and must surface to gulp air at regular intervals. It also forms pairs to care for offspring during the first 4–6 months after spawning. It is a large (up to 3 m), fast-growing, and valuable commercial species. Researchers at the Mamirauá Sustainable Development Reserve (RDSM) took advantage of these biological characteristics and the skills of pirarucu fishers to develop a simple census method to count the number of individual pirarucus in a floodplain lake. With this method, fishers can make reliable estimates of the numbers of adult and juvenile fish and use these estimates to determine sustainable catch quotas (Castello 2004). This stock assessment method provides accurate counts of adult and juvenile pirarucus and, combined with other data that trained fishers collect, can provide an accurate assessment of local pirarucu populations.

This methodology forms the basis for the adaptive management of pirarucu populations in floodplain lakes. Teams of trained community fishers undertake annual counts

of the number of adult fish in each lake and use this information to develop management plans with annual quotas that include a margin for the continued growth of lake pirarucu populations. In the RDS 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 more than 100 (Castello et al. 2009). The Maraã fishery, also in the RDS Mamirauá, increased from 50 fishers and a total catch of 5.5 tons per year, to 510 fishers and a total catch of 119 tons, between 2002 and 2009 (Amaral et al. 2011). This management system has been widely disseminated and there are now more than 100 pirarucu management initiatives functioning in the Brazilian Amazon (Castello et al. 2011a).

In 2004, the Amazonas State Superintendency of IBAMA implemented regulations for managing pirarucu based on the system developed in Mamirauá (IBAMA 2004), providing a regulatory framework for sustainable community-based management of pirarucu throughout the state. Community groups can now submit proposals for management based on counts using the method developed in the Mamirauá Sustainable Development Reserve. IBAMA then approves an annual quota and provides tags and transport documents to ensure traceability, addressing a key element of the MSC chain-of-custody certification. As of the end of 2011, there were 13 pirarucu management areas in the state with 2100 registered pirarucu fishers. Total production from 9 state management areas was 721 tons in 2011. In contrast, the state of Pará has thus far made no significant effort to bring illegal exploitation of pirarucu under control or to develop regulations based on the management system adopted in Amazonas, despite the existence of a major pirarucu management project in the Lower Amazon region of Pará.

The Amazonas state Secretary of Environment and Sustainable Development (SDS) together with the GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit) supported preassessments to obtain MSC certification for two of these pirarucu fisheries (Dias and Vigiúé 2013). A third was conducted for a WWF-supported pirarucu management project in the state of Acre. Unofficial information on preassessment indicates that the fisheries have the potential for certification and deficiencies identified by the evaluators can be addressed. These problems include lack of monitoring data on fish removals in areas adjacent to the managed fishery, lack of a program to monitor the impacts of the fishery on the aquatic ecosystem, documentation of the effectiveness of monitoring and enforcement mechanisms for controlling infractions, lack of a research plan to monitor stocks, and lack of a system for monitoring the functioning and effectiveness of the management system, broadly defined. These problems are largely government responsibilities and indicate that even in those states with a commitment to managing their fisheries, government management institutions are fragile, with insufficient capacity to provide the regulatory and research support needed for certification.

Formalization of Community Fisheries in the Lower Amazon

The two previous sections provide a policy context for the development of community managed fisheries in the Lower Amazon including the management of pirarucu fisheries. The development of this floodplain co-management system (Figure 2) has involved two main phases that address interrelated resource and land tenure issues: regulation of fishing in floodplain lakes and implementation of a land tenure

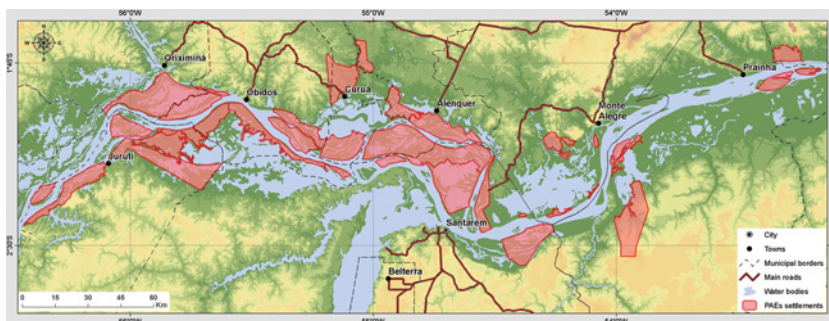


Figure 2. Agro-extractive Settlement Projects of the Lower Amazon Floodplain. *Source:* Ipam Várzea Project, INCRA Contract Database.

system that recognizes individual and collective rights to the main *várzea* habitats and their resources.

Co-Management of Floodplain Fisheries

Over the course of the 1990s, floodplain communities and the local *Colônia* worked with IPAM and IBAMA's Iara Project to develop a co-management system within the municipality of Santarém. The key co-management institution was the Regional Fisheries Council, an intercommunity council composed of representatives of all the communities sharing a given floodplain lake system. These councils were responsible for developing collective fishing agreements, which were submitted to IBAMA for evaluation and legalization. Once approved by IBAMA, the council, volunteer environmental agents, and member communities implemented the management regulations and together with IBAMA were responsible for monitoring and enforcement. By the end of the decade a system of seven regional fisheries councils was operational, each with a legally recognized fishing agreement. The system covered 2,600 square kilometers of floodplain and included some 180 communities from the floodplain and adjacent *terra firma* with a total population of approximately 40,000 people (McGrath et al. 2008a).

A key question, once the management system was operational, was just how effective it was ecologically and institutionally. A study comparing fishing productivity in 9 pairs of lakes, one managed and the other unmanaged, found that on average fishing effort was 60% more productive in lakes with effective management agreements compared to those without such agreements (Almeida 2006). Castello et al. (2011b) also found that managed lakes had a higher proportion of sexually mature individuals and high-value species. These 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 variations in water levels and the migratory behavior of many commercial fish species.

The institutional performance of co-management agreements, however, was less satisfactory. The co-management system suffered from serious structural and operational problems. First, a basic criterion for approval of a fishing agreement was that it could not restrict access, and could only specify the rules for fishing in a given lake. Thus, communities could not exclude outsiders, a basic condition for effective community management (Ostrom 1992). Second, community management organizations could not charge user fees or require fishers to sell their catch to a community

association, so there was no mechanism through which the community could capture the benefits or even recover the costs of managing the fishery (IBAMA 2002). To exacerbate the problem, IBAMA agents were rarely in the field, so support for enforcement was minimal. Over time, it became increasingly clear to participating communities and supporting NGOs that while floodplain lake fisheries could be sustainably managed, the policies and institutional arrangements for co-management needed to be substantially revised. Unfortunately, this realization came as the federal government lost interest in fisheries co-management.

Property Rights to Floodplain Land, Habitats, and Resources

The second phase involved development of a land tenure policy that recognized individual and community rights to floodplain habitat and resources. Land tenure on the floodplain has long been a source of confusion. Technically, the floodplain is the property of the federal government and legal titles cannot be issued for floodplain lands (Benatti et al. 2005). In practice, most of the floodplain is divided into individual properties, which are bought and sold in informal land markets. Because of the insecurity of these informal arrangements and the inability to use *várzea* holdings as collateral for bank loans, legal recognition of their land claims has long been a concern of *várzea* land owners.

Following several years of research and discussion, the National Institute of Colonization and Agrarian Reform (INCRA) began in 2006 to convert groups of floodplain settlements into Agro-extractive Settlement Projects (PAEs), a settlement model developed in 1988 and designed originally for rubber tappers in the state of Acre (McGrath et al. 2008a). As with the better known Extractive Reserve, the land is owned by the federal government and residents are granted concessions to live there. Both individual and collective use rights are recognized. Since 2006 some 41 PAEs have been created on the Lower Amazon *várzea*, covering 745,000 hectares with a resident population of roughly 11,000 families or 53,000 people (McGrath et al. 2008a).

PAEs can cover entire lake systems and include all communities that depend on the lake fishery, thereby providing legal recognition for community territories. In the municipality of Santarém, Pará, the floodplain portions of preexisting Regional Fisheries Council jurisdictions provided the basis for PAE territories. Formal concession of the PAE depends on approval of a Utilization Plan (UP). The UP integrates preexisting cattle and fishing agreements into a single comprehensive document, thereby providing a common institutional and regulatory framework for managing floodplain resources, land use, and territory. In addition, INCRA recognized that PAE residents have exclusive access rights to floodplain fisheries, resolving a key structural defect of the preexisting co-management system. Furthermore, the PAE association, which represents residents and is the actual holder of the concession ceded by INCRA, has the right to charge user fees and organize marketing arrangements. While the PAE settlement model can solve the collective action problem that gutted IBAMA's co-management policy, it does not solve the problem of weak government enforcement.

Integrating PAEs to Form Regional Co-Management Systems

While the PAE settlement model and associated UP provide the formal conditions for sustainably managing floodplain territories, taking advantage of that potential requires strengthening PAE institutions and obtaining more effective government

support for enforcing PAE Utilization Plans. To address this challenge, PAE leaders have begun a third phase in the long process of establishing the governance conditions needed to sustainably manage floodplain fisheries. Leaders of 23 *várzea* PAEs created the Forum of *Varzea* PAEs, composed of a mosaic of PAEs covering 480,000 hectares with a resident population of 43,000 people. The mosaic includes a pirarucu management project currently involving 18 communities in 3 PAEs. In addition to strengthening their negotiating power with government agencies, the forum could form commercial partnerships with a local processing company to market pirarucu from managed lakes. While these arrangements could enable communities to market sustainably managed pirarucu via certifiable marketing channels, the system would still need government support for monitoring and enforcement of regional fisheries management regulations.

Discussion

Fisheries certification grew out of a concern that governments had proven to be largely ineffective in halting the depletion of the world's major marine fisheries (Gale and Haward 2011). Private-sector, third-party certification was seen as a strategy through which market forces could be used to promote the sustainable management of commercial fisheries and by their example stimulate governments to make greater efforts to improve fisheries management. The view that emerges from the literature, however, is that certification generally relies on the conditions created by government management agencies (Pomeroy and Berkes 1997; Grafton et al. 2006). Without the investment made by government fisheries agencies, few fisheries would qualify for certification. Certification is formal recognition for sustainably managing a fishery, but it does not provide the means for achieving that goal.

The case study presented here highlights the critical role of federal and state governments in creating the conditions that make sustainable fisheries management possible. Where governments have not implemented effective regulatory systems for managing fisheries, as has been the case in Pará, the basic governance conditions required for certification are not likely to exist. This is the situation found in much of the Brazilian Amazon. The main exceptions are in those states, such as Amazonas and Acre, where government agencies have the interest and the political support to invest in the sustainable management of the state's fisheries. Both of the states discussed here have long and important traditions of grass-roots mobilization in support of community-based fisheries management and both passed similar legislation for the co-management of floodplain fisheries. However, only Amazonas implemented a comprehensive management system for state fisheries and consequently only in Amazonas is this grass-roots effort succeeding.

The community management system for pirarucu is a case in point. The state of Amazonas has implemented regulations and precarious arrangements for monitoring and enforcement that may have reduced the market for illegal pirarucu and have enabled pirarucu populations to recover in reserves where they are being managed (Bessa and Lima 2010). In contrast, the state of Pará has made no such effort, so pirarucu products from sustainably managed fisheries must compete in local markets with products from illegal and unmanaged fisheries. Not surprisingly, two of the three artisanal fisheries that have undergone preassessment for MSC certification are community-managed pirarucu fisheries in government reserves in Amazonas (Dias and Viguíé 2013).

Several authors, questioning the potential of private-sector certification to influence large national fisheries, argue that where fisheries governance is precarious, certification will simply create a class of elite fisheries that qualify for certification while most local fisheries are left to their own devices (Kaiser and Edward-Jones 2006; Pérez-Ramírez et al. 2012). Tlusty (2012) analyzes the impact of certification on salmon aquaculture farming. He shows that the imposition of a standard will divide aquaculture farms into two groups, one that can meet the costs of complying with the standard and a second for which the costs of compliance are prohibitive. He recommends that multiple standards be used, so that most fishers can achieve some initial level of certification. By combining multiple standards with a jurisdictional approach in which the state maintains an effective co-management system throughout its territory, individual fisheries could have the governance conditions they need to adopt progressively more rigorous standards and gradually improve fisheries management performance throughout the region.

In Amazonas, application of a single standard could lead to the certification of a small number of artisanal fisheries, such as the pirarucu fisheries located in government reserves, which are able to meet MSC standards, while artisanal fisheries outside these reserves continue to be largely unregulated. These certified fisheries could gradually expand to incorporate neighboring community fisheries, bringing a progressively larger proportion of the fishery into compliance with MSC standards, if there were a functional co-management system enforcing fisheries regulations throughout the state.

A more likely scenario is that prevailing policies for fisheries and aquaculture will lead to the progressive expansion of aquaculture as the wild stocks on which the artisanal fisheries depend are depleted through overfishing. Brazilian government policies for fisheries and aquaculture seem to be based on the implicit assumption that there is a natural evolution from the “irrational and inefficient” capture of wild fish to the “rational and efficient” farming of domesticated fish. Patterns of government investment in artisanal fisheries and aquaculture contribute to this trend in a self-fulfilling prophecy (McGrath et al. 2008b). The lack of investment in sustainably managing artisanal fisheries, in maintaining adequate hygiene standards in public markets, and in ensuring the legality and quality of fish caught by artisanal fisheries is in striking contrast to the efforts that state and federal governments are making to develop aquaculture production.² Under these conditions, it is likely that market formalization and certification will lead to the growth of aquaculture, the continuing depletion of wild fish stocks, and the marginalization of the artisanal fishers who depend on them. This is already happening. Despite the success of the community management system developed for pirarucu, the pirarucu promoted by the U.S. supermarket chain Whole Foods comes from Peruvian aquaculture farms.³

Conclusions

In conclusion, certification, as a strategy for harnessing market forces in support of sustainably managing commodity production, is an important and timely innovation. Thus far, though, certification has grown through capture of the low-hanging fruit represented by those fisheries that are already well managed and able to make the adjustments needed to meet standards of sustainability. The artisanal fisheries of the developing world represent a far greater challenge. While the potential impacts on the global trade in fisheries products are less impressive, the impacts in terms

of numbers of people and human well-being and of the conservation of critical aquatic and marine habitat are enormous (Béné et al. 2007; Dugan et al. 2010). However, achieving these impacts requires a response that goes beyond recognizing winners. It requires a long-term commitment to working with governments, local fisher organizations, and fisheries industries to develop co-management systems that enable local stakeholders to rebuild stocks, improve livelihoods, increase food security, and conserve the ecosystems they depend on.

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Notes

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.
2. See, for example, the aquaculture complex being constructed in Acre (<http://www.agencia.ac.gov.br/noticias/acre/complexo-de-piscicultura-desenvolvimento-com-sustentabilidade>). A similar complex is planned for the Turucui Reservoir in Pará.
3. http://www.wholefoodsmarket.com/sale_item/25404-farm-raised-peru-paiche-fillet.

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