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# From Myths to Rules: The Evolution of Local Management in the Amazonian Floodplain

FABIO DE CASTRO

*NEPAM-UNICAMP*

*C.P. 6166*

*Campinas, SP 13083-970*

*Brazil*

*Email: fabio@nepam.unicamp.br*

## ABSTRACT

Local management systems (LMS) are dynamic, locally crafted institutions whose set of prescriptions regulating resource use are created in different stages of the users' existence. The complex relationship between these types of institutions and their environment (both local and external) provides an opportunity to analyse human responses to social and ecological changes through time. This paper focuses on historical analysis of the local management of the Brazilian Amazonian floodplain, which is divided into three distinct periods of floodplain occupation—Amerindian Period, Migrant Period and *Caboclo* Period. Each period reflects a management pattern based on different types of resources, groups of users and individuals who managed the system. The analysis reveals that local management systems in this region encompass three rule types – ecological, cultural, and political – according to the source of incentives that influences the prescription. An increased focus on political prescription to limit entry and to monitor rules has taken place more recently in order to cope with the faster pace of environmental change in the region as well as to lower the consequent transaction cost among new actors. The fishing accords, for example, combine politically oriented goals of resource control with ecologically oriented goals of resource conservation. The historical dimension of LMS is fundamental to unravelling the connections between new sets of prescriptions and old management systems. Due to the system complexity, the consonance of both goals should be held as an empirical question rather than as an assumption.

## KEY WORDS

Local management, institutional change, floodplain, fishing, Amazon

## INTRODUCTION

Local management systems<sup>1</sup> (LMS) are locally crafted institutions, based on prescriptions that define how a given resource or ecosystem should be used. Such systems rely upon information obtained from local and repetitive experiences and are passed down to younger generations through learning and imitation processes.<sup>2</sup> Usually, LMS are described as community-based, enduring, and conservation-prone institutions.<sup>3</sup> Yet, broader social and ecological processes directly influence how users shape their local management by formulating and adjusting rules-in-use.<sup>4</sup> Similarly, LMS are not necessarily long-lived institutions. New local management initiatives may arise whenever incentives for collective organisation are at hand.<sup>5</sup> Finally, outcomes of LMS may vary according to ecological features of the resource, social features of the users, the set of rules-in-use<sup>6</sup> and the motivations driving the collective action.<sup>7</sup>

Given the complex environment in which LMS may operate, changes in their structure and organisation over time are to be expected. Prescriptions are replaced and redefined according to how incentives for and goals of resource management modify through time. As a result, LMS are better described as mosaics of prescriptions created throughout the history of the users according to a range of incentives and goals. The mixed and dynamic nature of these institutions provides a theoretical scenario for testing hypotheses concerning human responses to socioenvironmental changes. The emergence of institutions is a costly process, and thus more likely to occur under specific circumstances related to the resource features and social attributes of the users.<sup>8</sup> In general, unless radical changes in the social structure transpire, institutional change tends to manifest itself as a modification of the old structure.<sup>9</sup> Thus, the history of LMS can unveil the factors leading to institutional adjustments and, eventually to institutional emergence.

By sorting out the major management prescriptions during the history of a given region, one can relate the socioenvironmental context to agency with regard to the pattern of resource use. Management prescriptions vary according to the source of influence. Stocks describes three main categories of prescription.<sup>10</sup> Ecological prescriptions are individual or group foraging behaviours characterised by short-term economic efficiency, directly affected by attributes of the resources such as spatial distribution and abundance, predictability, and mobility. Cultural prescriptions are common-sense practices defined from social interactions that may indirectly enhance or maintain resource productivity. Such practices include things like rituals and taboos. Political prescriptions are developed from a 'conscious' problem-solving process carried out by a user group.

The co-existence of three types of prescriptions – ecological, cultural, and political – shaped during different historical periods raises theoretical questions

regarding levels of compatibility and conflict between the conservation goal of LMS and the other factors that shape these local institutions. Ecological prescriptions result from constant interaction between users and the resource, and they change according to the biophysical features of the system. Conversely, cultural and political prescriptions are influenced by the social interactions among users, and they change according to the social attributes of the users. While the conservation outcomes of the ecological and cultural prescriptions can represent an epiphenomenon of other processes, the primary conservationist goal of political prescriptions is usually quite obvious.

The Amazonian floodplain is an ideal place to explore these questions. The Amazon has been site of major social transformations due to factors such as cultural change,<sup>11</sup> urbanisation,<sup>12</sup> technological innovation,<sup>13</sup> governmental policies,<sup>14</sup> economic pressure,<sup>15</sup> and local organisation.<sup>16</sup> In the floodplain, where resources were intensively used during the Pre-Conquest period,<sup>17</sup> a new set of local prescriptions has recently emerged to regulate fishing activity – the fishing accords.<sup>18</sup> The fishing accords represent a conscious effort of floodplain residents to limit lake access to themselves and, thus, maintain resource productivity and ensure local control over the fishing system. Although the political prescriptions stand out in the current LMS, they have been combined with other ecological and cultural prescriptions developed in the past.<sup>19</sup> In this paper, I analyse the history of the LMS in the Amazonian floodplain, highlighting the connections between the fishing accords and other prescriptions developed in the past, in order to explore the institutional adjustments through time in addition to the motives behind the emergence of this new local institution.

A general historical description of ancient resource use is followed by a more detailed description of resource management in the contemporary period. The discussion is focused on the local and regional processes influencing prescription change, and how the structure of the LMS is related to conservation or other goals.

## STUDY SITE AND METHODOLOGY

The Amazonian floodplain is a complex landscape with high spatial and temporal heterogeneities. Four major landscape forms – lake system, grasslands, natural levees and river channel – are influenced by annual variations in river level that can range from a few metres in the Lower Amazon to twenty metres in the Upper Solimões (Figure 1).<sup>20</sup> Despite the risks inherent in residing along the river, human populations have historically been attracted by its nutrient-rich soil, which sustains a rich biota and provides natural transportation pathways.

For the purpose of this article, human occupation on the floodplain is divided into three major historical periods: Amerindian, Migrant, and *Caboclo*. Each

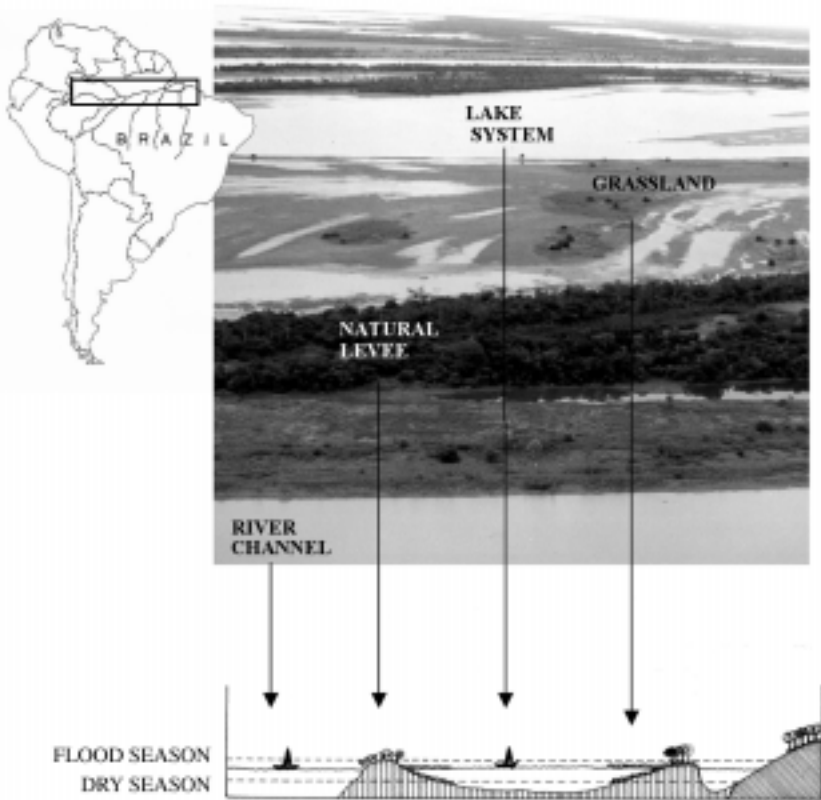


FIGURE 1. Aerial and cross-section views of the Amazonian floodplain subsystems.

period is marked by a different pattern of technological endowment, resource values and social interactions. Consequently, prescriptions regulating resource use vary considerably across each period with respect to the target resources, user groups and major rulers. The description of the Amerindian Period was based on a review of the ecological anthropology literature. Information on the Migrant Period was drafted from the local and scientific literature as well as from a survey of fourteen newspapers published in the Lower Amazon region from 1911 through 1960. The *Caboclo* Period was based on a survey of six newspapers published in the Lower Amazon between 1960 and 1980, and on seventy-seven documents of fishing accords established between 1981 and 1996, found in the archives of the Fishers' Union and the governmental office IBAMA<sup>21</sup>. In-depth interviews with floodplain residents were carried out between 1991 and 1999 to contextualise the local perception of the fishing accords.

## LOCAL MANAGEMENT SYSTEMS IN THE AMAZONIAN FLOODPLAIN

### *Amerindian Period*

The Amerindian Period spans the Pre-Colombian period, when Indian populations controlled the use of the Amazonian system. According to Roosevelt, human occupation in the Amazon dates back to at least 12,000 years ago, and is divided into four stages according to the social organisation and pattern of resource use: 1) nomadic hunter-gatherers before 10,000 B.C.; 2) early transitional sedentary groups starting in 8,000 B.C.; 3) widespread ceramic sedentary society of early horticultural villagers subsisting on root crops, fish, and game, starting in 3,000 B.C.; and 4) highly dense agricultural chiefdoms supported by intensive seed cropping and supplemented by intensive fishing and hunting until 1,000 A.D.<sup>22</sup>

Sociocultural development on the floodplain was influenced by ecological opportunities, such as natural pathways, fertile soils and relatively abundant protein. Technological innovations, such as domestication of plant species and a shift from game to crops as major sources of protein, enabled local populations to overcome limitations to population growth and set the stage for sedentary behaviour by 3,000 B.C.<sup>23</sup> The seed-cropping agricultural societies that developed following this stage supported up to six million inhabitants.<sup>24</sup> As a result, socially complex chiefdoms, such as the Omagua in the Upper Solimões, the Tapajó in the Middle-Lower Amazon, and the Marajó in the estuary, existed in several parts of the Amazonian floodplain prior to the arrival of Europeans.<sup>25</sup>

Contrary to popular romantic visions of this time period as being marked by peaceful, homogeneous, conservationist societies, archaeological studies reveal conflicts within and between highly diverse groups who fought for territories and, sometimes, were able to exhaust local resources.<sup>26</sup> Similarly, the ecological environment was not stable throughout the Amerindian period of human occupation. Human groups experienced strong changes in climate, which affected their social organisation, including patterns of settlement and of resource use.<sup>27</sup> Despite the high population density, social complexity within and between groups, and the climate changes, ecological and social interactions were mostly at the local level and for subsistence and exchange purposes. In addition, the relatively slow pace of environmental change seems to have enabled the adaptive process of resource management with social development, demonstrated by the humanised landscape evidenced by historical ecologists.<sup>28</sup>

Prescriptions of LMS during the Amerindian period are hard to assess due to the limited nature of archaeological data. Roosevelt discusses some evidence of political prescriptions to regulate resource use as a response to declines in fish productivity.<sup>29</sup> Studies of contemporary Amerindians, however, suggest some ecological and cultural prescriptions that may have been inherited from their ancestors.<sup>30</sup> For example, the influence of ecological attributes of the resource/system, such as distribution and abundance of the fish resource, landscape

diversity and level of predictability, is observed in fishing strategies among the Pumé,<sup>31</sup> Bari<sup>32</sup> and Cocamilla.<sup>33</sup> Cultural prescriptions are described in terms of social mechanisms related to two major strategies: 'altered ecosystems' and 'resource avoidance'. Altered ecosystems imply active human manipulation of the environment, such as the alteration by the Kayapo of the composition of plant species in fallows (*apetes*) on the upland to attract game.<sup>34</sup> In the floodplain, Stocks argues that the Cocamilla habit of dumping organic waste into lakes may help to increase fish productivity.<sup>35</sup> Resource avoidance implies prohibiting individuals from using a specific resource (food taboo) or an ecosystem (sanctuary). Food taboos of aquatic animals relate mainly to carnivores. Dolphins, for example, are considered an enchanted species<sup>36</sup> while catfish are considered *remoso*, an Indigenous term referring to certain food categories that have the effect of creating or aggravating health problems.<sup>37</sup> Dolphins and catfish are top predators, and their protection has ecological implications in regulating fish communities.<sup>38</sup> Sanctuary implies resource avoidance through beliefs or social norms shared among a user group. Chernela, for example, discusses the customary agriculture system by Uanano Tukano in a nutrient-poor floodplain system (*igapó*), which consists of protecting the vegetation on the river's edge.<sup>39</sup> The author argues that such a strategy enhances the productivity of this poor aquatic system, since fish productivity strongly depends upon terrestrial nutrient sources. The use of nutrient-rich floodplain systems (*várzea*) may also be restrained through fear of mythical creatures such as the *Tapiré-iauará*, a tapir nymph which patrols the flooded forest to keep fishers away.<sup>40</sup> Similarly, the giant water snake that lives in marshy areas scares fishers away throughout the Amazon floodplain.<sup>41</sup> These myths are usually related to highly productive floodplain lakes surrounded by dense flooded forest and macrophytes where fries and juvenile fish grow, much like the 'dying lakes' in Peruvian Amazon.<sup>42</sup> Although we cannot assume conservation functionality of the ecological and cultural prescriptions, we can suppose that under low external influences, low technological endowment and slow pace of change, these practices were likely to have enabled local maintenance of floodplain productivity as an epiphenomenon.

### *Migrant Period*

Ironically, the ecological opportunity of natural pathways which facilitated the floodplain occupation played against the Amerindians who were assaulted by European colonisers in the early seventeenth century. In a century, Europeans nearly annihilated the floodplain Amerindians through war, the spread of disease, and slavery.<sup>43</sup> Catholic missionaries protected Amerindian populations until the mid-eighteenth century, after which they were thrown out of the country. As a way to incorporate the native labour force into their production system, the Crown created incentives for intermarriage between Amerindians

and Europeans. This policy resulted in the formation of a new ethnic group, the *Caboclos*,<sup>44</sup> who later re-occupied the floodplain.

The *Caboclos* differ from Amerindians in two major social aspects: their nuclear household organisation<sup>45</sup> and engagement in the regional market.<sup>46</sup> From their Amerindian ancestors, the *Caboclo* populations retained some ecological prescriptions based on traditional ecological knowledge and some cultural prescriptions based on their cosmology.<sup>47</sup> From the Europeans, they assimilated skills to deal with the broader socioeconomic realm. The floodplain reoccupation by the *Caboclo* populations during the nineteenth century was disturbed by three major external factors. In the early 1800s, a basin-wide political movement led by the *Caboclos* called *Cabanagem* resulted in the loss of thousands of lives on the floodplain.<sup>48</sup> In the mid-1800s, the land tenure policy of the Portuguese Crown granted migrants land titles to floodplain farms, and overrode the *Caboclo* ownership system.<sup>49</sup> In the late 1800s, the rubber boom drew a large number of people away from the floodplain to work on the upland rubber-tree groves.

Land conflict between migrant landholders and *Caboclos* was commonplace throughout the Migrant period, as observed in several articles in local newspapers published in the Lower Amazon. However, due to the small economic importance of the floodplain, landholders maintained their property rights but did not close access to *Caboclos* residents. Landholders were involved with cocoa plantations and extensive cattle ranching, while the *Caboclos* practised a mixture of subsistence activities including agriculture, fishing, extractivism, hunting and small livestock rearing (chickens and ducks). *Caboclo* populations interacted with others to reach the market; they sold wood for steamboats, and traded floodplain products for basic urban products such as salt, sugar, oil and soap with itinerant boat traders (*regatões*).<sup>50</sup> They also teamed up with landholders to carry out commercial fishing of a few aquatic species, such as *pirarucu* (*Arapaima gigas*), turtle, caiman, and manatee.<sup>51</sup> In this partnership system (*feitoria*), landholders provided access to their private lakes and to infrastructure for catching and processing fish, while *Caboclos* provided the labour force.<sup>52</sup>

Old residents of communities in the Lower Amazon described ecological and cultural prescriptions of LMS during the Migrant period. They recalled fishing strategies carried out by their fathers and grandfathers according to productive fishing spots, appropriate fishing technologies for each fish group, and fishing seasons. Beliefs concerning 'dangerous' places and visions of 'giant snakes' are also present in their memories.<sup>53</sup> After 1930, however, the introduction of jute into the floodplain by Japanese migrants increased the importance of the floodplain soils, and consequently, the interest of landholders in their properties. Jute was rapidly assimilated in the floodplain economy due to the available labour force, market demand, low technological requirement, and ecological adaptation to the flooding cycle.<sup>54</sup>



The pattern of land tenure and lack of financial aid forced *Caboclo* populations to seek support from the landholders and *regatões* to engage in the jute market<sup>55</sup>. As a result, the *aviamento* system, which first emerged in the upland region during the Rubber Boom,<sup>56</sup> was established in the jute production system.<sup>57</sup> The *aviamento* system is a patron-client relationship in which the patron provides financial support for production and basic needs, and the client is committed to sell their harvest exclusively to their patrons for a low price. The *aviamento* system developed under other social ties between the two parties. Co-parenthood is an example of a social relation that transcended economic dependency. This religious-based system is grounded in a social commitment whereby patrons are blessed as co-parents of the clients' children.<sup>58</sup> In some regions, the patrons facilitated the engagement of *Caboclos* in cattle activity through an informal system of 'cattle partnership' like that in the Lower Amazon.<sup>59</sup> This system still exists today and consists of an agreement in which *Caboclos* take care of a herd for a landholder and receive half of the calves in return. In other words, rather than being dependent and hierarchical, the relationship between landholders and *Caboclos* has oscillated between conflict and co-operation. On one hand, the higher access to land and to political support by landholders created disputes between patrons and clients. On the other hand, land use strategies bound the two actors in an economic collaboration.

In contrast to the Amerindian Period, the Migrant Period was shorter and was strongly influenced by two external forces – the establishment of a private tenure system of floodplain management (which informally persisted after its stitisation), and by an economic change (the jute boom). The maintenance of ecological and cultural prescriptions was subordinated to a higher social structure. The unbalanced power relationship and relatively stable local politics between the two emergent actors – *Caboclos* and landholders – led the LMS to be shaped mostly by political prescriptions based on the patronage system. The Migrant Period was cut short by a new set of external factors that developed in the region and enabled *Caboclos* to claim political control of the floodplain.

### *Caboclo Period*

While soil was extensively used for jute cultivation and cattle ranching, lakes did not become commercially appealing until the 1960s, when another wave of social transformations took place in the floodplain. Fishing efficiency increased owing to technological innovations in fishing equipment (manufactured gillnets), transportation (oil-motor boats), and fish storage (ice factories and Styrofoam). In addition, a new wave of migration to the Amazon, propelled by road-building projects launched by the government in the upland region, led to rapid urbanisation along the rivers.<sup>60</sup> As a result, the combination of better fishing production combined with an increasing fish market filled the economic gap in the floodplain created by the decline of jute production.<sup>61</sup>

In contrast with other floodplain production systems, commercial fishing by *Caboclos* during this period was not based on any relationships of dependence with other actors such as motorboat owners, landholders or itinerant boat traders. Fishing systems have remained small-scale artisanal in most of the Basin today, based on wooden paddle canoes with one or two fishers.<sup>62</sup> Ecological and cultural prescriptions developed in the Amerindian period persisted during the *Caboclos* period. In many parts of the Basin, fishing systems were related to ecological prescriptions<sup>63</sup> and cultural prescriptions.<sup>64</sup> However, the major feature of the LMS during this period is the fishing accord, an explicit system of rules based on the consciously made decision to conserve. A list of fishing rules with the community signatures are prepared in community meetings and converted into a document. The analysis of the fishing rules listed in seventy-seven separate accord documents observed reveals that local ecological knowledge is used to define 'how to fish' (fishing spot, season, fishing technology) while social factors influenced the formulation of rules to define 'who is allowed to fish'.<sup>65</sup>

Fishing accords are sent to regional offices (Fisher's Union or IBAMA) and broadly publicised on the radio. The monitoring system is carried out by a local armed patrol which applies the sanctions, including sometimes physical confrontation, retaliation, and destruction of the offenders' fishing devices. The fishing accords have gradually evolved into a more complex structure according to the emergence of distinct actors, the level of empowerment of the *Caboclo* population, and the level of formalisation of the local decisions. This process can be divided into three stages: the local organisation stage, the integrated organisation stage, and the participatory organisation stage.

The *local organisation stage* comprises the period between the mid-1960s and the mid-1980s and emerged from conflicts between floodplain residents and motorboat fishers. These two fisher groups differed in terms of their level of attachment to the lake system and to their fishing-related technologies. While the lake system was part of the community fishers' livelihood, outside fishers rotate their activity across different lakes. Owing to their access to bank credits, motorboat fishers demonstrated higher transportation efficiency (motor boats), storage capacity (ice boxes), and catching capability (amount of gillnets). The technological externality generated by the motorboat fishers led to deadly conflicts between floodplain residents and outsiders in the Upper Solimões<sup>66</sup> and Lower Amazon.<sup>67</sup>

The role of the Catholic Church in fomenting local political organisation was fundamental in setting the stage for the response of community fishers to the intensification of fishing. During the Catholic outreach programmes, household units scattered throughout the basin were organised into community-based settlements in order to facilitate their work. Usually, a floodplain community encompasses a group of kin-related households settled in a contiguous area along a stream, with collective facilities such as a church, a common shelter, and a

school.<sup>68</sup> In the 1970's, the catholic organisations FASE (Organisation for Social and Educational Assistance) and CPT (Pastoral Land Commission), promoted educational programmes, political training and information networks (radio station, bulletins and regional meetings), which favoured the development of local leaders. The church also introduced the concept of Lake Zonation by assigning particular functional categories for each lake, such as preservation or subsistence.<sup>69</sup> *Caboclo* residents also relied upon political support from landholders in the Lower Amazon, who intensified the cattle ranching after the end of the jute boom and did not compete over the lake resource. The landholders' interest in the fishing accord was primarily an attempt to keep outsiders away in order to prevent property poaching and cattle piracy. In sum, the local organisation stage was marked by conflicts between local residents and motorboat fishers, the emergence of a *Caboclo* leadership, and, in some areas, the support of landholders. Fishing accords emerged in different regions of the Basin, but remained isolated initiatives with rough formal structure and no regional organisation. Documents analysed from this stage rarely spelled out all the prescriptions shared by the group, and usually were defined among residents of a single community.

The *integrated organisation stage* started in the mid-1980s, when small-scale fishers wrested control of the Fisher's Unions from non-fishers as part of the nationwide democratisation process.<sup>70</sup> During this stage, a more heterogeneous group of fishers emerged in the commercial fishing arena, escalating the fishing conflict between community fishers and other fisher categories (e.g., urban fishers and fishers from neighbour communities). The Unions played a major role in bridging the gap between community fishers and the governmental offices in order to find solutions to these conflicts. Documents from this stage reveal structural and organisational improvements, such as the foundation of community associations upon which the accords were established, multiple-community accords, and the participation of representatives of the Fishers' Union in community decisions. In 1984, several Fisher's Unions in the region met in a workshop to discuss their problems, and they generated the *Carta de Óbidos* (Óbidos Statement) – an influential document in the government's decision to launch a participatory management strategy.<sup>71</sup> In sum, fishing accords developed into a regional issue, with improved formalisation as the documents became increasingly better structured. Yet, the aggravated conflicts resulting from the illegal status of this local institution called for a formal recognition of their management system.

In the early 1990s, the formal engagement of grassroots organisations, governmental offices, and NGOs in the fishing accords issue opened the third stage of fishing accords, the *participatory organisation stage*. The ultimate goal of this stage has been legal recognition of the fishing accord as part of a co-management enterprise. An example of this enterprise is the joint programme launched in 1992 by the government (state and federal), international donors and

a local NGO to develop a participatory management plan for the Mamiraua Reserve. With the goal of combining conservation of a hot spot with local development of the rural population, three ecozones with distinct resource use restrictions – settlement zone, sustainable use zone, and preservation zone – were defined between researchers and residents according to ecological and socioeconomic criteria.<sup>72</sup> In 1994, the Brazilian and German governments funded the IARA Project in the Middle-Lower Amazon ‘...aiming at sustainable use [of fish resource], compatible with the interests and needs of the local population and the society as a whole, as well as the regional and national economy’.<sup>73</sup> Later, NGOs engaged in the process with research programmes supported by international development agencies, to support LMS through fomenting social organisation and developing local economic alternatives.<sup>74</sup> In the late 1990s, the government created a fishing committee represented by different stakeholders to create a collaborative management system of the Maicá Lake (Lower Amazon). The Provarzea Project from the Pilot Program G-7 is the most recent government-based initiative to support promising local initiatives, as well as to provide scientific and technical subsidies to implement co-management enterprises.<sup>75</sup> This stage has achieved fundamental structural improvements of fishing accords, which link them to a broader co-management system. On the one hand, the *Caboclo* populations lost their exclusive control over the floodplain system. On the other hand, they became visible in the decision-making process. The fishing accords are now evolving into formalised structures with legal grounds. Despite some problems regarding stakeholders’ representation and the extension of power in decisions, the participatory approach for the management of the floodplain system represents a turning point from a top-down, Amazonia-wide, government-based management system to a bottom-up, local-based, participatory management system.

## DISCUSSION

During 12,000 years of human occupation, the development of the LMS in the Amazonian floodplain has gone through major transformations, due to modifications in the structure of opportunities and constraints at local and external levels. Although local populations enjoyed access to a wide range of resources provided by this heterogeneous environment, the combination of prescriptions influenced by ecological, cultural and political factors have operated differently in each historical period according to the social features of the users and the ecological features of the target resources.

During the Amerindian Period, the LMS was mostly centred on subsistence goals. Increase in short-term energy reward and long-term food security were major motivations influencing local prescriptions. Ecological features of the resources directly influenced foraging behaviour, and individual failure to

achieve optimal energy returns played as a sanction. Cultural prescriptions were based on socially constructed behaviour (taboos, myths, and social pressure), while sanctions were based on individual emotions such as fear, self-respect, and shame. Thus, ecological prescriptions defined mostly 'how to use the resource' while cultural prescriptions guided 'what should not be used'.<sup>76</sup> During the Amerindian Period, ecological and cultural prescriptions as well as sanctions to violators were internalised and self-controlled. While prescriptions were shaped from unrelated conservation-driven motivations, strong food reliance on natural resources, low technological endowment, local-based social and ecological interactions, and the relatively slow pace of environmental change were major factors influencing the conservation outcome of the ecological and cultural practices during the Amerindian Period.

In contrast to the Amerindian Period, the prescriptions that developed during the Migrant Period were heavily influenced by external institutions, such as changes in land property rights and the broader market system, which allowed landholders to dictate strategies of resource use based on market demands. Floodplain *Caboclo* populations enjoyed access to resources during this period, but had little control over their management system. As a result, the ecological and cultural prescriptions that developed during the Amerindian period were overridden by new political prescriptions shaped from the patronage system. Increased economic and political returns became the two major goals of the LMS in this period, while the low reliance on floodplain resources for subsistence by the landholders created little incentive to adjust resource use patterns to sustainable levels. Landholders sought to increase economic efficiency through changing the production system according to the market demand for products like cocoa, jute and, recently, cattle. The fast pace of socioenvironmental change, the fragile ecological conditions of the floodplain, and the broader social complexity between resource use and local users during the Migrant period inhibited the development of responses addressing ecological concerns. As a result, the floodplain landscape was heavily modified from land-use activities in just a few decades.<sup>77</sup>

Just after external and internal changes related to the social structure and economic patterns of resource use occurred, a new set of prescriptions emerged. Intensification of commercial fishing, development of community leadership, and external support for local decisions created new conditions for the floodplain *Caboclo* populations to claim their right to rule the LMS. Fishing, then, was carried out mostly by floodplain *Caboclo* populations, at sustainable levels due to the combination of low technological assets<sup>78</sup> and low market demand. The introduction of more efficient devices by motorboat fishers combined with the increased fishing market spurred other fisher groups to engage in the commercial fisheries. Threats to their stable fish food availability and to their exclusive access to the lake system motivated floodplain *Caboclos* to respond promptly

with violent attacks on motorboat fishers, and, later, with the formulation of political prescriptions. The increased interest of individuals in joining the fishing accord, on one hand, and the improved ability of the group to organise on the other, enabled *Caboclo* populations to reclaim their control over management decisions regarding the floodplain lakes. While fishing accords have succeeded in protecting the lakes from motorboat fishers, in a few cases improved fishing productivity has been reported.<sup>79</sup> Thus, more than a conservationist-driven institution, fishing accords represent a new venue for expanding power to control the use of local resources.

The emergence of fishing accords is part of a broader social movement among Amazonian natives such as the Indigenous peoples,<sup>80</sup> rubber tappers<sup>81</sup> and black communities,<sup>82</sup> who have articulated their power to negotiate with the broader society for the legitimacy to conserve natural resources.<sup>83</sup> The increasing power to claim rights to nature has been a major factor motivating local populations to resist external pressures based on the conservationist discourse. The recognition of this political process driving the LMS during the *Caboclo* period is fundamental to assessing the potential of fishing accords for conservation purposes. Rather than being a conservation-oriented institution, the fishing accords are part of a historical process of change in the LMS to 'increase return', whether ecological (e.g., energy), cultural (e.g., respect), economic (e.g., money), or political (e.g., control). Whether or not strategies to increase efficiency will be consonant with resource conservation is a matter of how the LMS structure is related to the ecological system.

## CONCLUSION

Local management systems are dynamic and complex institutions whose prescriptions are reshaped and created according to socioenvironmental influences at different scales. The outcome of this process is a multi-layered set of prescriptions, defined under distinct circumstances existing during different historical periods. The common emphasis on current structure of the LMS and on local social relations has limited the analysis of these local institutions. Paying more attention to the historical dimension of the LMS and the external factors influencing local decisions has unveiled sources of motivations embedded in the local institutional crafting process. The Amazonian floodplain case reveals that recent LMS were strongly influenced by past social experiences and by broader socioenvironmental factors. Five main issues have been raised in this case study as contributions to improving the analysis of LMS.

First, the LMS may evolve from many incentives. Sometimes, the combination of prescriptions are consonant with resource conservation and prove to support resource sustainability, as during the Amerindian Period; at other times,

the prescriptions may lead to unsustainable ecological and social outcomes, as during the Migrant Period. Thus, rather than assuming positive or negative outcomes, the LMS must be analysed in terms of how the prescriptions are compatible with changing social and ecological systems.

Second, LMS retain both social capital and social costs accumulated throughout their history. Social capital, such as traditional knowledge, group ethics, social organisation, and administrative skills reveals the potential of LMS to support broader management strategies. Social costs, such as power relationships (e.g., patronage), local conflicts, and non-conservationist habits, may create barriers in the development of socially effective local institutions. Therefore, rather than emphasising social capital or social costs of LMS, a focus on the incentives to support the former and to abate the latter is fundamental in building co-management schemes.

Third, although LMS may encompass many different prescriptions, those actors enjoying local power dominated the decisions on what prescriptions should prevail (e.g., migrants during the Migrant Period and *Caboclos* during the *Caboclo* period). Therefore, instead of assuming good-for-all outcomes by returning power to the local populations, it is important to understand the local politics in the decision-making process.

Fourth, LMS become more coercive as the social system becomes more complex. The faster pace of change and higher diversity of user groups diminishes the level of commitment, trust, and mutual interest, and provides incentives for free-riding and rent-seeking behaviour. From more individual-oriented sanctions based on cultural and ecological prescriptions during the Amerindian Period, LMS evolved into more explicitly oriented sanctions based on economic and political prescriptions during the following periods. Thus, LMS can survive even in a very complex social environment if the local populations succeed in keeping control of the ecosystem.

Finally, recently established LMS, such as the fishing accords, are by no means isolated systems. They are closely related to former LMS, as the prescriptions capture ecological and social influences from the past. After all, fishing accords represent a social innovation to overcome an old problem – ensuring resource access. Thus, instead of assuming the conservationist discourse, any analysis of LMS should account for other hidden agendas.

In sum, LMS carry along motivations and goals developed throughout the history of the user groups. Often, prescriptions are not based on conservation ethics. The historical dimension of these local institutions is fundamental to unveiling the social context in which prescriptions emerge, resist, modify or vanish.

## NOTES

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<sup>1</sup> Local management takes several names, such as folk management, community-based management, communal management, traditional management. I chose the term 'local' because it includes the concept of management of a specific area by a local population, regardless of its cultural origin (folk), political boundary (community-based), or historical presence (traditional).

<sup>2</sup> Boyd and Richerson 1985, Berkes 1999.

<sup>3</sup> Berkes 1989, Dyer and McGoodwin 1994.

<sup>4</sup> Ostrom et al. 1994.

<sup>5</sup> Castro 2000.

<sup>6</sup> Ostrom 1990.

<sup>7</sup> Edwards and Steins 1999.

<sup>8</sup> Ostrom 1999.

<sup>9</sup> North 1990.

<sup>10</sup> Stocks 1987.

<sup>11</sup> Parker 1985.

<sup>12</sup> Browder and Godfrey 1997.

<sup>13</sup> Roosevelt 1980.

<sup>14</sup> Moran 1981, Schmink and Wood 1984.

<sup>15</sup> Weinstein 1983.

<sup>16</sup> Allegretti 1990.

<sup>17</sup> Roosevelt 1989.

<sup>18</sup> McGrath et al. 1993.

<sup>19</sup> Smith 1981, Begossi 1998, Castro 2000.

<sup>20</sup> Junk 1997.

<sup>21</sup> Brazilian Institute for Renewable Natural Resources and the Environment.

<sup>22</sup> Roosevelt 1989.

<sup>23</sup> Ibid.

<sup>24</sup> Denevan 1992. In areas of nutrient-poor soils, social reorganisation, including a complex regional exchange system were adopted in order to overcome environmental constraints (Moran 1991).

<sup>25</sup> Meggers 1971; Roosevelt 1980, 1989.

<sup>26</sup> Meggers 1971.

<sup>27</sup> Meggers 1995.

<sup>28</sup> Balee 1994; Denevan 2001.

<sup>29</sup> Roosevelt 1989.



- <sup>30</sup> Beckerman 1994.
- <sup>31</sup> Gragson 1993.
- <sup>32</sup> Beckerman 1983.
- <sup>33</sup> Stocks 1987.
- <sup>34</sup> Posey 1985.
- <sup>35</sup> Stocks 1987.
- <sup>36</sup> Goulding et al. 1996.
- <sup>37</sup> Smith 1981.
- <sup>38</sup> Jackson et al. 2001.
- <sup>39</sup> Chernela 1989.
- <sup>40</sup> Smith 1996.
- <sup>41</sup> Smith 1981.
- <sup>42</sup> Stocks 1987.
- <sup>43</sup> Denevan 1992.
- <sup>44</sup> The term *Caboclo* is used in this article to refer to non-Indian native populations, with no further social connotation.
- <sup>45</sup> Parker 1985.
- <sup>46</sup> Lima 1992.
- <sup>47</sup> Wagley 1953, Moran 1974.
- <sup>48</sup> Di Paolo 1990.
- <sup>49</sup> Benatti 1996.
- <sup>50</sup> Bates 1892, Ross 1978.
- <sup>51</sup> Verissimo 1895.
- <sup>52</sup> Furtado 1984.
- <sup>53</sup> Field notes.
- <sup>54</sup> Zimmerman 1987.
- <sup>55</sup> The floodplain became state property with the Constitution of 1934, but land tenure did not effectively change, owing to the lack of monitoring by government agencies.
- <sup>56</sup> Weinstein 1983.
- <sup>57</sup> Gentil 1988.
- <sup>58</sup> Wagley 1953.
- <sup>59</sup> Castro 2000.
- <sup>60</sup> Browder and Godfrey 1997.
- <sup>61</sup> Smith 1985, Chapman 1989, McGrath et al. 1993.
- <sup>62</sup> Petrere 1978, Smith 1981, Almeida et al. 2001.
- <sup>63</sup> Smith 1981, Goulding 1980, McGrath et al. 1998.
- <sup>64</sup> Smith 1981, Begossi 1998.
- <sup>65</sup> Castro 2000.
- <sup>66</sup> Goulding 1983.
- <sup>67</sup> Hartmann 1989.
- <sup>68</sup> Castro 2000.
- <sup>69</sup> CPT 1992.
- <sup>70</sup> Leroy 1988, Breton et al. 1996.
- <sup>71</sup> Furtado 1993.
- <sup>72</sup> <http://www.siamaz.ufpa.br/cgi-bin/folioisa.dll/Mami.nfo?>
- <sup>73</sup> IBAMA 1995.

- <sup>74</sup> McGrath et al. 1999.
- <sup>75</sup> [http://www.worldbank.org/html/extdr/offrep/lac/ppg7/docs/participation\\_full.pdf](http://www.worldbank.org/html/extdr/offrep/lac/ppg7/docs/participation_full.pdf)
- <sup>76</sup> As noted earlier, cultural prescriptions are not assumed to have emerged from functional process of adaptation. Yet, as an epiphenomenon, some prescriptions may have affected the ecological sustainability.
- <sup>77</sup> Goulding et al. 1996.
- <sup>78</sup> Low technological asset does not necessarily imply low impact (e.g., poison fishing). Yet, in this case it describes low-impact fishing devices (e.g., gig, harpoon, castnet).
- <sup>79</sup> Castro 2000.
- <sup>80</sup> Cocklin and Graham 1995.
- <sup>81</sup> Allegrati 1990.
- <sup>82</sup> Verán *apud* O'Dwyer 2002.
- <sup>83</sup> Schmink and Wood 1992.

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