"More eyes watching…"
Community-based management of the Arapaima (*Arapaima gigas*) in Central Guyana

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Abstract*. The Makushi of Guyana's North Rupununi Region maintain strong cultural, economic and subsistence relationships with their resource base. Recent threats to these resources have led to self-organisation and the creation of multi-level partnerships, and a series of community-based projects. This paper discusses lessons learned in one such project, the conservation of the Arapaima (Arapiama gigas) fishery, by examining traditional Makushi management and current community-based efforts. The Arapaima is the subject of many beliefs and taboos in traditional Makushi culture, and still features prominently in local folklore, although taboos have broken down. Guyanese law forbids harvesting of the species, but is rarely enforced. Years of overharvest driven by outside groups led to the virtual commercial collapse of the Arapaima fishery. In response, local communities partnered with national NGOs to develop a conservation strategy for the species. This relationship led to exchanges between fishermen and scientists from Brazil and Guyana, and the development of a management plan based on local knowledge. Current management efforts include a community imposed harvesting ban, the formation of fishermen groups at village and regional levels, a local monitoring program, and community education and awareness campaigns. Since the project began, Arapaima populations have increased threefold, even though the formal approval of the management plan has stalled largely due to lack of commitment at senior levels. Planned harvesting has therefore yet to occur, and no direct income has been generated by the initiative. Community responses suggest that reduced harvest intensity is related primarily to changed attitudes and self-monitoring at the community level. The education and awareness campaign appears to have influenced social norms, resulting in informal social pressure that has been more effective in enforcing the ban than formal mechanisms. The case shows the importance of developing multilevel partnerships, understanding local culture, and targeting informal social mechanisms with a history of success. This is critical when formal institutions are inappropriate or slow to develop.*

Introduction

Greater recognition that biodiversity conservation and economic development cannot be treated as separate, and antagonistic, goals has led to the emergence of the community-based approach to conservation (Barrett & Arcese 1995; Alpert 1996; Abbot et al. 2001; Berkes 2004). Community-based conservation differs from past approaches in that it recognises that social and ecological systems are inextricably linked (Abbot et al. 2001). This approach assumes that by being involved in the decision making process, local communities will develop a sense of ownership for the resource, realising that the long-term maintenance of biodiversity is in their own economic and social interests (Barrett & Arcese 1995; Forte et al. 1999). Community-based

conservation projects often have a number of common characteristics, including: i) a commitment to involve local community members and institutions in the management and conservation of biodiversity; ii) an interest in decentralising power and authority from the state level to local communities and institutions; iii) a desire to link and reconcile the objectives and socio-economic development with biodiversity conservation and protection; iv) a tendency to defend and legitimise local resource and property rights and; v) a belief in the desirability of including traditional values and ecological knowledge in modern resource management (Brown 2002).

However, there are differing views in conservation and development circles as to the practicality of the community-based approach. Some evaluations have been favourable (Alpert 1996), however, most see community-based management as unproven (Brandon & Wells 1992), while others suggest that this approach is inadequate in achieving both conservation and development, and usually breaks down in the face of severe poverty (Redford & Sanderson 2002). Thus, there seems to be two positions in the current debate over the merits of community-based conservation. One argues that community-based management, and the attempt to reconcile conservation and development, is inherently flawed (Hackel 1999; Redford & Sanderson 2002). The other position tends to hold that the concept behind community-based conservation is powerful and has potential, but its failure is mostly due to improper implementation (Songorwa 1999).

Berkes, (2004: 11) responds to this debate by suggesting that:

> "Does community-based conservation work?" is the wrong question. Sometimes it does, sometimes it does not. More important is to learn about the conditions under which it does or does not work."

Further, Berkes (2004) argues that a number of emerging fields of research have important lessons to offer to the conservation dilemma, including common property, traditional ecological knowledge, political ecology, ecological economics, and environmental ethics and history. He focuses on five factors that are central to achieving effective community-based management. These include the importance of cross-scale conservation, adaptive co-management, the question of incentives and multiple stakeholders, use of traditional ecological knowledge, and developing a cross cultural ethic.

Following Berkes (2004), this paper examines "the conditions under which [community–based conservation] does or does not work" through a case-study of a community-based effort to manage the North Rupununi Arapaima (*Arpaima gigas*) fishery, in Central Guyana. It explores traditional management of the Arapaima among the North Rupununi's Makushi people, current conservation efforts to recover the fishery, and the broader implications of both approaches to the theory of community-based conservation.

I begin the paper by outlining the research objectives and methodology. This is followed by a background of the area, the people, the current initiative and the fish. The discussion then investigates the Arapaima's place in Makushi folklore and its historical impact on fish populations. I then examine current management interventions, focusing on the involvement of local communities, and the development of partnerships at different levels of organisation. This is followed by a discussion of informal enforcement in the implementation of the Project. I

conclude with the argument that community-based conservation can be facilitated through an understanding of local histories and cultures, the development of cross-scale partnerships, and interventions that foster community buy-in and linked social monitoring and enforcement.

Study Methods and Area

Fieldwork was conducted from July to November 2003 in the North Rupununi communities of Apoteri, Aranaputa, Annai, Crash Water, Fairview, Kwataman, Rewa, Surama, Toka, and Wowetta. A follow-up verification phase was then conducted in October 2004, where reports and findings were presented and refined with community members. Research methods included informal and semi-structured interviews, participant observation, and one search workshop. Fisheries Committee outreach meetings were attended in four of these ten communities. These approaches were aimed at documenting livelihood activities, self organisation, changes in Arapaima use and management over the past five decades, Arapaima myths and legends, and cross-scale linkages in contemporary management efforts.

As summarized in Table 1, a total of thirty-nine (n=39) semi-structured interviews targeting fishery committee members (40%) and Arapaima fishers (10.5%) were carried out in the ten communities. Seven of those interviewed were fishery committee members, 12 were Arapaima fishers or traders, 13 were both, and seven were other community people who were neither fishery committee members nor Arapaima fishers/traders. Government officials and NGOs representatives were also interviewed (n=6).

The search workshop was used to conduct a timeline analysis and an institutional mapping exercise. The session was attended by 21 participants from 11 communities, and primarily included fishermen and community project personnel. Participant observation through involvement in project and community meetings, daily activities, and monitoring was employed to better understand Makushi culture and livelihood activities. Archival research was also conducted to examine changes in fisheries legislation, historical Arapaima use, and changes in traditional resource use practices. Arapaima population counts, summarised in Figure 3, were compiled using technical reports and information from the Guyanese national conservation NGO, Iwokrama (Castello 2001; Jafferally 2002; Iwokrama 2006).

The North Rupununi savannas, which are approximately 8,000 km^2, form a seasonally flooded plain, known as the North Rupununi Wetlands (Mistry et al. 2004). These Wetlands are dominated by the Rupununi, Rewa, and Essequibo Rivers, and include over 750 lakes, ponds and inlets covering approximately 22,000 ha (Figure 1). During the rainy season, the Rupununi River floods into the surrounding savannahs and forested areas. This flooding creates a large, unique wetland, which is an important feeding and spawning area for the area's fish species. Over 400 species of fish were recorded from surveys of only three of the river systems in the area (Bicknell 2004). This has led to estimates of up to 600 species for the area; remarkably high compared to other South American wetlands. The Rupununi, Rewa, and Essequibo Rivers are home to the Arapaima (*Arapaima gigas*), and healthy populations of endangered species including the Giant River Turtle (*Podocnemis expansa*), Black Caiman (*Melanosuchus niger*), and Giant Otters (*Pteronura brasiliensis*).

The people of the North Rupununi are distributed among fourteen primary communities, consisting of approximately 3500 people. This population is composed of Makushi (77%), Wapishana (11%), Arawak (3%), and a mixture of non-indigenous ethnicities (9%) (Iwokrama 2006). The North Rupununi is the traditional home of the Makushi people. Compared to other indigenous Amazonian societies, traditional Makushi social organisation is known for individualistic tendencies, loose social structures, and lack of formal social groupings (Rivière 1984; Allan 2002). Although many of their beliefs and practices have faded, a significant amount of Makushi culture is retained today in remnants of the local folklore (Forte et al. 1999).

The primary livelihood activities in the area are subsistence farming and fishing, although a number of other activities have come and gone. The main local crop is cassava (*Manihot esculenta*), while fish is the primary source of protein in the region. Aside from its subsistence value, fish is also traded within and between the communities of the area, along with other bush meats. This trade included the Arapaima (*Arapaima gigas*), which began initially as a commercial activity.

The villages are presently represented by democratically elected Toushaus (leader). These leaders came together in 1996 to establish the North Rupununi District Development Board (NRDDB), a regional, community-based NGO. The NRDDB was initially established as a formal link between the communities, government agencies, and the nearby Iwokrama Rainforest Reserve (Figure 1). The NRDDB has since taken responsibility for the planning and coordination of most educational, developmental, cultural and research programmes in the North Rupununi. The NRDDB currently manages a number of ongoing community projects that focuses on the management of local natural resources, including the Arapaima Management Project.

The Arapaima Management Project

The Arapaima Management Project is one of the many NRDDB initiatives. The Project began with the NRDDB endorsement of the legal ban on Arapaima harvesting, which was followed by surveys of the local Arapaima population and the training of local fishers in the survey methodology. This then led to the development of the Arapaima Management Plan. The Management Plan defines the processes and responsibilities for the managed harvest of Arapaima under the Project. The initiative was also linked to other NRDDB-Iwokrama initiatives such as river checkpoints, and the Community Environmental Worker (CEW) Programme, where community members were employed to lead environmental education and awareness campaign in their communities.

The Arapaima, pirarucú or warapai (*Arapaima gigas*) is among the largest freshwater fish species in the world, and can reach up to 3 m in length and over 200 kg in weight (Bard & Imbiriba 1986). It is a top predator, and has evolved unique respiratory and reproductive strategies. Because of the low oxygen environment in many Amazonian systems, the Arapaima evolved the ability to breathe air using modified swim bladders as lungs. As such, they have to periodically breathe air to survive. Breathing intervals are directly proportional to body size, and range from 10 to 20 minutes (Fontanele 1948). Arapaima reproduction involves the formation of pairs, nest building, territorial behaviour, and parental care (Isaac et al. 1993).

They are thought to spawn in lakes and ponds during low water, just prior to the rainy season. Parental care includes helping to aerate the water for its offspring, which is a necessity in the oxygen-deficient habitat. Adults have the ability to exude a milky sustance from their head containing a pheromone that attracts offspring and keep them in close proximity to the adult.

The Arapaima is highly prized for its meat and is among the most sought after fish species in South America, with a large Arapaima yielding up to 100 kg of meat and worth about US$ 200. Although Arapaima harvesting is forbidden in Guyana, 30 years of illegal fishing has led to the near local extinction of Arapaima in Guyana. Most of the local harvest was sold by North Rupununi communities to Brazil at approximately US$ 0.80 per kg, a low value in relation to market prices in Brazil (Iwokrama 2006). Although Arapaima harvesting is no longer a viable activity in the area, many villagers still see the fish as an untapped food source and a potential source of income in the future.

History of arapaima harvest and traditional management

The Makushi in the North Rupununi region of Guyana once had to a number of myths and beliefs, including a number of stories associated with the Arapaima. These stories formed the basis of a taboo on Arapaima harvest in traditional Makushi culture. Although no longer fully practiced, this taboo persisted well into the 20th century, and there is still a significant living memory among the North Rupununi communities of the beliefs surrounding the fish.

In exploring these beliefs, we recorded five stories, four of them specifically focused on the Arapaima. All of these beliefs were discussed as reasons why the Makushi traditionally avoided kiling Arapaima. Most of these beliefs seem to be based on the behavioural and physical appearance of the fish. Similar fish taboos stemming from behaviour and appearance have also be documented among fishing communities of the Amazon and Atlantic forest region in Brazil (Begossi 1992; Begossi et al. 2004).

The most frequently mentioned belief was that the Arapaima represented an *"Oma"*, which is the Makushi word for demon or evil spirit. Although most interviewees dismissed the belief as *"old time story"*, this story was told throughout the 11 communities visited. Similar claims told of the appearance of sores and scales on anyone that consumed the fish, along with occasional electrocution by lightening. Other, less prevalent, myths spoke of the Arapaima as the *"mother and father of the fishes"*, or that the fish is *"like human beings because the nurse their young with milk"*. The belief that the Arapaima represented the *"mother and father of the fishes"* is particularly interesting, since the story follows that if Arapaima are killed, the other fish would disappear from lack of care. This belief parallels understanding of the North Rupununi ecology, were the Arapaima is a top predator and a keystone aquatic species.

The taboo appears to have been highly effective in preserving the Arapaima in Guyana well into the 20th century, even as other populations in Brazil were being overfished (Gerrit & Baas 1997; Martinelli & Petrere 1999; Isaac et al. 1993). Anecdotal accounts of Arapaima numbers in the pre-colonist North Rupununi include statements like *"them times Arapaima was too much"* and *"they had Arapaima like worms in some ponds"*. Individual estimates of harvest volume at the height of the trade include a two man crew harvesting over 500 kg of salted meat per trip. These

figures suggest that the taboo had been extremely effective prior to harvest, providing a veritable abundance of Arapaima for the taking during the harvest period.

The taboos were socially enforced through a number of informal mechanisms. First, most of the stories suggest a belief in some level of supernatural sanction for anyone who harvested the fish, including the threat of bursting, sores, electrocution, illness and evil spirits. Persons known to have caught Arapaima, even accidentally, were associated with bad spirits. The fisher had to then have the *Piaman* (shaman) perform a ceremony to chase the evil spirits away from them. Only then would other villagers feel safe associating with that particular person. In these cases, the mechanisms of enforcement went beyond simple disapproval and included gossiping and ostracism. Therefore harvesting an Arapaima was a very expensive mistake in traditional Makushi culture, a mistake not many Makushi made until outsiders began moving into the area in the early 1900s.

These outsiders were settlers from the coast and other indigenous groups looking for employment in the balata trade (similar to rubber resin). Not recognising Makushi custom, these groups began to harvest the Arapaima for subsistence. This small harvest continued until the 1950s, when Brazilians began operating cross-border commercial trade in the area. In 1952, the Government passed the Fisheries Act, which made Arapaima harvest illegal. However, with money becoming increasingly important in the local economy, and with little enforcement of the ban, North Rupununi communities soon joined the harvest. By the late 1980s, the fishery had been pushed to commercial collapse. As the species succumbed to overfishing, there was a growing sense of alarm within some North Rupununi communities about the health of the fishery. This led community leaders to voice their concerns in regional meetings with Government officials in the 1980s. However, no significant action was taken, and the unregulated harvest continued, mainly as subsistence, with a much reduced trade component.

This story highlights the classic dilemma of mismatch between institutions and the scale of the problem (Brown 2002). On one hand, the communities had lost their taboo and lacked regional level institutions needed to control the harvest. On the other hand, the centralized Government had the policy but lacked the resources, local-level institutions, and know-how to have any impact at the community level.

Re-creating regional level management institutions

This disconnect continued until the early 1990s (Figure 2, panel 1) when the Iwokrama Rainforest Reserve was created through an agreement between the Guyana Government and the Commonwealth Secretariat. This agreement led to the creation of the Iwokrama International Centre for Rainforest Conservation and Development, which was given the mandate of managing the Reserve. The Centre approached this mandate by first investing resources into the creation of a regional body to represent all of the communities of the North Rupununi and, in 1996, the NRDDB was formed.

The Iwokrama-NRDDB partnership was the catalyst for the linking of institutions at different scales and was the first step to regaining control over the fishery (Figure 2, panel 2). The NRDDB, a regional level institution, could not match the effectiveness of cultural taboos, but it did allow for collective decision-making and management institutions on a regional scale. This

scale was much more closely matched to regional resources than were centralized laws and policies. The NRDDB also served as a link to the North Rupununi communities, and brought increased recognition to local concerns, such as the overharvest of the Arapaima. For its part, Iwokrama acted as a key link between donor groups, Government, and the NRDDB.

Iwokrama was able to draw on its legitimacy with the Guyana Government and visibility at the international level in negotiating with the State. It was able to facilitate meetings between Government and communities, where Government officials were forced to address local concerns. Iwokrama's international contacts also allowed the organisation to link to a number of donor agencies and bring additional resources to bear on community issues. In doing so, Iwokrama facilitated a shift in the conduct of conservation and management in the North Rupununi. Rather than the usual centralized, command and control approach of the Government, Iwokrama facilitated participatory approaches and focused on partnership based processes.

Partnerships and learning: the Project takes shape

With the establishment of this network in the 1990s, the stage was set for the development of the Arapaima Management Project. In 1998, Iwokrama funded community wildlife workshops, which brought together representatives from the North Rupununi communities. At the workshops, communities identified the state of the local Arapaima population as a major local concern. Iwokrama acted on these concerns by identifying an established project in the Mamirauá Sustainable Development Reserve in Brazil. The project was developed by the Mamirauá Institute for Sustainable Development, which worked with local communities to managing their Arapaima stocks in exchange for harvest quotas. The Mamirauá project had resulted in a number of innovations, including the development of a survey methodology based on fishers' knowledge.

Through correspondence between scientists from the Iwokrama Centre and the Mamirauá Institute, an informal relationship was established (Figure 2, panel 3). By creating this link with Mamirauá, Iwokrama was able to tap into a network in Brazil that proved critical in the development of the Guyana Project (Figure 2, panel 4). For one, Mamirauá was able to use its established relationship with the Wildlife Conservation Society, an international NGO, to access funding for the development of the Guyana Project. The Mamirauá link also facilitated the transfer of knowledge and expertise gained in the Brazilian Project.

In 2001, fishers from Mamirauá were brought to Guyana to run workshop aimed at training Guyanese fishers to survey Arapaima. Scientists from the Mamirauá Institute had discovered that experienced Arapaima fishers could count the number of Arapaima in a pond. A standardised method was developed based on this ability and tested (Castello 2004). The study showed that experienced fishers have the ability to count the number of Arapaima in a defined area by distinguishing individual fish at the moment of breathing. Fishers' counts were found to be strongly correlated ($r = +0.98$) with mark-recapture estimates for the same populations. This study also showed that fishers have the ability to learn the survey method from experienced fishers. A total of 13 Guyanese fishers were trained in the survey methodology and, when compared to similar counts by the Brazilians, were found to be accurate in distinguishing individual Arapaima. This gave the Guyana Project a means of monitoring the impact of conservation efforts.

The Mamirauá link also resulted in a Brazilian scientist being assigned to the Guyanese project. He led a team of Guyanese in a series of consultations with communities, which were used to adapt lessons gained in Brazil to local conditions in the North Rupununi. These consultations led to the NRDDB agreeing to enforce the harvest ban locally, the formation of fisheries committees at the regional and community levels, and the development of an Arapaima Management Plan for the area in 2002. Other linked projects included the creation of monitoring checkpoints along the major rivers in the area, and an education and awareness campaign aimed at increasing support for the community-endorsed harvest ban.

Barriers and linkages: the role of the Government

Throughout the Project's development, the Ministry of Fisheries, Crops and Livestock was consulted, and sent representatives to participate in the crafting of the Project and management Plan. When the Management Plan was presented to the Ministry in 2002, it gave its full endorsement, committing to a provision in the Fisheries Act which would allow harvesting of an annual quota under the Management Plan.

However, as of 2006, the Ministry has yet to live up to that commitment. There are many reasons why the government is dragging its feet, some of which is outside the control of the Project personnel, including the local economic importance of the fishery, or an aversion to setting precedence of sharing management responsibility with local communities. Project personnel did not persist in lobbying the Government to ratify its verbal commitment, nor did it take steps to formalize the verbal agreement after it was made.

The lack of effective negotiation with Government underscores a more fundamental issue of researchers and managers that lack training and experience in the political process. Project personnel require a fair understanding and working knowledge of policy issues, political negotiation and communication. Without these skills, it is often difficult to understand, and manoeuvre within, the political superstructure around community-based conservation. Although much is made of the importance of empowering local knowledge in these types of initiatives, this Project highlights the importance of political knowledge in facilitating community-based conservation. The lack of political will at senior levels in the Ministry continues to be the primary obstacle in the full implementation of the Arapaima management project.

Without Government approval, the plan to begin managed harvests remains on hold. As a result, the project has yet to produce direct economic benefits for the communities involved. Furthermore, the institutions created to implement the Management Plan have begun to break down. For instance, many of the community level fisheries committees are dormant or non-functional, many not having met since their creation. These structures were created primarily to manage quota harvesting, which has yet to take place. Although inactive, many local fishers still identified themselves as "fisher committee members", and felt that once harvesting was approved they would perform their roles in harvesting and monitoring. A full assessment of these institutions will therefore only be possible after harvesting gets underway.

From this assessment the situation might appear bleak, yet another failed effort in community-based conservation -- except for one major fact. Annual Arapaima surveys have been carried out

by Iwokrama and the NRDDB since the original training workshop, and these surveys have provided empirical evidence to support local claims of Arapaima recovery. Four surveys have been conducted in the management area since 2001, with the total count of adult and juvenile Arapaima increasing from 425 in March 2001, to 1200 in December 2003 (Figure 3). These growth rates are similar to those observed in other managed areas of the Mamirauá Reserve (Castello et al. 2005). These data suggest that the community ban is still holding and is contributing to the recovery of the population.

We investigated the factors that have contributed to the effectiveness of the harvesting ban. Based on interview data from former Arapaima fishers, fisheries committee members and other residents, the main factors contributing to local support of the harvest ban include: changed attitudes, fear of penalty, availability of alternative fish species, and a desire to access future benefits through the Project (Figure 4).

Monitoring and social enforcement: *"More eyes watching…"*

How can the ban still be effective if there are currently no formal institutions enforcing it? As we see in Figure 4, effectiveness of the ban appears to have more to do with informal social mechanisms than the Project's formal management institutions. Most villagers agreed that the two major drivers behind the ban is a change in attitudes due to the outreach campaign, coupled with the re-emergence of social sanctions for illegal harvesters. First, the education and outreach program seems to have been the main contributing factor in the emergence of a new conservation ethic among the communities. As one former Arapaima fisher argued:

"If one person catch one, what will happen? Is 300 people here, that means 300 Arapaima would be gone in one month. Because I have three children, the youngest, he is 8 years, but he never see it [Arapaima]*, only he see it in a book. That is my main aim for my children, I want my children and grandchildren to benefit, more than 1 benefit."*

Another fisher commented:

"We did not see ourselves as catching too much. We used to only concentrate on people from other communities, saying these people coming from outside and we shouldn't allow them. But we never think about our self. Now we get to understand the need to conserve, that the goal in end is to harvest, and that is what people want."

This change in attitudes has been created by the joint action of a number of players, including Iwokrama, supportive community leaders, and committed project personnel and community members. It was further supported by the joint Iwokrama-NRDDB Community Environmental Worker (CEW) Programme, where community members were employed to lead environmental awareness campaigns in their communities.

Having the support and buy-in at the community level was critical, since the villages are small, and strong interpersonal relationships are a fundamental part of the local culture. Being community members themselves, leaders, project personnel and CEWs were able to undertake

education and awareness campaigns. They have thus tapped into the informal, word-of-mouth communication networks that shape local attitudes and social norms.

This level of local participation can be seen in the use of local knowledge in the development of the fisher survey method, and the creation of community-based institutions like the fisheries committees. The monitoring approach in particular served as a very effective entry point in building community support for the initiative. The prominence of community members in monitoring has demystified management for the people. They see that their existing knowledge can play an important role in the management of their resources. This aspect of the initiative seems to have empowered many of the individuals involved, while increasing local ownership of the survey findings and encouraging more support for future management interventions. As the primary actors in the monitoring programme, trained counters are exposed to resource conditions at a regional scale. As a result, many seem to have gained a regional perspective on management and conservation.

The Iwokrama Centre, with its links to a broader network of institutions, was able to dedicate substantial funding and expertise to the development. Iwokrama scientists also took a collaborative approach early on in dealing with communities. The relationship was critical to Project development, since the organisation played an important role in facilitating meetings and regional level forums that led to the development of the NRDDB and the Project, and has contributed both resources and institutional support to these efforts. Both the NRDDB and Iwokrama work at the regional scale but link to very different actors and institutions (Figure 2).

Iwokrama played a key role as a linkage organisation in both the formation of the NRDDB and the development of the Arapaima project. They also provided for external forums of discussion, allowing for dialogue between fishers and government officials. Iwokrama is particularly effective in identifying international interests and concerns, accessing resources, and bringing both national and international recognition to local issues. On the other hand, the NRDDB has been relatively effective at linking these elements to local needs and represents local aspirations for development and conservation of their natural resources. The major lessons to be gained here is that community-based conservation initiatives can benefit from a close partnership with organisations that can navigate within, and link between, multiple levels of organisation. However, how these partnerships are developed is just as critical.

Iwokrama's participatory approach (community consultations, recognition of local knowledge as a management tool) appears to have resulted in the development of a very positive relationship with the NRDDB and communities. This relationship seems grounded in shared objectives, a long history of person to person interaction, and a high level of trust and reciprocity. For instance, in 2003, Iwokrama lacked the funding to conduct a thorough timber inventory of its Reserve. In response, the NRDDB offered to organise and conduct the inventory at lower costs, citing the history of reciprocity between the NGO and local communities. In 2004, Iwokrama faced a major funding crisis and needed bridge funding for a number of months. The NRDDB and a number of community representatives traveled to Georgetown and met with the President to lobby for the funding needed to keep Iwokrama functioning. In the end the Government agreed to provide funding. The strength of this relationship is fundamental to the continuation of the Arapaima Project. These positive partnerships, and their influence on individuals and institutions, underscore the importance of personal relationships and trust in maintaining

effective cross-scale institutional linkages. All too often, projects fail due to a lack of trust and respect between major stakeholders. This trust can only be built through years of interaction built on mutual respect and proven track records of inclusion, reciprocity and accountability.

Having local players involved in, and supportive of, the conservation efforts has significantly influenced social norms in most North Rupununi communities. The resulting social pressure to avoid Arapaima harvest seems to play a larger role in enforcing the ban than the formal structures set up by the management plan. Three instances of illegal harvest were identified during the research. In these cases, the harvester was reported to the NRDDB by both the local CEW, and other villagers. Visits to the individuals were then carried out by NRDDB members. In all cases, the catch was said to be accidental, and no penalty was enforced. However, most incidents resulted in a fair degree of gossip or *"talk name"*, and some ostracism of the offending individual. As one interviewees put it, "More eyes watching to see if you catch Arapaima", while another complained that *"You can't do nothing in this village without people seeing and talking your name* [gossiping]*."* With these "invisible" social mechanisms working in favour of Arapaima conservation, it is not surprising that there is an apparent increase in community-level monitoring and social pressure to adhere to the ban. Interestingly, it was these same informal mechanisms of gossip and ostracism that were operative during the taboo period, and now seem to be the key to current conservation effort.

Conclusions

It is clear that, although the traditional Arapaima taboo is no longer effective among the Makushi of the North Rupununi, the social mechanisms that made it so effective are still critical to contemporary efforts at community-based conservation. The first step in attempting to incorporate these mechanisms in current management is understanding the local culture and the legacy of traditional restrictions. In the case of the North Rupununi, the taboo, and the lack of a strong Arapaima fishing culture presented a very receptive environment for certain management interventions. In addition, using local knowledge of the species as an entry point proved very effective in gaining initial local support and buy-in to the management process. Secondly, a strong outreach and awareness campaigned based in the community and run by community members was critical in employing the aforementioned social mechanisms in contemporary conservation initiatives. This is important in situations where formal institutions are culturally inappropriate, non-functional, or slow to develop. However, this level of support is only possible if all the actors, both local and outsiders, share similar objectives and a working relationship based on trust and mutual respect. These types of relationships take time to develop and the right personalities to work.

What began as a somewhat top-down, externally driven project has become strongly dependent on bottom-up support. In the end, it is the change in community attitudes towards harvesting, combined with social enforcement of the ban, which has been the true success of the Project. These social mechanisms appear to be more effective than the formal management institutions, and can be credited with the apparent increase in Arapaima numbers. Every community-based conservation project will have differing challenges and require different approaches. However, community-based Arapaima management in the North Rupununi demonstrates the importance of developing multilevel partnerships, effectively engaging Government, understanding local culture, and targeting informal social mechanisms with a history of success. In particular, the

Project shows that although the process may be rocky and unpredictable, the potential benefits of community-based conservation are worth both the time, and the mistakes. As one CEW put it *"Iwokrama help to open our eyes, and now we can manage our own resources."*

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Table 1. - Number and roles of community interview respondents.
The ten communities surveyed are listed alphabetically from left to right.

	Apoteri	Aranaputa	Annai	Crash Water	Fairview	Kwataman	Rewa	Surama	Toka	Wowetta	Total
Fishery Committee members interviewed	3	1	2	1	1	2	1	3	1	3	18
Total no. Fishery Committee members in community	5	2	2	3	4	8	4	7	7	3	45
Percent of Fishery Committee Represented	60	50	100	33	25	25	25	43	14	100	40
Total number of respondents in community	7	2	5	1	2	5	4	6	3	4	39

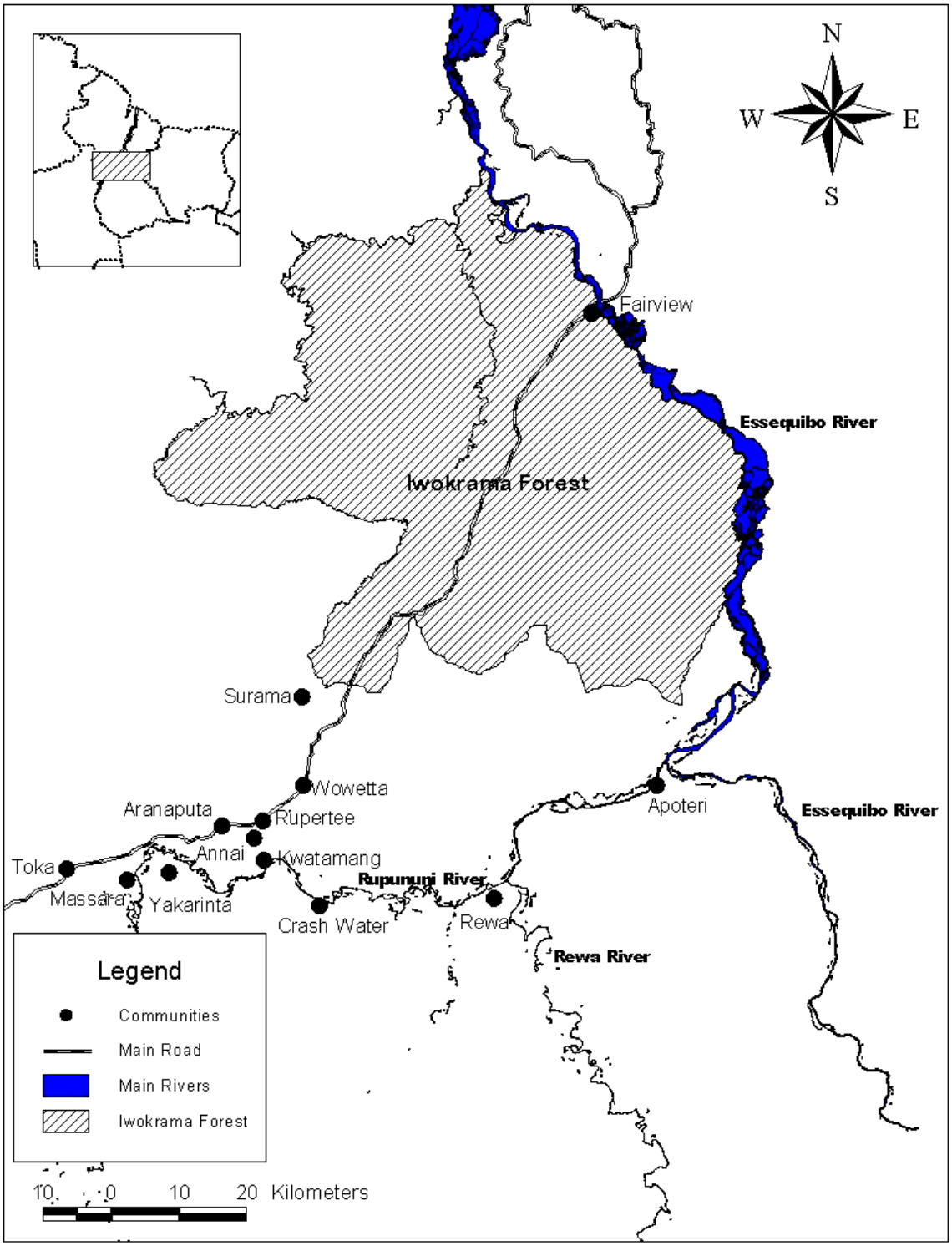

Figure 1 Map of study area

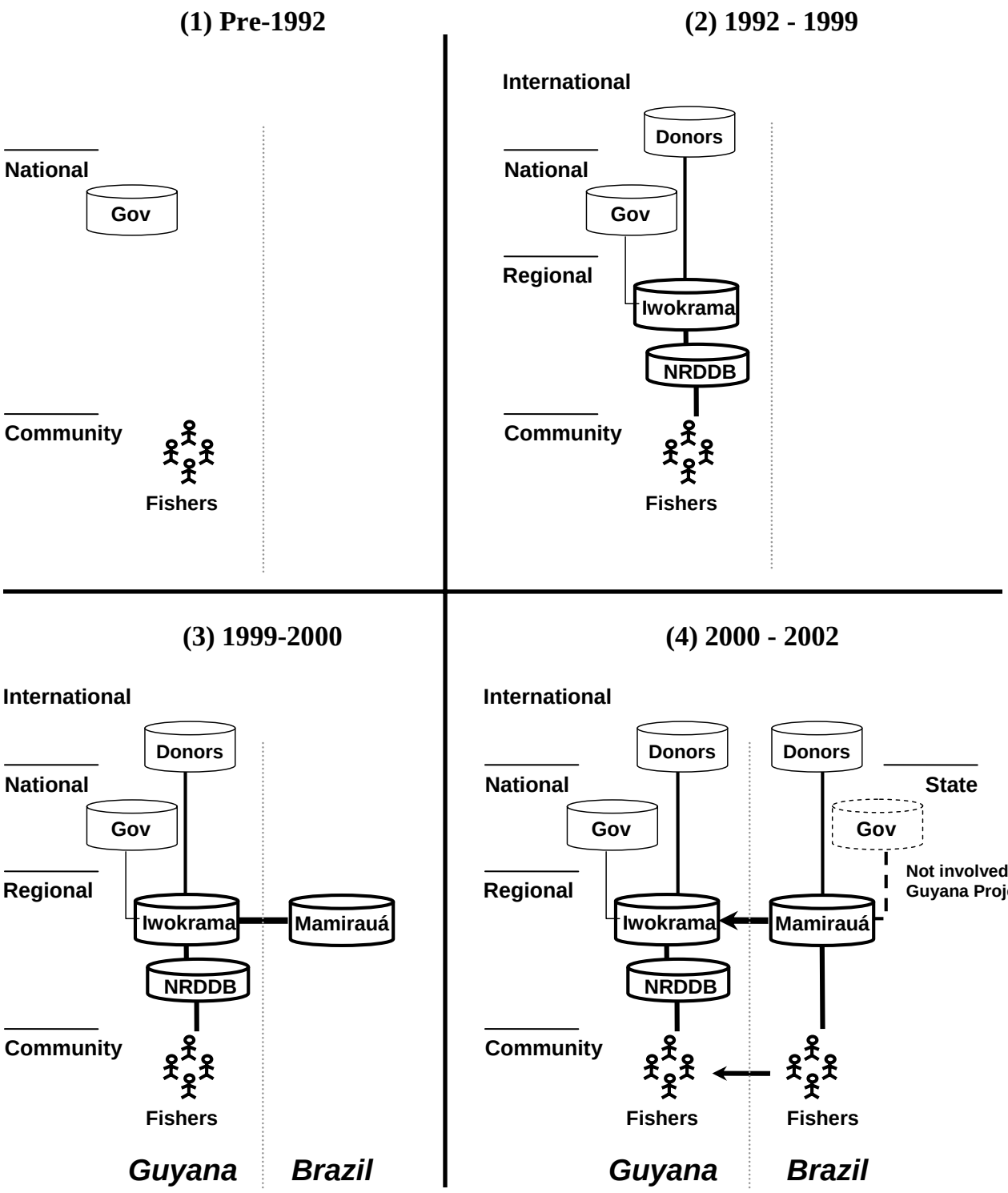

Figure 2 Institutional linkages leading to the *development* of the Arapaima Management Project.

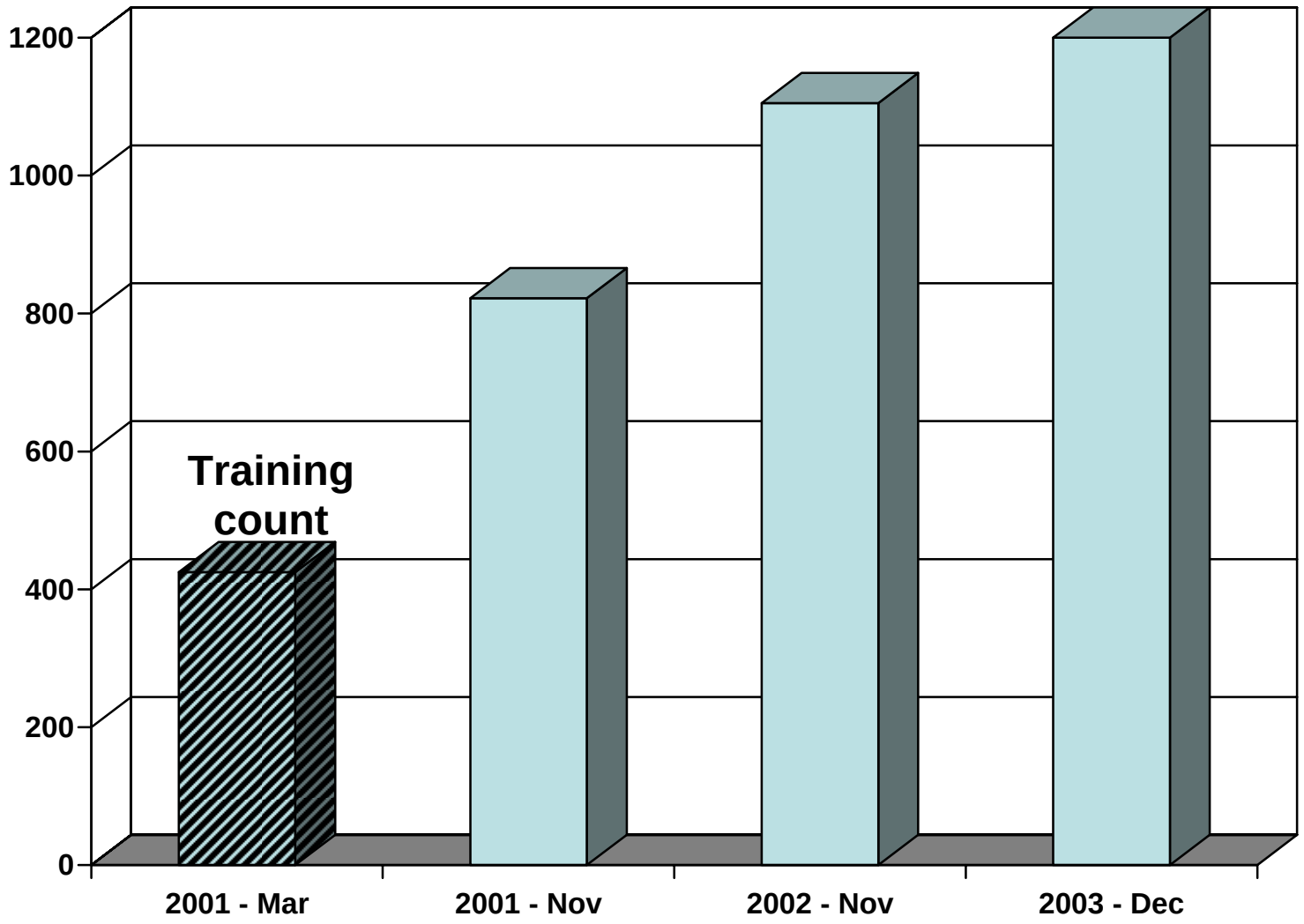

Figure 3 Surveyed Arapaima populations in the management area

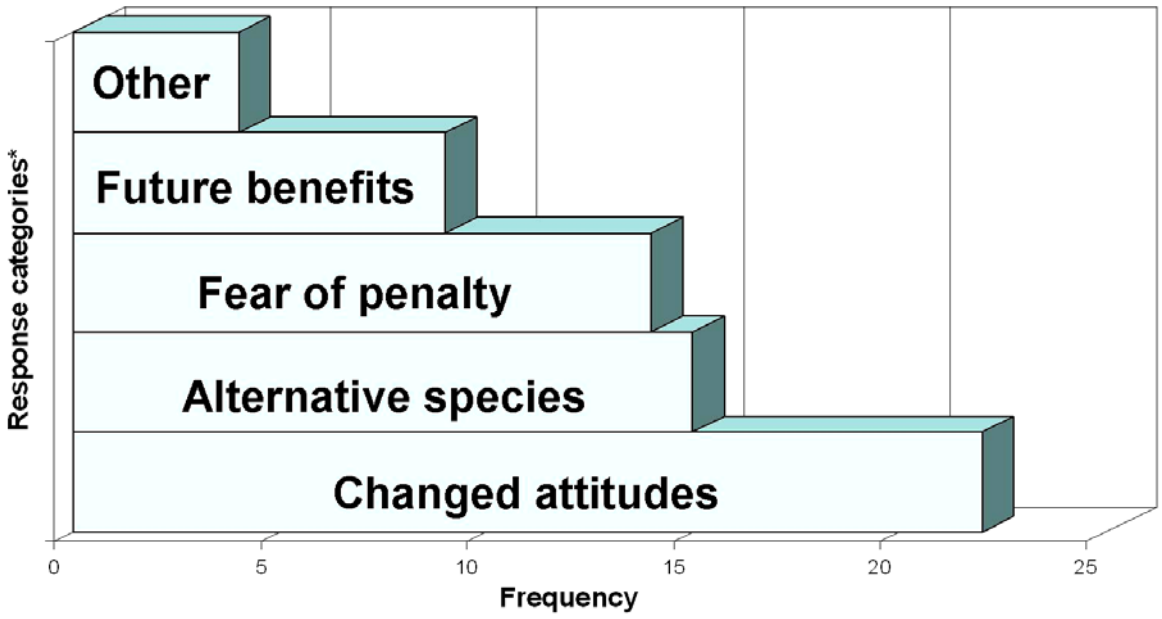

Figure 4 Community responses to the question "Why is the ban having an effect?" (n=39: see Table 1 for description of respondents)

*multiple responses allowed.
**response given primarily in combination with "fear of penalty" or "change in attitudes" responses.