

Bottom-up management of *Caiman yacare* in the Bolivian Amazon

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Abstract

In 1997, Bolivia initiated a national harvesting program for the caiman species *C. yacare*, which by that time had recovered satisfactorily after a large period of indiscriminate hunting in the 1950s-70s. The program foresees the annual legal harvesting of between 30 000 and 45 000 *C. yacare*, approximately 90% of which originate from the Bolivian Amazon, with less than 10% from the Bolivian Pantanal. The program has generated economical benefits at macro-level but suffers from weak governmental regulation and poor local stakeholder involvement. Recently, local organizations started to elaborate management plans in cooperation with non-governmental organizations. The present paper presents the lessons learned during the implementation of one of these plans and discusses the conceptual framework of local and regional proposals aimed at strengthening local organizations. The latter is considered as one of the key factors contributing to *C. yacare* conservation at local and national level.

1. Introduction

Caiman yacare is common throughout the Bolivian Amazon basin and the Bolivian pantanal [1,2,3,4]. The species was subjected to intensive exploitation throughout its distributional range in South America [5] during at least three decades in the 20th century (1940-1970). Its exploitation in Bolivia was halted in 1970, with the approval of a law that prohibited wildlife hunting. Its recuperation after this lengthy period of uncontrolled hunting was probably made possible by sufficiently large post-harvest surpluses [5], in combination with the high recovery potential of the species. After assessing the harvesting potential of *C. yacare* [2], in 1999 Bolivia initiated a national cropping program in the Bolivian Amazon and Pantanal (see review by Llobet et al. [6]). This program foresees the annual legal cropping of between 30 000 and 45 000 *C. yacare*. Around 90% of these animals are hunted in the Bolivian Amazon, while the remaining 10% are harvested in the Bolivian pantanal. This is the second program of its kind in South America, following the example of Venezuela that has been running a similar program with *C. crocodilus* since 1983 [7]. However, whereas in Venezuela private landowners are the primary beneficiaries of the program, in Bolivia a large proportion of the *C. yacare* are hunted on indigenous lands.

The Bolivian cropping program is backed by a set of legal regulations, which include a number of restrictions and management recommendations for the species. The program is based on the selective removal of large (larger than 1.8m) dominant males from the population, which is expected to lead to an increase of the wild population through the working of compensatory mechanisms. Some of the management recommendations are difficult to implement, as was recognized by the Bolivian Caiman UICN expert group [6,8].

The annual assignment of local harvest quota by the government is supposed to be based on an elaborate system of monitoring. However, there are deficiencies in the data collection, caused by the difficulty of implementing monitoring systems in a country characterized by difficult access to its renewable resources (but see advances in Rumiz and Cochrane [9]). In the absence of reliable population data, the assignment of local harvest quota is very much influenced by political and economic pressures exerted by the tannery industry, cattle farmers, salesmen and local politicians. The annual harvest quota assigned by CITES to Bolivia are distributed amongst hundreds of requests in two Amazon states: Santa Cruz and Beni. The requests are submitted on the basis of land ownership for individuals (privately owned cattle ranches) or communities (both communal farmer land and indigenous territories TCOs). Generally, the hundreds of small cattle ranches receive small individual harvest quota; these are considered by many of the private owners of these ranches as a commercial good that can be traded or sold, although this is illegal. On the other hand, a few indigenous territories receive high annual quota, ranging between 100 and 4000. In the Beni state, the mean annual harvest quota for private cattle ranches in 2005 was 35, distributed among 516 cattle ranches. In the same year the mean harvest quota for indigenous territories was 667 (based on unpublished governmental data).

Despite the weakness of the public sector, a strong top-down regulation of the cropping program was firmly maintained before 2006. Local stakeholders were not consulted and generally neither took part in the decision-making process nor in the designation of the harvest quota. Moreover, local people were not kept informed by the central government and their organizations were weak; this has resulted in salesmen dominating the commercialization of skins and paying very low prices to legitimate land owners. This in turn has led to low local economical benefits and a low level of local identification with the legal harvesting program. The prices per caiman skin paid to local hunters tended to be very low (4-7 US\$).

Considering that social and political conflicts related to the harvesting program are increasing considerably, and that monitoring is not yet a valid alternative for assigning sustainable harvest quota, new management approaches are called for. One of the most promising approaches consists of delegating responsibility and decision making to those local stakeholders who are legal owners of land that contains the resource and to involve them actively in the management process. This approach coincides with the current trend to strengthen bottom-up and co-management approaches for conservation of renewable resources [10,11,12]. The hypothesis behind this approach is that local stakeholders being able to decide on harvest quota and the harvest process, and who benefit economically from harvesting, will tend to protect or manage their resource more effectively [13]. The task of the public sector would then change to creating the conditions to making this bottom-up approach possible, and to guaranteeing that local harvesting can be organized in a planned way and without political pressure.

One of the first efforts in Bolivia to effectively incorporate local stakeholders in the management process was the putting together of a caiman management plan in one of the many protected areas in which indigenous tribes thrive. The pilot area is located within the national park Isiboro-Sécure, which is superimposed on an Indigenous Territory (TIPNIS) located in the center of the country. The present paper discusses experiences of the elaboration and implementation of the TIPNIS caiman management plan and strategies of incorporation of local stakeholders in the management process of *C. yacare*, and presents caiman management prospects.

2. Elaboration and implementation of the *C. yacare* management plan in TIPNIS

National Park Indigenous Territory "TIPNIS" is located in the center of Bolivia. It is a remote area in the Beni lowlands, at the foot of the Andes mountain chain. Roughly 40% of this territory consists of floodplain that receives the white waters of the Isiboro and Sécure rivers. Though it was assigned the category of National Park in 1997 and Indigenous Territory in 2003, outsiders exploit various resources, often buying local indigenous labour. It was estimated that after 1999, illegal hunting accounted for a loss of between 1 500 and 2 000 *C. yacare* each year. The price paid for caiman skins to indigenous people was between 3 and 5 US\$.

The management plan of *C. yacare* was put together in 2003 and 2004 by a team consisting of park rangers, indigenous leaders and technicians. The process consisted of many steps, ranging from the monitoring of habitats and caimans to know the local potential for *C. yacare* hunting, a study of the productive chain of *C. yacare*, the elaboration of a predictive model of *C. yacare* densities, and informative meetings in the 10 communities that participated in the program, to the organization of intercommunal meetings to discuss zoning, control and monitoring programs. The resulting management plan [4], which was approved at the start of 2005, contains a proposal of indigenous capacity building and strengthening of local organizations as well as a zoning proposal. The latter foresaw a single protected area (coinciding with the central protected zone of the national park) where caiman cropping was not allowed. The management plan also provided recommendations for the criteria to be used to fix local harvest quota. Local people did not trust official strategies used to fix harvest using biological monitoring systems based on nocturnal counting, as these were considered to be too far away from their traditional evaluation systems based on perceptions acquired during events of subsistence hunting. Therefore, these methods were complemented with traditional evaluation systems, not aiming at reliable population data, but at actively involving local hunters in the resource evaluation process.

The multiple criteria adopted to propose harvest quota were as follows:

- the quota should be large enough to provide social, cultural, economical and/or institutional benefits to the hunters, to the indigenous communities and to the local authorities.
- the harvest quota should take into account population estimates obtained through nocturnal counting of caimans
- the harvest quota should take into account the results of traditional evaluations of the population status of caimans

- the harvest quota should be based on agreements reached amongst all community members during community meetings.
- the harvest quota should take into account the interpretation of harvest results of the previous year (within a framework of adaptive management)

On the basis of these criteria, a quota of 500 was proposed for the central part of the park (the Ichoa river basin). The government responded to the recommendations, assigning harvest quota of 524 in 2005 and 564 in 2006, which are quota that did not pose a threat to local caiman populations and that were well below past illegal annual extraction data.

Once the management plan was approved, in 2005, the first step during the implementation stage was to create a local indigenous organization, which was named the "Intercommunal Council for the Sustainable Use and Commercialization of *C. yacare*". The composition and functioning of this committee was discussed during various community meetings. The members (hunters, indigenous technicians and a coordinator) were elected during the yearly assembly of TIPNIS. During this same meeting, it was decided that the committee should have the following characteristics:

- it should not compete with existing local organizations
- it should be re-created annually on a temporal basis, and should operate in function of the official calendar of the national cropping program
- it should have exclusively operational tasks and should not accumulate any political power

The members of the "Intercommunal Council for the Sustainable Use and Commercialization of *C. yacare*" initiated the process of planning, harvesting and commercialization of the product, and external technicians of a nongovernmental organization accompanied this process. Characteristics of the harvesting process during 2005 were described by Cisneros et al. [14]. The indigenous people of TIPNIS sold the caiman skins through a public auction at 27 US\$ each, which signified a 500% increase in income per skin compared to previous years. The income was divided into five parts: 25% was used to pay hunter salaries, 35% was distributed proportionally amongst communities which had participated in the process, 5% was channeled into indigenous organizations, 15% was used to pay two indigenous technicians, and 20% was set apart to train and prepare next year's hunters. In general, local communities were very happy with the economic benefits, though in some communities there was disagreement as to whether communal benefits should be distributed amongst families or whether they should be used to finance community projects. Finally, it was decided that each community should decide on its own how to use the incoming community funds.

During 2005-2006, local partners accumulated both positive and negative experiences during harvesting and commercialization. This allowed them to strengthen technical and organizational capacity, and start a process of adaptive caiman management, which should result in adapting local harvest quota taking into account caiman population status and hunting experiences. Starting in 2007, the local indigenous organizations will adjust annual quota levels, taking into account multiple information accumulated during 2005 and 2006.

3. Future prospects for caiman management and local stakeholder strengthening in Bolivia

Common fisheries resources are increasingly managed through formal agreements between stakeholders [11]. Caimans, on the other hand, can be generally considered as non-migrating resources (though they can move large distances in a lifetime), and they can be managed more effectively through recognizing ownership of the land that contains the caiman populations. This promising approach has important multiple effects, one of those being the increased appropriation of land and the resources it contains, and the consequent inclination to defend land and resources against invasion or illegal use. In a country such as Bolivia, where ownership is weakly defined [15, 16], caiman conservation and management strategies can help to legitimize ownership and increase the effectiveness of conservation approaches. The cropping program may provide tangible economical incentives for indigenous communities to maintain viable and healthy *C. yacare* populations and to protect their territories from illegal use.

The appropriation of renewable resources is a slow and gradual process. During the TIPNIS experience it became clear that it is not wise to advance too fast with the process because the risk of making irreversible errors or of creating false expectations is high. For example, during 2005 it was decided not to sell caiman meat, though this involved a waste of meat and loss of income. Later on, it became clear that this decision had been a wise one because the risk of loss of meat during transport was too high and the prices paid by local companies were too low. It was learned that sustainable management is a step-by-step approach and local communities should be given the opportunities to take the different steps one by one.

Empowerment of local stakeholders has become central in the approach adopted during the process. During the experiences in TIPNIS, it became gradually clear that there are three different elements forming part of, and contributing to, local stakeholder empowerment: awareness raising and information transfer, "formal" capacity building, and organizational strengthening. These three strategies are complementary. The overall process demands for strategic alliances between local indigenous territories and external nongovernmental or governmental organizations. Recently, a capacity building program [16], planned along the lines of the framework of the Bolivian BIOTRADE program aims at strengthening local stakeholders involved in sustainable use of *C. yacare* [17]. These and other experiences led the same BIOTRADE program to start in 2007 with the putting together of 10 new *C. yacare* management plans in indigenous territories. It is thought that these plans will become instruments that allow the strengthening of local resource users.

4. Discussion

There are several lessons to be learned from the implementation stage of TIPNIS's *C. yacare* management program. The national harvesting program of *C. yacare* so far failed in not setting consistent goals. It is not clear whether the program was conceived in the first place as a caiman conservation plan, a plan to alleviate local poverty or a plan to generate income along the respective productive chain. This lack of a clearly defined policy made difficult the prioritization of actions necessary to improve the different components of the program. For example, the harvesting program in its current design has failed to recognize that a large part

of the harvest quota is assigned to indigenous people, and this segment of society has not been strengthened accordingly.

In the absence of a clear national policy, local *C. yacare* management plans introduced a new framework for the sustainable use of this species at the local level, focusing the attention on the strengthening of local actors. These management plans should be taken as dynamic guidelines for sustainable harvesting at local level, while the guidelines should be adapted continuously taking into account new experiences. In TIPNIS, for example, the proposed zoning system, including protected areas, was not respected during the harvesting process because it proved to be unrealistic. The idea of setting apart a single fixed protected area which could function as a source of *C. yacare* was not understood by local indigenous people, who implicitly adopted the notion that the exclusive hunting of adult males is enough to guarantee conservation of the species and its populations. The management plan was adapted accordingly, and indigenous communities decided to adopt their own strategy, which consisted in the annual changing of hunting zones.

It is wishful thinking that legal harvesting will be able to replace illegal hunting practices in the short term. This will be a gradual change, with success depending on which of the two approaches provides more economic and social benefits for local people. One of the target groups is the hunters themselves, who should earn more income per skin sold within a legal framework than do illegal hunters. The surplus prices to be paid to hunters for working in a legal framework should be agreed upon during committee meetings.

It is equally wishful thinking that indigenous communities would be able to manage and control the entire harvesting and commercialization process in the short term. It is therefore recommended that long-term strategic alliances be established between indigenous organizations and public and non-governmental organizations that support this process. At the same time, it is crucial to create temporary committees or councils that have specific attributes and skills related and limited to *C. yacare* harvesting and that do not compete with existing indigenous organizations. There should be ample opportunity to evaluate and discuss the lessons learned so as to adapt management programs throughout the years. Equally, it is important to share experiences horizontally, amongst local stakeholders with different types of experiences. Finally, management strategies should not be focused only on the indigenous stakeholders but should also take into account other stakeholders who play one or other role in the process, such as salesmen, cattle ranchers with properties that overlap with indigenous territories, or cattle ranchers that have properties in buffer zones.

It is important to create stability and predictability of the process. Annual harvest quota should be constant during some years, allowing the local stakeholders to plan and invest their time in improving harvesting strategies and strengthening their organizations, thus avoiding having to invest their time and energy in political lobbying aimed at trying to receive the desired quota. Once the local stakeholders have accumulated experiences and are strengthened, it might be easier to adapt to annually changing harvest quota. Errors, conflicts and failures are the best opportunities to improve the learning process and to make considerable advances. For example, in TIPNIS a local indigenous leader signed a secret agreement with tanneries, and was punished by his fellow community members. This experience was used by local communities to consolidate mechanisms that in the future should help to avoid this type of situation.

Monitoring of the resource using standard techniques (nocturnal counting) has only limited value in a local context. It was shown that monitoring of the harvesting process yields more useful information that can be used in the framework of adaptive and appropriative management. Indigenous knowledge of the *C. yacare* population status should be taken into account and be used to fix harvest quota. Indigenous people should be encouraged to develop or valorize their own evaluation systems. The main monitoring moment is during hunting itself, and hunting success should be used as an indicator of the caiman population status.

Informing local stakeholders of all the steps of the process is crucial in the capacity building. It is important to reach all the community members in order to achieve wide acceptance of the program. All processes should be interpreted and seen from the perspective of the indigenous stakeholder, and all instruments should be "translated" in an accessible language. For example, the "official calendar of the *C. yacare* program", never very well understood by local people, was translated to a calendar focusing on the local stakeholder's point of view. On the other hand, "formal" capacity building of local indigenous organizations is important but it is more efficient to accompany local stakeholders during the overall harvesting process. The "walking together" of local hunters, public and non-governmental technicians offers the best opportunities for learning and strengthening.

Local strengthening should go hand in hand with strengthening of the public sector and the local governments, which should play a leading accompanying and facilitating role during the process. Taking into account the highly fluctuating prices of caiman skins on the international markets, local stakeholders should be motivated to diversify activities. The capacity building acquired during the *C. yacare* harvesting process should be used to strengthen other types of sustainable use.

A key factor is to ensure the independence of external salesmen through the existence of funds at the start of the process. In some cases, this single factor might be enough to initiate local processes, and formal capacity building might become of secondary importance. The exclusion of intermediate salesmen from the process of sustainable use generates more income for local communities, but also implies more organizational capacity and involvement of the local stakeholders. This is also risky, and the program can fail when too little effort is given to capacity building. When the risk is too high, deception after failure might also be higher, as well as the probability that local stakeholders quit the process. It was shown in TIPNIS that significantly higher economical benefits can be obtained through a public auction; however the organization of an auction demands skills that are not always present. The tanneries can block this process easily when it is not supported by the government.

The *C. yacare* cropping program is expected to yield multiple effects. The economic benefits obtained by the indigenous communities transform them in the most secure responsables for the control and the sustainable management of their *C. yacare* resource. Appropriation of local resources through a legal harvesting process strengthens the sense of property of local stakeholders and stimulates them to defend their territory against invasion by illegal hunters or usurpation of it by cattle ranchers. Within the framework of the process, new leaderships are created. These new leaderships are important because they are based on professional merits, although they can present a threat when they lead to a mixing of political and technical objectives.

The government that was elected in 2006 is expected to give relatively more importance to stakeholder strengthening than previous governments. The theoretical foundations of these politics were already laid by previous governments with development programs and plans such as ENDAR (Strategy for Development in Rural Areas) and programs such as BIOTRADE. The scene is set for an accelerated empowerment process of indigenous actors, that will strengthen their position as main beneficiaries in the productive chains.

5. Conclusions

The experiences with the *C. yacare* management plan in TIPNIS have shown that:

- bottom-up community-based conservation and management of *C. yacare* might valid alternatives for top-down management of this resource
- the elaboration and implementation of *C. yacare* management plans might enable the strengthening of local resource users
- *C. yacare* management plans should include strategies enabling the adaptive management of the resource
- illegal hunting of *C. yacare* can be reduced by recognizing resource ownership of legitimate owners
- strengthening of resource ownership may increase the probabilities of effective and long-term resource conservation

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