

Proposal for the sustainable use of the Spectacled Caiman (*Caiman yacare*) in indigenous lands of the Bolivian Amazonia

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ABSTRACT: Population evaluations of the Spectacled Caiman (*Caiman yacare*) were carried out between 1999 and 2000 in the Tacana Indigenous Land, in the Beni river basin (Bolivian Amazonia). The relative abundance of the Caiman was determined around five communities using night counts. The population density ranged from 2.03 to 123.78 individuals/km of shore, and an overall population structure of Class IV individuals (= 180 cm of Total Length) of 25.6% was determined. These population characteristics suggest that sustainable use through annual harvests is possible for this region. Participative community workshops in 2003 enabled a community management program that incorporates aspects of fair benefit distribution (among communities, supra-communal organization, and direct harvesters of the resource), communal organization (associations of caiman managers), control of the evaluations and harvests, and commercialization of the resource in the national market. This proposal presents an alternative for managing this resource that promotes greater administrative transparency, and promises increased benefits for the direct harvesters. This management model can also contribute to the process of improving the National Program for Spectacled Caiman, developed by the Ministry of Sustainable Development, to achieve a true sustainable use of the species. Nevertheless, internal control mechanisms and the harvest by people from outside the indigenous land require further discussion.

Introduction.

In Bolivia, the pilot program for sustainable use of the Spectacled Caiman (*Caiman yacare*) started in 1995 with the project “A Programme for the Sustainable Use and Management of Caiman in Bolivia” (King and Godshalk 1997, Godshalk 1994). In 1997, this program promulgated the “Regulation for the Conservation and Use of the Caiman (*C. yacare*)” for Santa Cruz and Beni Departments. This same year the experimental phase of Caiman Management Plans was developed and applied at cattle ranches in the Beni Department.

Once concluded the experimental phase and incorporated the modifications, in 2000 the new “Regulation for the Conservation and Use of the Caiman” in ecological regions established by Ravenstein (2000) of CESO/SACO - Canada started. In 2002, a new evaluation of the Program was conducted by adjusting the regulation that is working currently.

Through this process, since June 2000, the Wildlife Conservation Society (WCS) and the Indigenous Council of the Tacana People (CIPTA) have been working together to formulate and to implement a Strategy for Sustainable Development in the Tacana Indigenous Land using the Management of the Natural Resources, and structured through a zoning based on the current and potential use of the communities, expressing their own perspective of how to use the Indigenous land.

Starting from the verification of the necessity of developing initiatives of management of the natural resources and the new Strategy, in 2000, WCS and CIPTA agreed to support a thesis for the evaluation of the populations of Spectacled Caiman in the Tacana Indigenous Land. During the first evaluation of the water bodies in the communities of the Ixiamas region, no population of Caimans was found for harvest. However, during the 2001 evaluation in which the study was extended to the communities found along the Beni River, various populations of Caimans with a good population size were found and were considered to be able to be harvested in a sustainable way (Ríos 2003).

On the other hand, in 2002, the Prefecture of the Department of La Paz began the process of legal harvest of caimans and evaluated the population status of the Spectacled Caiman in the northern part of the Department. Two of the areas evaluated were Tacana communities located along the Beni River, inside the Tacana Indigenous Land.

By virtue of all the efforts taken, it was considered convenient to establish a process of sustainable use of Caimans in the Tacana Indigenous Land, based on the scientific studies and under a regulatory system and communal and supra-communal controls. These controls should work with the aid of the competent authority, which are organized at the community level and assumes specific responsibilities for the conservation and the commercial use of the Caiman. The communities are constituted in juridical body with obligations according to law and at the same time are the direct beneficiaries without middlemen. This can be achieved with the support of the CIPTA and the technical and scientific advices of the WCS - Bolivia.

Study area.

The project will be developed inside the Tacana Indigenous Land, which is found in the Abel Iturralde province at the north of the La Paz Department. The Tacana Indigenous Land has a requested extension of 769,891 ha (Ríos 2003), of which 325,327 ha have been entitled up to the date (Figure 1).

In accordance with Ríos (2003), the area where Caiman populations have been recorded with possibilities of commercial use is the east part of the Tacana Indigenous Land and is located in the canton of San Buenaventura (toward the east of the Tacana territory).

This area belongs to the Amazon basin, inside of the sub-basin of the river Beni, and presents periodic floods by the overflow of the local rivers, which defines an ecosystem of flooded plains (Ríos 2003).

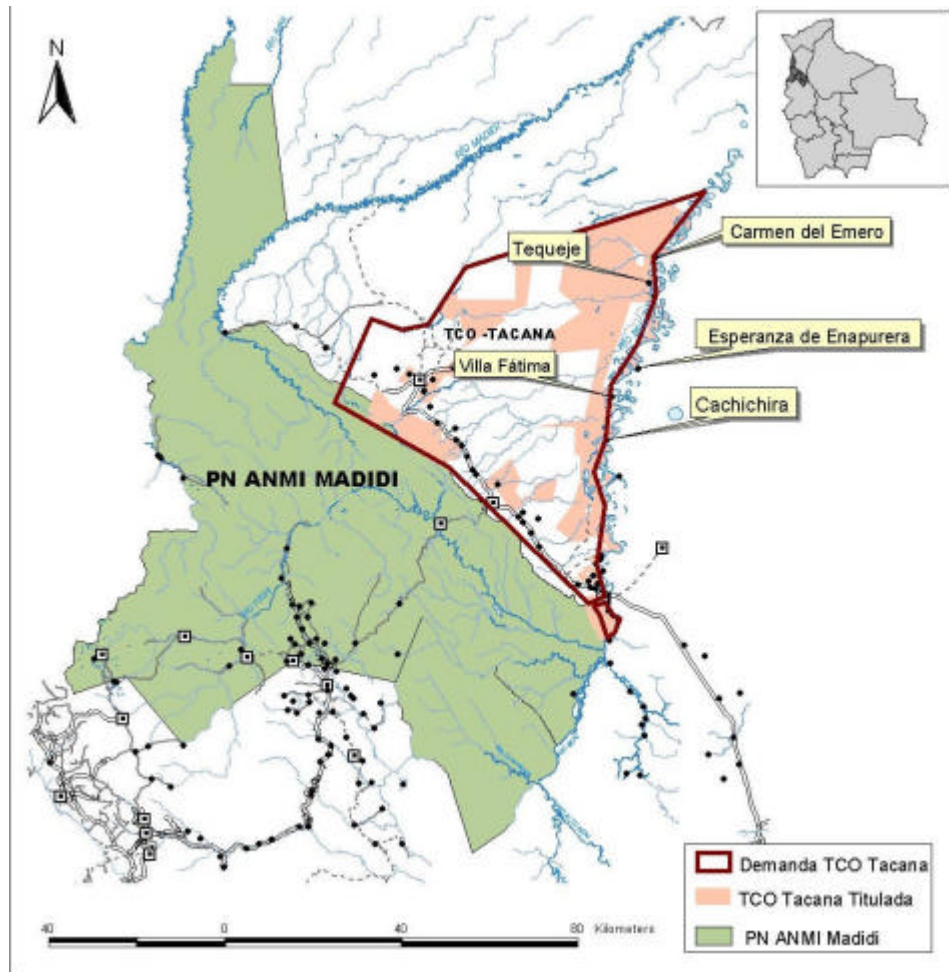


Figure 1. Map of the Tacana Indigenous Land, Provincia Iturralde, Department of La Paz.

The watercourses of this region are originated from the Andean mountains or from savanna, which influences their chemical composition and associate biota. The river with the biggest flow in the area is the Beni, which has an Andean origin. There are also many meanders in the region (Ríos 2003).

A humid tropical climate is found with a short period of drought in this area. A rainy season lasts from November to May and dry season lasts from June to October. The annual precipitation is 2,500 mm; however, considerable fluctuations of the annual precipitation are found from year to year (Ríos 2003).

The average temperature is 27°C with a reduced seasonal and daily temperature variation, except during the cold fronts or “surazos”, which cause a considerable decrease in the temperature and are frequent during the dry season (Ríos 2003).

The population found in the area of the pilot project is mostly of the Tacana ethnic, but members of other ethnics also exist. In the area ten communities are found in the alluvial plain along the Beni River. These communities have a communal area, and an area of use of natural resources (Ríos 2003).

Methods.

For this implementation phase, the thesis by Ríos (2003) was used as base line. This document presents a list of communities in the Tacana Indigenous Land, where exhaustive evaluation of the abundance and population structure of the Caiman in the different water bodies was conducted. The communities selected for this study were those where the populations of the Caiman could be used for the commercial purpose. These were the communities of Carmen del Emero, San Antonio de Tequeje, and Cachichira, all of which are found along the Beni River.

The information provided by Ríos (2003) was supplemented with some censuses conducted at the communities of Villa Fátima and Esperanza de Enapurera, by the Prefecture of La Paz in 2002, which are found in the report “Study of Zoning and Evaluation of the Caiman Populations (*Caiman yacare*) in the Department of La Paz”.

To calculate the abundance of Caimans, the index of abundance was used for water body (lagoons, lakes, rivers, and streams) provided by Ríos (2003) and Prefecture of La Paz (2002). If both studies evaluated the same water body, the average of the index of abundance was calculated. Later the total perimeter of the water body was calculated using ARC VIEW GIS 3.2. Once estimated the total perimeter, the number of Caimans per km of riverbank was projected.

Results.

The population size and age structure at the area of each community is reported in Tables 1 to 5. A total population of 9297 caimans was found, with an overall population structure of Class IV individuals (= 180 cm of Total Length) of 25.6% . According to the Bolivian laws, with this data, it would be possible to calculate a harvest quota of 427 individuals.

Table 1. The population size and age structure of Spectacled Caimans at the community of Carmen del Emero.

Water body	Density (per km of shore)	perimeter (km)	Estimated population size	Proportion of Class IV	Number of Class IV individuals	Harvest quota Class IV
Arroyo Undumo	14.97	25.0	374.25	22.73	85.07	21
Laguna Japón	51.66	13.8	712.91	7.21	51.40	13
Lago Barrientos	76.32	6.0	457.92	8.34	38.19	10
Lago Juan Carlos	65.79	11.4	750.01	7.32	54.90	14
Laguna Bibosal	44.97	8.4	377.75	0	0	0
Laguna Tacuaral	37.04	12.5	463.0	23.26	107.69	27
Lago San Pedro	7.0	17.9	125.30	16.67	20.89	5
Laguna Sicuri	20.32	7.5	152.36	25.0	38.09	10
Río Beni (Sector 1)	2.03	46.1	93.58	33.33	31.19	8
TOTAL			3 507.08			110

Table 2. The population size and age structure of Spectacled Caimans at the community of San Antonio del Tequeje.

Water body	Density (per km of shore)	perimeter (km)	Estimated population size	Proportion of Class IV	Number of Class IV individuals	Harvest quota Class IV
Arroyo Tequeje	18.12	25.0	453.0	18.84	85.35	21
Lago Flojo	55.2	15.8	872.16	23.08	201.29	50
Laguna Miti	50.22	4.2	211.93	24.24	51.37	13
Laguna Supa	13.65	4.73	64.56	21.28	13.74	3
Río Beni (Sector 2)	5.72	37.7	215.64	20.75	44.75	11
TOTAL			1 817.30			98

Table 3. The population size and age structure of Spectacled Caimans at the community of Esperanza de Enapurera.

Water body	Density (per km of shore)	perimeter (km)	Estimated population size	Proportion of Class IV	Number of Class IV individuals	Harvest quota Class IV
Lago Corpus	123.78	5.6	77.17	0	0	0
Lago Redondo	12.32	9.4	115.81	35.72	41.37	10
Río Beni (Sector 3)	3.88	41.9	162.57	27.04	43.96	11
TOTAL			355.55			21

Table 4. The population size and age structure of Spectacled Caimans at the community of Cachichira.

Water body	Density (per km of shore)	perimeter (km)	Estimated population size	Proportion of Class IV	Number of Class IV individuals	Harvest quota Class IV
Laguna Moa	24.39	41.8	1 019.50	27.56	280.97	70
Laguna Colorada	15.22	10.8	164.38	21.11	34.70	9
Laguna Maja I	25.39	6.9	175.19	36.61	64.14	16
Laguna 3 Hamacas I	14.20	0.9	14.06	63.64	8.95	2
Laguna 3 Hamacas II	33.82	4.3	145.43	41.57	60.45	15
Laguna 3 Hamacas III	27.37	2.3	62.95	40.82	25.70	6
Laguna Sayuba	20.61	12.06	248.56	36.90	91.72	22
Río Beni (Sector 5)	3.88	41.9	162.57	27.04	43.96	11
TOTAL			1 992.63			151

Table 5. The population size and age structure of Spectacled Caimans at the community of Villa Fátima.

Water body	Density (per km of shore)	perimeter (km)	Estimated population size	Proportion of Class IV	Number of Class IV individuals	Harvest quota Class IV
Arroyo Tarene	39.78	25.0	994.50	5.0	49.73	12
Laguna Palizada	3.57	5.0	17.99	50.0	9.0	2
Lago Media Luna	20.47	7.3	149.64*	22.43	33.56	8
Lago Tarene	20.47	7.3	149.64*	22.43	33.56	8
Lago Nato	20.47	7.3	149.64*	22.43	33.56	8
Río Beni (Sector 4)	3.88	41.9	162.57	27.04	43.96	11
TOTAL			1 623.97			49

* These three lagoons are connected in the same system, so the results obtained from Lago Media Luna were extrapolated to Lago Tarene and Lago Nato.

Management plan.

The general objective of the Management Plan proposed for the “Sustainable use and management of the Caiman (*Caiman yacare*) in the Tacana Indigenous Land, Iturrealde Province, Department of La Paz”, is that the communities of the Tacana Indigenous Land will be able to realize a sustainable use of the Caiman (*Caiman yacare*) with larger environmental, economic, and community benefits (Aparicio 2003).

The specific objectives are:

- Commercialize Caimans through the management plan that guarantees their long term availability and productivity.
- Strengthen the capacity of administration of the communities involved in the management of Caimans.
- Improve the quality of life of the families through the increment of their economic revenues.
- Foment the understanding and appreciation for Caimans at the community level through the participation in the management and the education.

The Management Plan presents five programs and seven sub programs with activities that should be developed in two phases (Aparicio 2003). The first phase, during two months in the 2003, is the implementation of the administration and is restricted to develop the Management Program and especially the sub programs of harvest of Caimans and communal commercialization of the Caimans - distribution of benefits, and the control Program and communal protection, with the sub program of communal control of the process of the harvest. The second phase will have a two-year-duration (2004 - 2005), when all the programs and sub programs proposed in the Management Plan will be carried out (Aparicio 2003). All these programs are shortly described below:

1. Management program.

This program implies that the species will be subjected to the decisions and manipulations of the managers. To achieve this, it is important to combine investigation and harvest.

1.1. Sub Program of Population Evaluation of the “Caiman”.

For the implementation of the program during the pilot phase, between October and November, 2003, the information about population abundance (Prefecture of La Paz 2002, Ríos 2003) was used. However, for the next administrations new population evaluations should be carried out in the five communities involved in the Program to establish the annual harvest quota. For the development of this Sub Program, technical personnel trained in each community will be required to carry out the evaluations and to guarantee the good field data.

The evaluations should be carried out according to the established schedule. Starting from the 2004 administration, it is expected to extend the harvest area with the objective of increasing the annual quota for each community. The objectives of this Sub Program are:

- Evaluate the abundance and the age structure of the populations of Caimans annually in the harvest areas of each community.
- Establish whether the population of Caimans of each community should or not be subject to harvest for the year of the evaluation.
- Assign the harvest quota of Caimans for each community under management.
- Increase every year the number of water bodies subject to the evaluation of Caimans populations to determine their harvest potentiality.

1.2. Sub Program of Harvest of “Caimans”.

The harvest of wildlife is established in the Strategy of Sustainable Development of the Tacana Indigenous Land, respecting its zoning and based on the agreement with the five communities (Carmen de Emero, San Antonio de Tequeje, Esperanza de Enapurera, Villa Fátima, and Cachichira), which have expressed their interest of harvesting Caimans legally at the meetings organized in these communities in August, 2003.

An appropriate use of Caimans will provide multiple benefits to the local residents; however, it is necessary to implement this Sub Program in agreement with the effective normative to guarantee the sustainability of this benefit and to maintain the viable population of the species in the area. The distribution of the harvest quota inside the community will be established in a community meeting organized by its authorities. The objectives of this Sub Program are:

- Achieve a sustainable harvest of Caimans.
- Achieve an efficient administration of the harvest process by the communities.

1.3. Sub Program of Commercialization of the Caiman at a Community level and distribution of benefits.

One of the biggest problems that the native populations and rural communities face on commercializing their wildlife is their poverty, which could cause the overexploitation of wildlife to get immediate economic benefits. To avoid the overexploitation, it is necessary that the local population decides to be a part of the management programs and that they know that the benefits will not come immediate. It is essential that the local inhabitants will be the main beneficiaries of the economic values generated by the management of wildlife, because this can motivate them to use this resource in a sustainable way, guaranteeing their conservation. The process of commercialization should be transparent and the community itself should be inspector of the commercialization. This will guarantee the fair and equal distribution of the benefits and will guarantee the continuity of the program. The objectives of this Sub Program are:

- Increase the family income in the communities with committing the conservation of the resource.
- The communities that harvest Caimans should conduct a fair and equal distribution of the benefits.
- The communities involved in the program should conduct a good administration of commercialization of Caimans.
- Assure the best channels and commercialization mechanisms.

2. Program of control and communal protection.

Bolivian rules establishes the general and indefinite prohibition for the pursuit, capture, storing, and treatment of wildlife. However, in spite of this national normative and others of Departmental and communal character, illegal hunting have been observed frequently. This makes it necessary to implement this program to preserve the legal sustainable use of the Caiman that Tacana Indigenous Land wishes to carry out.

2.1. Sub Program of Communal Control of the Harvest Process.

The wildlife management doesn't guarantee its availability in the long term, given the prevailing economic and social conditions in Bolivia. It is indispensable to combine the actions directly related to the species management and actions that permit to control the appropriate execution of the harvest. The control conducted by the same harvesters will assure the correct application of the norms, procedures, and regulations of the management plan, including the restriction of the harvest in unauthorized water bodies, the illegal sale of leathers, and others.

The control mechanisms should be concerted in a communal regulation, so that these mechanisms have the acceptance of the harvesters and the harvesters themselves demand complement of these mechanisms. The objectives of this Sub Program are:

- Guarantee the complement of the established dispositions in the Management Plan.
- Achieve a transparent harvest and legal commercialization of the Caimans in the Tacana Indigenous Land.

2.2. Sub Program of Minimum Protection.

The prohibition of harvesting Caimans outside of the Tacana Indigenous Land is necessary to guarantee the sustainable harvest and conservation of the species. The objective of this sub program is to avoid the illegal harvest by people outside of the program. This kind of illegal harvest can cause incorrect estimates of the harvest quota established for each community and can reduce the production of Caimans for the communities harvesters.

It is important to coordinate with the authorities: National Police and Ecological Battalion of the Armed Forces. These institutions have the legal right to conduct inspections, seizures, and other actions in the rural and urban areas close to the areas of Community Management. It is also fundamental to coordinate control efforts with the Prefecture of La Paz, which is the entity responsible for the harvest process at the Department level and responsible for making harvesters comply the effective normative on this topic. The objectives of this Sub Program are:

- Control the effect of the human activity on the habitats and the populations of Caimans in the community.
- Control the illegal harvest of Caimans outside of the Tacana Indigenous Land.

3. Program of scientific investigation.

The biological information of the species in the country is almost nonexistent. This makes it indispensable to implement the present program and to obtain the necessary technical and scientific data that allow us to make the management program works. The objectives of this Sub Program are:

- Increase the knowledge about the biology and ecology of the Spectacled Caiman in Bolivia.
- Obtain the technical and scientific bases that allow to conduct the sustainable harvest of the Caiman in the Tacana Indigenous Land.

4. Monitoring program.

This program will allow to record the population dynamics of the Spectacled Caiman subject to management through a database that contains the information provided by the investigation, and the respective technical reports of the different programs and sub programs of the Management Plan.

The communal authorities and the leaders of the CIPTA should have the information of the monitoring to make decisions to increase or decrease the harvest of the Caiman or to correct the errors that would be causing the reduction of their harvest quota. The objectives of this Sub Program are:

- Register and evaluate the changes in the Caiman populations subject to Management.
- Have technical and scientific information necessary to take the most effective measures for the conservation and the management of the species.
- Improve the process of commercial harvest. This allows to take better measures to improve the economic benefit for the communities.

5. Program of training, environmental education, and diffusion.

The future of the species under management depends on the attitude that the society and people have on the process of sustainable use. Without the participation and the support of the local communities, any conservation project will be failed or their implementation will be very complicated. For this reason the programs of training, environmental education, and diffusion are essential to achieve this support.

5.1. Sub training Program

To avoid the errors made by the people related to the harvest of Caimans in other Departments of Bolivia, we will transmit the necessary information to the Tacana Indigenous Land, so that the communities can strengthen their organization and administration, distribute the economic income obtained by this program to the communal and supra-communal instances in a transparent system, and carry out a sustainable management of Caimans with the largest environmental, economic, and community benefit. The training of the harvesters of Caimans in the communities of the Beni River, concerning the laws and norms that regulate the process of sustainable use, should be a constant work in the Tacana Indigenous Land. The Sub training

Program should allow that the theoretical base is reinforced by the practical and objective application, increasing the knowledge of the local agents on the different processes of the management plan, to achieve the necessary support for its execution. The objectives of this Sub Program are:

- Train the communities (those participating in the pilot project) about administrative, organizational, commercial, and legal aspects to guarantee the sustainability of the management and harvest of Caimans in the Tacana Indigenous Land.
- Train the harvesters of Caimans in techniques of evaluation and monitoring of Caiman populations.

5.2. Sub Program of Education and Environmental Diffusion.

The Non-Formal Environmental Education should direct their teaching programs to the inhabitants of the towns of San Buenaventura, Rurrenabaque, Ixiamas and the communities of the Tacana Indigenous Land.

The diffusion of the results and activities of this Management Plan will be directed not only to the communities that harvest Caimans but also at other Indigenous Lands and the Department of La Paz. This will constitute a fundamental step for the consolidation of the Pilot Project of harvest and sustainable Management of the Caiman.

The educational authorities of the communities will promote meetings among the technicians of the management program and the local professors and students, to show the ecological importance of the Caimans, their biological characteristics, and other aspects that can improve the opinion of the students concerning the Caiman. The objectives of this Sub Program are:

- Make the local residents obtain knowledge to be involved direct or indirectly with the Management Plan of the Caiman.
- Change of the local population's attitude, not only with the species subject to harvest, but also with the wildlife in general, through the understanding of the importance of the conservation and the sustainable development.
- Transmit the results of the activities developed inside the management of this species to the local communities direct and indirectly involved in the program.

Conclusions

The improvement of the organizational structures of the communities that harvest Caimans will allow to improve the social control on the resource management and to assure a more transparency in the processes, giving the necessary sustainability to the process of harvest of the Caiman.

The social control exercised by the communities can, without a doubt, strengthen the control of the program, in charge of authorities, as much National as Departmental. Likewise, an appropriate coordination with national police and armed forces will allow to reduce the impact of the furtive hunters.

In the measure that the responsibility of the administration (from the registration of the animals to the commercialization of the product) will fall in the same communities that harvest Caimans, it is possible to achieve a fairer and more equal distribution of the benefits of the program.

Through the diffusion and training programs (permanent along the administration), it is possible to strengthen the information that should reach to the producers, concerning their rights and obligations on managing a resource.

The establishment of a sufficiently sensitive monitoring program, with participation of local people and the support of the scientific entities, will offer reliable information about the population status of the species and the population dynamic, which allow to take appropriate management decisions.

Nevertheless the elements considered in this proposal, it is necessary to have the political support of the responsible authorities to be able to carry out this model of management that can enrich and improve a National Program of Conservation and Harvest of the Spectacled Caiman in Bolivia.

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