

ECONOMIC AND MARKET VIABILITY OF SCIENTIFIC ECOTOURISM RELATED TO THE JAGUAR IN A VÁRZEA AREA IN CENTRAL AMAZONIA

VIABILIDADE ECONÔMICA E DE MERCADO DO ECOTURISMO CIENTÍFICO COM ONÇA-PINTADA (*Panthera onca*) EM UMA ÁREA DE VÁRZEA DA AMAZÔNIA CENTRAL

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KEY WORDS:

Ecotourism;
Jaguar;
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ABSTRACT

Ecotourism can be an efficient strategy to generate income for local communities and conservation. Scientific tourism is defined under the same premises as ecotourism, but its objectives are focused on research. In this study, the creation of a package tour for scientific ecotourism related to the jaguar in the Mamirauá Sustainable Development Reserve (MSDR) was proposed. The objectives were to analyze the economic and market viability for this package through a cash flow analysis for 18 different scenarios. Questionnaires were sent to two groups titled technical-scientific and ecotourism. Nine scenarios had the same daily rate for the 10 year period, and the other nine had daily rates increase annually in accordance with the mean IPCA for the previous three years. For each scenario, the Net Present Value (NPV) was calculated. Ninety-two questionnaires were returned: 47 from the technical-scientific group, and 45 from the ecotourism group. Scientific ecotourism related to the jaguar activities should be related to scientific research, contemplation, and culture, and not just focused on the species. Ecotourists also value low-impact activities, information, and benefits to the communities and to research. For the economically viable scenarios, sharing of profits with the communities and with research was proposed.

PALAVRAS - CHAVE:

Ecoturismo;
Onça-pintada;
Viabilidade econômica;
Viabilidade de mercado.

RESUMO

O Ecoturismo pode ser uma estratégia eficiente na geração de renda para comunidades locais e para a conservação. Turismo científico é definido sob as mesmas premissas do ecoturismo, porém com objetivos voltados à pesquisa. Neste estudo foi proposta a criação de um pacote de ecoturismo científico com onça-pintada na Reserva de Desenvolvimento Sustentável Mamirauá - RDSM. Os objetivos foram analisar as viabilidades econômica e de mercado desse pacote através de análise de fluxo de caixa para 18 cenários distintos. Foram enviados questionários para dois grupos, denominados técnico-científico e de ecoturismo. Nove cenários foram mantidos com a mesma diária durante o intervalo de 10 anos e os outros nove tiveram as diárias aumentadas anualmente seguindo o IPCA médio dos últimos três anos. Para cada cenário foi calculado o Valor Presente Líquido (VPL). Foram recebidos 92 questionários, 47 do grupo técnico-científico e 45 do grupo de ecoturismo. As atividades do ecoturismo científico com onça-pintada devem estar ligadas a pesquisa científica, a contemplação e a cultura e não focadas apenas na espécie. O ecoturista também valoriza atividades pouco impactantes, informação e benéficas às comunidades e à pesquisa. Para os cenários viáveis economicamente foi proposta a partilha dos excedentes entre as comunidades e a pesquisa.

INTRODUCTION

Tourism is one of the largest and fastest growing economic activities in the world, accounting for more than 9% of gross world product (WTTC, 2011). Brazil, despite being a country with many tourist attractions, still receives a small number of foreign tourists, a total of just over five million tourists per year; of this number, approximately 13% who come to Brazil are motivated by nature (MTUR, 2010). The Amazon biome still attracts few tourists (COELHO; OZÓRIO, 2010). Between 2003 and 2011, the state of Amazonas received a total of 1,418,752 foreign tourists and 1,847,134 Brazilian tourists (AMAZONASTUR, 2011).

Ecotourism can be defined as tourism focused on natural areas, generating benefits for the environment and the local residents, and which stimulates better knowledge of the culture and the environment where it occurs (HONEY; ROME, 2001). It is a form of nature tourism in which trips are intended to appreciate nature in little-changed landscapes, adding important functions such as education and income generation as well as an important role in conservation and involvement of local populations (WEILER; DAVIS, 1993; CEBALLOS-LASCURAIN, 1996; EMBRATUR, 1994; PIRES, 1998; BLAMEY, 2001; WOOD, 2002). Ecotourism has been growing up to three times more than all other types of tourism combined (TIES, 2006). However, these numbers could be overestimated, since various segments of tourism often fall into the category of "ecotourism" but do not always fulfill all the premises for real ecotourism (JANÉR, 2012).

Ecotourism has been efficient an strategy for conserving biodiversity and generating income in local human communities in various regions of the world. In *Serengeti National Park* in Tanzania,

tourism centered around observing fauna, especially observing large felines, generates an income of around US\$ 5.5 million per year for the park (TAPPER, 2006). In *Kruger National Park* in South Africa, tourism in areas where cheetah (*Acinonyx jubatus*) and African wild dogs (*Lycaon pictus*) occurs has significantly diminished hunting pressure on these animals (WATERMEYER et. al., 2011). In Húsavík, Iceland, tourism related to whale watching has helped to reduce pressure on fishing resources, as well as to diversify and increase local income (O'CONNOR et. al., 2009). In Costa Rica, environmental education activities associated with ecotourism have contributed to making the population conscious of the importance of biodiversity and conservation to the country's environment (EAGLES et. al., 2002). And in Brazilian Amazonia, ecotourism conducted in the Mamirauá Sustainable Development Reserve (MSDR) through the Uakari Lodge, a venture of the Mamirauá Institute for Sustainable Development contributes towards the conservation of the region, mainly because it is a low-income economic alternative and contributes to monitoring of the area and generating income for local communities (PERALTA, 2002). To establish this activity, the Special Ecotourism Management Zone [Zona de Manejo Especial de Ecoturismo] was established to provide complete protection to the biodiversity there (IDSM, 2010).

Another form of tourism established within the criteria of ecotourism but with objectives focused on research is scientific tourism, which is considered to be an activity that contributes to environmental preservation (MIECZKOWSKI, 1995; DRUMM; MOORE, 2002; BOURLON; MAO, 2011). The tourist who engages in scientific tourism is willing to learn about the process of scientific research (BOURLON; MAO, 2011).

Ecotourism activities related to the jaguar in Brazil are common in the Pantanal. Although this biome is currently the principal destination for the observation of this feline, the initiatives which take place there are private, and apparently do not generate considerable benefits to conservation to the local residents; in fact, they generate misgivings with relation to the impacts caused to that species (OEKO, 2008).

The proposal for scientific ecotourism related to the jaguar in the MSDR involves the observation of individuals equipped with a radio collar, which makes it easier to find the animal using telemetry (SCHALLER; CRAWSHAW, 1980).

The proposal differs from other existing plans because it is a strategy for generating income for scientific research and for the communities, aiming to increase conservation efforts for the jaguar by both increasing research as well as by raising awareness in the population. The scientific ecotourism related to the jaguar proposed here is the first and only program in Brazilian Amazonia. Besides this predator, the visitor can also observe its prey and other species, since one of the strong points of ecotourism in the MSDR is the observation of fauna (PERALTA, 2002).

Calculations of economic viability seek to analyze the costs and benefits of an activity, using the net present value (NPV) as an indicator (SEROA DA MOTTA, 1997). Market viability is an instrument for learning what the client's profile and preferences are (SALVATI, 2003).

The objective of this study was to determine the economic and market viability for scientific ecotourism related to the jaguar in a Sustainable Development Reserve (SDR) in Amazonia.

MATERIALS AND METHODS

Study Area

The Mamirauá Sustainable Development Reserve (MSDR; 2° 51' S, 64° 55' W) is a state conservation unit totaling 1,124,000 hectares, and is the largest area of protected *várzea* in the world (QUEIROZ, 2005). The reserve is located in the Middle Solimões region and is bordered by the Solimões, Japurá, and Auati-Paraná Rivers (Figure 1). Along with the Amanã Sustainable Development Reserve and Jaú National Park, it makes up one of the largest continuous areas of protected tropical forest in the world (QUEIROZ, 2005). The MSDR is located in the Central Amazon Corridor; it is a UNESCO World Heritage Site (PERALTA et al., 2010), part of the Amazon Biosphere Reserve, and is recognized by the Ramsar Convention (PERALTA, 2002).

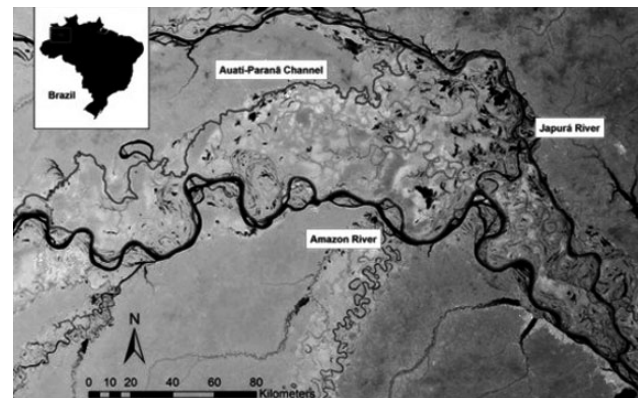


Figure 1 - The figure at the top left represents the location of the MSDR in Brazil. The large map represents the limits of the MSDR.

Data Collection

Semi-structured questionnaires were used to determine the viability of the market. The questionnaires were sent via internet to researchers acting in the areas working conservation and ecology, managers of national conservation

units, NGOs, veterinarians working with wildlife, ecotourists, nature photographers, tourismologists, tour guides, internet ecotourism groups, and tour operators (Table 1). The tour operators selected

were those working in the ecotourism market, mainly in Latin America; some were already known to the authors, and others were found through internet searches.

Table 1 - Number of questionnaires sent by category

Group								
Technical-scientific	Managers				Researchers		Veterinarians	
	State	Federal	Municipality	NGOs	Brazilian	F o - reign	Brazilian	
	4	49	1	6	52	26	12	
Ecotourism	Operators		Ecotourists					
	Brazilian	Foreign	Brazilian	Foreign	Photographers	Guides	Tourismologist	I n t e r n e t Group
	11	36	6	42	9	3	5	2

Two forms of the questionnaire were sent, one in English and the other in Portuguese. The questionnaire contained 14 questions, but the last two were restricted to tour operators.

In question 11 of the questionnaire, and in comparisons with other ecotourism initiatives for jaguar watching, the US Dollar to Brazilian Real exchange rate utilized was 2:1.

The questions were comparatively analyzed between the technical-scientific group and the ecotourism group. Questions 7, 8, 9, and 10 were demonstrated using a bar graph and their relative percentage values. The value of each item was divided by the total sum of the values, by question.

To assess the venture's economic viability, the first 10 years of the activity were analyzed considering 18 different scenarios; variables for these scenarios were number of tourists per year (30, 60, 90), fixed starting daily rates (per night, including the activities and three meals) (R\$ 500.00, 600.00, 700.00) or variable rates (progressive annual

increases of the daily rate (DIAZ et al., 2008) according to the mean value of the Extended National Consumer Price Index (IPCA) – for the last three years). All the scenarios began with 30 tourists. In the other two scenarios, there was an annual increase of 15 tourists until a total number of 60 and 90 tourists was reached.

Analysis of cash flow, spending, and income (JANÉR, 2003) includes earnings, investments, yearly depreciation costs, and fixed and variable costs. For each transaction, the net present value (NPV) was calculated, which matched costs and future income using a discount rate (ALENCAR et. al., 2005). The discount rate used was 6%, which is the equivalent of the yearly yield on a savings account (VALOR, 2013). Negative figures for the NPV indicate that the activity is not viable (SOUSA JUNIOR et. al., 2006).

For all scenarios, income, variable and fixed costs, depreciation of assets and investments and NPV were calculated. Depreciation is the devaluation of a certain asset over time (JANÉR, 2003);

investments are expenses spent on applying capital to infrastructure and machinery (SEROA DA MOTTA, 1997); fixed costs are expenses that do not change according to production, and variable production costs are altered (SEROA DA MOTTA, 1997). Daily wages for the local guides who accompany the tourist groups were considered to be components of variable costs, as were the fuel needed for activities within the MSDR, the taxi transfer between the airport and the Port of Tefé and the transfer for the return trip, taxes applicable to income (Tax on Services, or ISS, and Contribution to Finance Social Security, or COFINS), and bank fees related to the total earnings, a 15% discount for the tour operator, and the “lodge cost” (a value which refers to the other services offered by the Uakari Lodge). Daily wages for the researchers who accompany the clients were not included, as these are paid by the Mamirauá Sustainable Development Institute (MSDI; Figure 2).

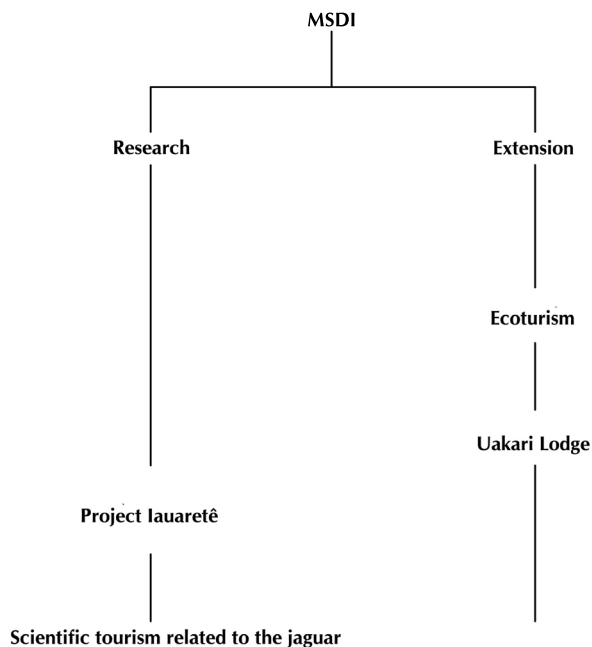


Figure 2 - Institutional organization of scientific ecotourism related to the jaguar

The components of the fixed costs were the salaries and associated tributes (which were considered only after the fifth year of activity, since for the first four years the project will be managed by an MSDI scholarship student), publicity materials (ex. banners, pamphlets, creation and maintenance of a website), travel to ecotourism events, and boat maintenance. The projections of fixed and variable costs were based on the initial values of each component added to the mean IPCA for the last three years.

The investments for this project are the purchase of an aluminum boat and a motor. The boat is an 7-meter Igaráçu model, with cushioned seats for six passengers and the captain, and does not have a roof. The boat will be equipped with a headlight, horn, navigation lights, a mast, a three-fuse panel and an installed steering kit (steering cable, steering box, bezel, and steering wheel). The motor is a 30Hp outboard motor. The investments were made in the third year of activities. The boat will be used for activities in the Mamirauá SDR. The transfer from Tefé-the Uakari Lodge-Tefé will be made together with the one for the Uakari Lodge’s normal tourists.

For each investment item, a depreciation rate of 10% for boats and 20% for motors was calculated (OZÓRIO; JANÉR, 2012).

The final total of the cash flow calculation was equally divided between the communities involved in ecotourism and scientific research related to the jaguar (30% for each), and the remaining 40% was maintained as cash on hand and was deposited in a bank account.

RESULTS

A total of 92 questionnaires was received: 47 from the technical-scientific group, and 45 from the ecotourism group (Table 2).

Table 2 - Number of questionnaires received by category

Group							
Technical-scientific	Managers				Researchers		Veterinarians
	State	Federal	Municipality	NGOs	Brazilians	Foreigners	Brazilians
	2	14	0	2	19	4	6
Ecotourism	Operators		Ecotourists				
	Brazilians	Foreigners	Brazilians	Foreigners	Photographers	Guides	Tourismologists
	7	5	4	20	7	1	1

Scientific ecotourism activities related to the jaguar, which respected to the residents, to the species, and to the environment, was classified as excellent/good for all interviewees, except for one person in the ecotourism group who did not express an opinion.

Both the technical-scientific group (20%) and the ecotourism group (19%) attributed more importance to offering quality information to the visitor, and less importance to comfort (Figure 3).

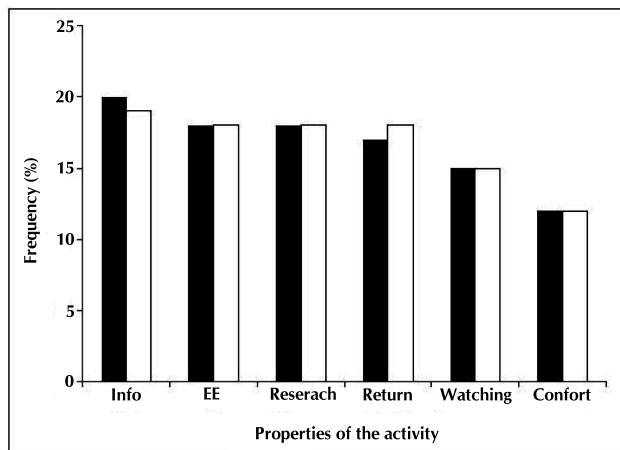


Figure 3 - Characteristics that jaguar-related scientific tourism can offer. Quality information (info), support for environmental education (EE), support for scientific research (research), financial return to residents (return), jaguar watching (watching), and comfort. The bars represent the technical-scientific group (black) and the ecotourism group (white).

For negative aspects, the technical-scientific group attributed greater values to habituating jaguars to the presence of humans (23%), while 23% of the ecotourism group named moving the jaguar away from its typical range as the main impact (Figure 4A).

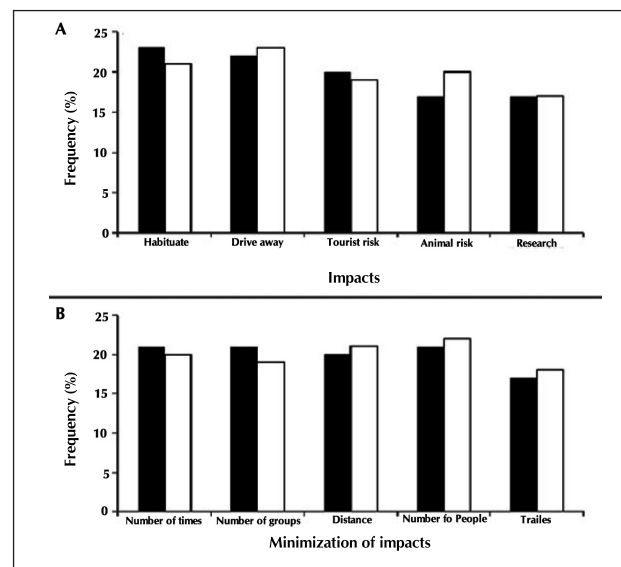


Figure 4 - (A) Negative impacts that this activity can cause. Cause the jaguar to become accustomed to human presence (habituate), move the jaguar out of its typical range (move away), risk to tourists (tourist risk), risk to the animal (animal risk) and impede the collection of research data (research); (B) Measures to mitigate negative impacts of activity. Limit the number of times the jaguar is observed (number of times), establish a maximum number of tourist groups per year (number of groups), limit the distance at which the jaguar is observed (distance), establish a maximum number of people per group (number of people), and use of a variety of trails for observation instead of just one (trails). Higher values indicate more effective measures. The bars represent the technical-scientific group (black) and the ecotourism group (white).

To mitigate the impacts, the technical-scientific group responded that the best methods are to limit the number of times the jaguar is observed, limit the number of groups for visitation, and limit the number of people per group (21% for each), while for 22% of the ecotourism group, limiting the number of people per group was most important (Figure 4B).

Telemetry tracking was the preferred activity for the technical-scientific group (21%). Looking for signs of the jaguar was preferred by the ecotourism group (19%) (Figure 5). Activities related to capture were preferred by 56% of the technical-scientific group and by 51% of the ecotourism group.

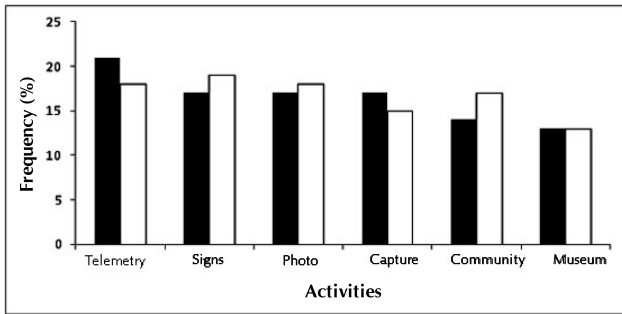


Figure 5 - Proposed activities: telemetry tracking (telemetry), searching for signs of the presence of jaguars (signs), constructing and monitoring camera - traps (photo), constructing and monitoring traps to capture jaguars (capture), visit the community to hear reports of jaguars (community), and visit the museum dedicated to the jaguar and its prey (museum). Higher values indicate greater interest in the activity. The bars represent the technical-scientific group (black) and the ecotourism group (white).

The greatest barriers to participating in the activity were lack of time, costs of both the package itself as well as the airfares, and distance. Other barriers reported more than once were tourist safety and the possibility of not sighting the jaguar.

Market research showed that the majority (51% of the technical-scientific group, and 44% of the ecotourism group) would pay a daily rate of between R\$ 350.00 and R\$ 500.00, but 23% of

the ecotourism group believed it would be fair to pay between R\$ 550.00 and R\$ 700.00.

Only ten tourism operators responded about the number of clients they could arrange for this initiative. Only one of these operators would not lodge their guests at the Uakari Lodge, since they have their own lodging structure on a boat. Adding the numbers related by the other operators, the quantity of tourists varied between 41 and 174 per year.

Of the 18 scenarios analyzed, ten presented negative NPVs (Table 3). Only the scenarios with 60 and 90 tourists and rates of R\$ 600.00 and R\$ 700.00, which increased annually, showed a positive cash flow for the entire interval sampled.

Table 3. NPV results for each scenario. Negative values indicate that the NPV is not viable, and positive values indicate a viable NPV. The first three values for the daily rate are fixed, and the other three consider the initial value and the final value, after 10 years with IPCA increase.

Daily rate (R\$)	Nº of clients		
	30	60	90
500.00	-	-	-
600.00	-	-	+
700.00	-	+	+
500.00-810.00	-	-	-
600.00-971.00	-	+	+
700.00-1133.00	+	+	+

All scenarios showed a positive cash flow in the first two years. The investment that took place in the third year caused a drop in cash flow, but the greatest impact on income is caused by the insertion of salary and related tributes in the fifth year.

DISCUSSION

It was expected that the ecotourism group would have greater interest in capture-related activities than the technical-scientific group, but this did not occur. This result indicated that the target public is that ecotourist who is seeking greater contact with nature and another culture, and not only to learn scientific techniques (BAEZ; ACUÑA, 2003).

Activities such as visiting a community include knowing the local residents' way of life and the opportunity to hear stories about the jaguar. The search for signs of the presence of this species (such as scratch marks, feces, and footprints) also includes other animal species such as the jaguar's prey and one of the most charismatic species of the Mamirauá SDR, the white uakari (*Cacajao calvus calvus*).

The technical-scientific and ecotourism groups considered the proposal for ecotourism which includes generating income for research, residents, and environmental education to be good to excellent. In fact, ecotourists seek to bring value to those locations which cooperate with conservation and with residents (JANÉR; MOURÃO, 2003).

According to the technical-scientific and tourism groups, the main characteristics that scientific ecotourism related to the jaguar should offer were providing quality information to the target public as well as participating in research activities, environmental education, and financial return to local residents, corroborating the fact that the ecotourist desires an experience directly in nature, and expects to contemplate and learn (WEARING; NEIL, 2009).

The impacts considered to be most relevant were habituating the jaguar to the presence of humans and moving it from its typical range. Habituation

can elevate the risk of attacks on humans (MARCHINI, 2010) and may leave the jaguar more vulnerable to hunters (ROE et al., 1997), both within its typical range as well as outside of it. It is important to minimize impacts, since ecotourists value low-impact enterprises (JANÉR; MOURÃO, 2003). Tourism can also move the animal from its range. Such impacts have already been reported with the cervids *Rusa unicolor* and *Muntiacus spp.*, the Sumatran rhinoceros (*Dicerorhinus sumatrensis*), and birds during nesting season (ROE et al., 1997; HIGGINBOTTOM, 2004). However, in the Ecotourism Management Zone in the Mamirauá SRD, there is already control of how many tourists can use each trail at one time, as well as a rotation between trails which are visited (IDSM, 2010). The market research also should take into consideration the price of the activity and the amount the client is willing to pay (JANÉR; MOURÃO, 2003). Even considering daily rates which are less than those charged by other ventures in the area of jaguar watching tourism (Table 4), in this study, eight scenarios were considered to be economically viable; four of these had a positive cash flow for the entire 10-year interval.

Table 4 - Jaguar-watching tourism programs in Brazil. Fazenda San Francisco, Refúgio Ecológico Caiman, and Puma Lodge are lodges; Chapada Explorer and South Wild are tourism operators. The daily rates for each package vary according to the number of tourists per group.

Location	Package	Daily rates (R\$)
Chapada Explorer	4 days and 3 nights	475.00 – 1575.00
	5 days and 4 nights	590.00 – 1579.60
Earthwatch	12 days	382.50
Fazenda San Francisco	4 days and 3 nights	442.50 – 875.00
	5 days and 4 nights	446.00 – 900.00
Refúgio Ecológico Caiman	3 nights	1838.00
	4 nights	1838.00
Puma Lodge	3 days	633.30
South Wild	7 days and 6 nights	988.60 – 1842.90

The daily rates proposed for scientific ecotourism related to the jaguar were, on average, less than the other initiatives because it is for a new product and need to established in a new market. The operator South Wild guarantees jaguar sightings during its packages (Charles Munn, personal communication), and in recent studies, researchers in the MSDR are also obtaining 100% rates of sightings of the species with the assistance of telemetry.

Only 21.3% of the tour operators that were consulted in this survey divulged the number of tourists that they are capable of attracting for jaguar-related scientific tourism, but even with such a small group of operators it was possible to note that there is a large market interested in this activity, surpassing the maximum proposed number of 90 tourists.

The four scenarios that had positive cash flows throughout the entire time period allowed for income to be shared with the communities and used for jaguar conservation and environmental education projects, contributing to making residents into direct actors in the preservation of this predator. Ecotourists want to visit destinations where the local residents benefit financially (OZÓRIO; JANÉR, 2012).

The cash flows can be smaller if a discount rate which is greater than the savings rate is used, around 10% to 15%, keeping in mind that this proposal involves a certain degree of risk (Ariane Janér, personal communication).

Scientific exploration, education and cultural travel, ecotourism with a scientific dimension, scientific research, educational travel, and learning travel are the five segments of scientific tourism which fit into the proposal for jaguar-related scientific tourism (BOURLON; MAO, 2011).

Few locations offer ecotourism activities related to scientific research. In the Galapagos, Ecuador, tourists can observe and assist researchers, and in the region of Aysén, Chilean Patagonia, ecotourists can help researchers to collect cultural, historical, and zoological data (WALLACE, 2001; BOURLON; MAO, 2011). The big difference with scientific ecotourism related to the jaguar in the Mamirauá SDR is the possibility for the visitor to learn how jaguar research is conducted, and to participate in a conservation project in a conservation unit, different from other similar projects in the Pantanal region, where the ventures are private and there is practically no scientific component. The visitor will directly participate in the research (BOURLON; MAO, 2011) and will also help to fund the research, as part of the profits generated from ecotourism will also go towards scientific purposes.

The proposed division of the profit was 60% equally divided between the communities and the scientific research, and the remaining 40% would go into a bank account as a way of guaranteeing resources for the future and for unforeseen situations. This differs from the way in which the Uakari Lodge has, in some years, distributed profit to the communities at rates above that which was recommended, resulting in infrastructure problems and consequent lower satisfaction on the part of visitors (OZÓRIO; JANÉR, 2012).

Some projects show a positive NPV but a decreasing cash flow that dips below zero at some point during the 10-year interval. In these situations, it is necessary to consider if the profit will be shared in years where the cash flow is positive or if the profit should be invested to compensate for future losses.

CONCLUSION

Market research showed that the scientific ecotourism related to the jaguar package is viable and accepted by the groups involved with conservation and ecotourism. The results of the activity preferences suggest that the target public does not have specific preferences, and consequently preparation of the package should take into account both activities involving jaguar capture as well as those activities which do not involve jaguar capture. The differentiating factors for scientific ecotourism related to the jaguar in the MSDR, in comparison with other similar ventures in Brazil, are the research and community components, and generation of income for both; this should be a fundamental factor in publicity.

Cash flow analysis indicated the scenarios which are advantageous, as well as the minimum expenses and income which are necessary for the activity to be lucrative. Of course, as the package comes to be more independent of the Uakari Lodge and the MSDI, the costs will increase. Nevertheless, the route which will most likely be followed is total connection between scientific ecotourism related to the jaguar and the logistics and function of the Uakari Lodge.

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