# Stakeholders' Perceptions of a Wading Bird Colony as a Community Resource in the Brazilian Pantanal

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**Abstract:** *In the Brazilian Pantanal, large breeding colonies of ciconiiform wading birds (200–10,000 pairs) have recently become important as tourist attractions, although there is good evidence of detrimental effects of tourism on breeding behavior and success. We sought to understand the possible amelioration of the effects of tourists on colonies by identifying human users of the colony and their control over changes in the way colonies are used. We conducted a stakeholder analysis, consisting of interviews with local interest groups made up of tourist guides, boat drivers, hotel owners and landowners, local fishermen, and tourists. The analysis revealed a series of human activities that potentially perturb nesting birds, including tourism, the collection of eggs and chicks for human consumption, camping, and sport and bait fishing close to colonies. There was a strong conservation ethic among stakeholders and an awareness of the consequences of human disturbance. In addition, tourism provided an economic incentive for conservation, which potentially outweighed the importance of consumptive uses of the colony. Results of questionnaires given to tourists offered insights into alternative management ideas for improving satisfaction with visits to the colony. Future development of tourism in Pantanal nesting colonies appears to be a realistic objective from the human community perspective but will require a strong, well-enforced management plan and continued education of locals, tourists, and the tourist industry.*

Percepciones de Interesados de una Colonia de Aves Vadeadoras como Recurso Comunitario en El Pantanal Brasileño

**Resumen:** *En El Pantanal brasileño, las grandes colonias de aves vadeadoras ciconiformes (200–10,000 pares) recientemente han cobrado importancia como atracciones turísticas, aunque existe evidencia de los efectos negativos del turismo sobre su conducta y éxito reproductivo. Buscamos entender la posible mejoría en los efectos de turistas sobre las colonias mediante la identificación de usuarios humanos de la colonia y su control sobre los cambios en cuanto a la forma en que se utilizan las colonias. Llevamos a cabo un análisis de los interesados, que consiste en entrevistas con grupos locales de interés (guías de turistas, operadores de lanchas, propietarios de hoteles y terrenos, pescadores locales y turistas). El análisis reveló una serie de actividades humanas que pudieran perturbar las aves anidantes, incluyendo el turismo, la recolección de huevos y pollos para el consumo humano, el camping y la pesca deportiva cerca de las colonias. Se observó una fuerte ética de conservación entre los interesados y una apreciación de las consecuencias de la perturbación humana. Además, el turismo proporcionó un incentivo económico para la conservación, que potencialmente rebasó la importancia de los usos de consumo de la colonia. Los resultados de los cuestionarios entregados a turistas proporcionaron ideas de alternativas de manejo para que los turistas queden más satisfechos con su visita a la colonia. El futuro desarrollo del turismo en las colonias de aves anidantes en El Pantanal parece ser una meta realista desde la perspectiva de la comunidad humana pero requerirá un plan de manejo sólido, bien administrado y la educación contínua de los habitantes locales, turistas y la industria turística.*

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## Introduction

The rapid growth of nature-based tourism over the last few decades has resulted in an influx of visitors into natural areas worldwide. The pressure this places on these ecosystems and their wildlife is the subject of debate and concern (Boo 1990). One such system is the Brazilian Pantanal, where large colonies of nesting ciconiiform wading birds have become an important focus for the local nature-based tourism industry (Yamasita & Valle 1990; Bouton 1999).

The nesting season of wading birds in the Pantanal coincides with the height of the tourist season. In contrast to other wildlife viewing opportunities in the Pantanal, nesting colonies are a predictable and impressive attraction lasting 3–4 months, with adult birds present at the nest throughout most of the cycle. In addition, the colony provides prime habitat for a rich diversity of other species, including anacondas, caimans, and monkeys (Bouton 1999), all of which add to the tourist experience.

Wading birds are sensitive to human presence near the nest, and human disturbance has been documented to have detrimental effects on breeding success and nesting behavior (Ellison & Cleary 1978; Tremblay & Ellison 1979; Burger 1981). However, over 95% of the Pantanal wetland is private property (Por 1995), where cattle ranchers, fishers, fishing and tour guides, and other local inhabitants use the wetland's resources to make a living. In addition to tourism, the wading bird colony may be used for hunting, fishing, and shelter and forage for cattle. These multiple uses and their effects create the potential for conflict between the needs of humans and those of the wildlife. For a management plan to be successful in this system, it must not only benefit and protect wildlife but must also be realistic and equitable for local human communities.

In most systems the management of natural resources depends strongly on human behavior and economic interests, and stakeholder analysis is fast becoming a popular tool for addressing the role of local communities in conservation (Grimble & Chan 1995; Grimble & Wellard 1997; Kontogianni et al. 2001; Zorn et al. 2001). A stakeholder is an individual or group that has the power to affect, or is in a position to be affected by, management decisions regarding a specific resource (Grimble & Chan 1995; Varvasovszky & Brugha 2000). The analysis is used to inform the design and implementation of management so as to facilitate the inclusion and cooperation of stakeholders (Brugha & Varvasovszky 2000). Categorizing stakeholders by their level of interest and power to influence helps determine their relevance to a management policy or plan. Analysis of their level of understanding about the issue and what they stand to gain or lose upon implementation of the project also helps identify and focus educational efforts. Overall, stakeholder analysis facilitates implementation of resource-related projects in a culturally informed context, and increases the potential for equitable and efficient conservation and management of the resource. We report here on the results of an analysis of the perceptions of major stakeholders in a wading bird colony, Porto da Fazenda, in the Brazilian Pantanal.

During 1997 and 1998, we also worked in the Porto da Fazenda colony to document the potential effects of human activities on behavior and nesting success. We found that pedestrian viewing of the birds could be managed in a sustainable way, but that viewing from boats caused significant nest desertion and breeding failure (Bouton 1999). In conjunction with a local environmental organization, Associação Ecológica Melgassense (AMEC), we used our findings to help initiate a management plan for the colony.

The objective of our use of the stakeholder analysis was to understand the ways in which the local human community uses or relies on the wading bird colony as a resource, and the relative importance of these uses to the community's subsistence. In conjunction with data from our study of the birds' nesting behavior, we believed that a stakeholder analysis would allow us to predict and—we hoped—avoid possible conflicts between the needs of the stakeholders using the colony and the conservation objectives of our management efforts. We used our knowledge of these dynamics to focus our efforts on who to include in and educate about the need for management of the colony. We also measured tourist satisfaction with visits to the colony in order to understand the value of the colony as a tourism resource and to discover ways to improve the quality of the colony visit for tourists.

## Methods

All stakeholders used the Porto da Fazenda nesting colony (lat. 16°28.21′S, long. 056°07.567′W), which in both 1997 and 1998 was composed of 600–700 nesting pairs of Wood Storks (*Mycteria americana*), Roseate Spoonbills (*Ajaia ajaja*), and Great Egrets (*Ardea albus*, in 1997 only) (for detailed colony description, see Bouton 1999). For the last 10 years this colony has been subject to increasing numbers of unmanaged, uncontrolled tourist visits, which included walking and boat tours within a few meters of nesting birds. Interviews with local stakeholders were conducted in Barão de Melgaço, a small fishing town in the northeast of the Brazilian Pantanal, or at the colony. The Porto da Fazenda colony is a 2-hour boat ride from Barão de Melgaço and is one of the primary foci of the nature-based tourism that originates from the town.

We identified stakeholders and gathered information on stakeholder attitudes by two methods. First, between July and October of 1997 we conducted semi-structured interviews (Bernard 1994) with all known types of users

of the colony, including licensed guides, hotel owners and managers, and boat drivers. Each respondent was asked to identify all other important stakeholder groups who used the colony or influenced decisions about it (Bernard 1994; Varvasovszky & Brugha 2000). Of the user groups identified, only bait fishers were not interviewed directly because the activity is illegal and is therefore a sensitive issue. Instead, boat drivers who, in the course of an interview, indicated that they did fish for bait were asked additional questions. Second, tourists were not interviewed but were given self-administered questionnaires to complete and return on-site.

The relatively local scale of our analysis meant that the most appropriate approach was to attempt to interview all individuals in each stakeholder group. Limited time and resources made this impossible. Therefore, rather than using a randomized sample, we attempted to maximize sample sizes and minimize individual bias by interviewing all members of every stakeholder group who were available to be interviewed. We interviewed owners or managers of 8 of the 10 hotels in the region, 7 of the 15 guides known to visit Porto da Fazenda, approximately 50% of boat drivers ($n = 24$) operating out of Barão de Melgaço, the only nongovernmental organization involved in conservation and management of tourism at the colony, and approximately 75% of the tourists visiting the colony during July and August 1998. Two teams of biologists visited the Porto da Fazenda colony during 1997 and 1998, and we had extensive discussions with the principal investigators of both groups. Sport fishers are poorly represented in this analysis because they probably numbered in the hundreds and we interviewed only four. The total number of bait fishers using the Porto da Fazenda colony was hard to estimate, but 50–60 people in Barão de Melgaço sold bait fish regularly. Together, these interviews allowed us to consider the motivations and opinions of stakeholders who use the colony directly and of those who exert some control over the activities of other stakeholders at the colony.

Nontourist stakeholders were interviewed by one of us (S.N.B.) with the help of a key informant who was a respected and trusted member of the local community. The informant set up interviews with stakeholders, introduced the interviewer, and reassured interviewees that responses would be kept anonymous. Interviews consisted of a checklist of open-ended questions. We asked respondents to quantify their own participation in tourism at the Porto da Fazenda colony (how many visits per week, average group size, nationality of tourists), whether they allow tourists to walk within the colony, and how they thought walking in the colony affected the birds. We then discussed their perception of disturbance of the birds by using the example of a colony that had been abandoned recently, possibly because of tourism. Finally, respondents were asked how wading bird populations have changed in the area (increased or decreased), who was controlling activities in the colonies, how much control respondents themselves felt they had over what happened at the colony, and who they felt should take responsibility for protection of the colonies.

Tourists were typically transported from hotels to the colony by boat drivers and guides and allowed to view the birds by boat or on a walking trail. Boat drivers, guides, and local hotel managers were informed of AMEC's new on-site management position and were encouraged to bring groups to a house near the colony before visits for a short educational presentation about the colony and our research. During July and August of 1998 (peak tourist season) we asked all tourists who came to the house to complete a questionnaire at the end of their visit to the colony.

Through these written questionnaires, tourists were asked questions similar to those asked of other stakeholders about their opinions of conservation and management of the colony, plus additional questions aimed at determining their satisfaction with the various types of viewing experiences (e.g., boat-viewing, walking tours, and viewing from a distance). We were interested in how tourists first learned about the colony, whether they contracted a guide or came with a boat driver, whether other tour groups at the colony affected their experience, and their understanding of the impact of their visit. We also collected information on the education, socioeconomic background, and nationality of the respondents (see Bouton [1999] for complete copies of questionnaire). The majority of questions were formatted to allow tourists to circle one of several responses. Satisfaction was measured on a five-point Likert scale ranging from "very impressive" to "completely disappointing." We assessed attitudes toward conservation and management of the site by asking for opinions of statements such as "the Brazilian government should regulate tourist activities near colonies of nesting birds," with six possible responses ranging from "strongly agree" to "strongly disagree" and including "don't know." Several questions were asked in more than one way to confirm that respondents understood the question. The format of this questionnaire was based on suggestions of Bernard (1994). The questionnaires were available in Portuguese, English, French, and German, and only people over 18 years of age participated.

## Results

### Study Participants

We initially identified tourists, boat drivers, guides, hotel owners, and landowners as the principal stakeholders involved in the nature-based tourism that utilized the wading bird colony at Porto da Fazenda. During inter-

views, we also identified several other groups that used the colony or had some potential for important effects on the colony. We identified and interviewed 10 stakeholder groups. Stakeholders were grouped into one of three broader categories: (1) local, on-site, (2) local, off-site, and (3) regional, national, and international. Local, on-site stakeholders included boat drivers ($n = 24$), bait fishers ($n = 4$), local inhabitants ($n = 9$), and a nongovernmental organization ($n = 1$). Local, off-site stakeholders included professional guides ($n = 7$), hotel owners ($n = 8$), and landowners ($n = 2$). Regional, national, and international stakeholders included tourists ($n = 195$), sport fishers ($n = 4$), and researchers ($n = 2$). Each group's motivation for using the colony differed somewhat. Local, on-site stakeholders considered the colony of value as a food source and for the purposes of economic gain, access to the resource, tourism development, and conservation. Local, off-site stakeholders considered the colony of value for the purposes of economic gain, access to the resource, tourism development, and conservation. Regional, national, and international stakeholders considered the colony of value for the purposes of conservation, tourism development, and interactions with wildlife. Complete descriptions of the 10 stakeholder categories are available in Bouton (1999).

### Characteristics of Tourists and Their Visits

A total of 195 tourist questionnaires were completed and returned. Of those, only the 181 that were completed according to instructions were used in the analysis. Tourist questionnaires allowed us to collect formerly scarce information on the nationality and socioeconomic and educational backgrounds of visitors to the Pantanal (Bouton 1999; LaCapra et al. 2000). The questionnaires revealed that 57.1% of visitors were Brazilians, 75% were from upper socioeconomic levels (annual income of >U.S.$45,000), and 76% had undergraduate or graduate degrees ($n = 164$). Therefore, they represented relatively uniform socioeconomic and educational backgrounds.

The colony was most heavily visited on weekends, and more people viewed the colony in July (53.6%) than in August (46.4%). Visits by Brazilians were frequent throughout July and August (52% and 48% of Brazilian visitors, respectively), whereas foreigners were more likely to visit in August than in July (63.6% and 36.4%, respectively). Of all tourists interviewed, 78.7% were visiting the Pantanal for the first time and 82.3% had never seen a wading bird colony before.

Only 3.2% of tourists used the walking trail alone, 37.8% saw the colony by boat only, and 59.0% used both methods. When tourists arrived with licensed guides, 39.0% used the walking trail, either solely or in combination with the boat ride, whereas 90.6% of tourists arriving with only a boat driver used the trail.

Foreign tourists were much more likely to contract licensed guides than were Brazilian tourists (arriving with guides: Brazilians, 21.7%; foreigners, 87.7%; $\chi^2 = 58.562$, $p < 0.001$). Responses given during interviews suggest that this was related mainly to the language skills of the professional guides (Bouton 1999).

### Decision-Making in the Use and Management of the Colony

To illustrate our summary of the decision-making hierarchy at Porto da Fazenda, Fig. 1 shows tourism stakeholders' own perceptions of control over the decision-making process. We determined perceptions directly by asking interviewees who made the decisions regarding the colony, whether they were abided by, and how much control respondents themselves believed they had over what happened at the colony. Stakeholders were then placed in one of three groups, high, medium, and low control. Groups controlling only their own behavior in the colony were given the lowest ranking. These included tourists and boat drivers. The latter were included because they rarely exerted control over tourists, even when guides were absent.

Nongovernmental organizations (NGOs), researchers, and licensed guides all expressed a sense of being able to influence regulations and activities in the colonies and were put in the middle control bracket. Hotel owners and landowners were assigned the greatest relative perceived control because they could restrict access and influence the activities of other stakeholders. Other stakeholders also acknowledged the authority of these groups to control activities at the colonies.

### Responsibility for Conservation of the Colony

All stakeholders were asked to give a list of groups they thought should take responsibility for protection of the colony. Responses often included several stakeholder groups (Table 1). Among the stakeholders, 57% of boat drivers indicated that direct-user groups, including themselves, should be responsible either alone or in combination with hotel managers and landowners (40% of boat drivers) or the government (40% of boat drivers). Professional guides did not indicate that direct users other than themselves should be responsible at all. Instead, 14% indicated that hotel managers should be responsible and 100% were in favor of government control. Of hotel owners and landowners, 38% said direct users should be responsible, 50% said hotel managers and owners, and 75% said government. When asked who was active in trying to protect the colony, 50% (9/18) of boat drivers mentioned hotel owners and landowners and 39% (7/18) mentioned AMEC. All of the above stakeholder groups, although in favor of the involvement of NGOs, did not believe that NGOs had any obli-

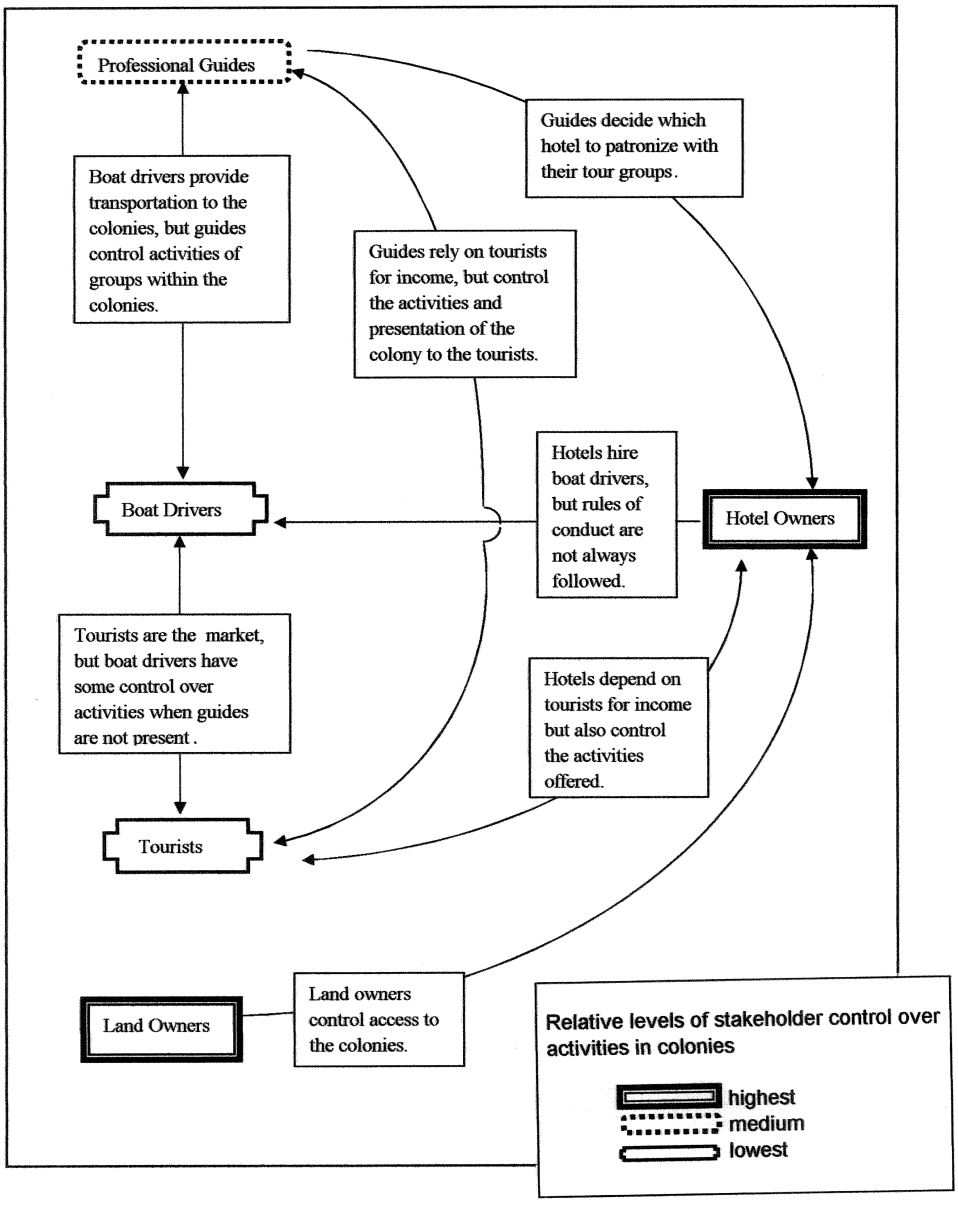


*Figure 1. A conceptual model of the interactions between tourism stakeholders of the Porto da Fazenda wading bird colony in Barão de Melgaço, Brazil. Boxes indicate the nature of the interaction, and arrows show the direction of the interaction.*

gation to participate in management of tourism at the colony.

Tourists were asked to select from a list of stakeholders all those who should be responsible for protecting colonies of nesting birds. Of those that responded ($n$ = 177, 98%), 27% indicated that all stakeholders should be involved, 72% thought that NGOs should be involved either alone or in combination with other stakeholders, and 49% of tourists did not place themselves among the responsible stakeholders (responses are not mutually exclusive). Brazilians were significantly less likely to indicate themselves to be responsible than were foreigners ($\chi^2 = 6.801$, $p = 0.009$, $n = 176$). When asked if the government should be involved, 83.8% of all tourist respondents said yes, and there was no significant difference between Brazilians and other nationalities in response to this question.

### Perceptions of Colony Disturbance

In response to the statement that "tourism is detrimentally impacting wading bird colonies," 63% of boat drivers ($n$ = 24) agreed, whereas 71% of professional guides ($n$ = 7) said that the statement was too general and that

**Table 1. Responses to the question, Who should take responsibility for conservation of the colony?[a]**

| | | *Those who should take responsibility* | | | | | |
|---|---|---|---|---|---|---|---|
| *Respondents* | n | *boat drivers* | *professional guides* | *hotel and landowners* | *nongovernmental organizations* | *tourists* | *government* |
| Tourists | 177 | | 27[b] | | 72 | 51 | 83 |
| Boat drivers | 15 | 60 | 20 | 40 | 0 | 0 | 40 |
| Professional guides | 7 | 0 | 100 | 14 | 0 | 0 | 100 |
| Hotel owners | 8 | 38[c] | | 50 | 0 | 25 | 75 |

[a] *Numbers represent a percentage of the total number of respondents for each group. Respondents often indicated more than one group.*
[b] *Twenty-seven percent of tourists said that boat drivers, professional guides, and hotel and landowners should take responsibility.*
[c] *Thirty-eight percent of hotel owners said that both boat drivers and professional guides should take responsibility.*

the question needed to define what kind of tourism was being considered. None of the professional guides interviewed said that they allowed their tourist groups to walk within the colonies, whereas 75% of boat drivers said they conducted walking tours. Because they walked in the colonies, boat drivers were more likely to see the tangible effects of disturbance and therefore might be more likely to agree that tourism has a detrimental impact. Of the hotel owners and landowners ($n$ = 10), 33% agreed with the statement and 56% said that it depended on the type of tourism.

When tourists were asked the same question, only 14.7% said they believed that their presence in the colony disturbed the birds, and 1.7% said they did not know if they disturbed the birds or not. Almost half the tourists who said the birds were disturbed suggested that the problem was the noise made by the boat motors. About 15% of tourists complained about the noise of the boat motors, saying it was detrimental to the enjoyment of their visit. Several boat drivers and tour guides did not use the motors on their boats while viewing the birds, preferring to pass the birds by floating downstream.

When asked to identify activities other than tourism that they thought were detrimental to birds nesting in the colonies, stakeholders mentioned eight potential disturbances (Table 2). Discussions with hotel owners and boat drivers revealed that wading birds and their eggs are eaten locally (mentioned by one hotel owner and two boat drivers). Wood Stork chicks reach the size of a large chicken by 3 weeks of age and represent an easily harvested food resource. In addition, two hotel owners mentioned incidents in which fishermen had cut up chicks to use as bait, and one occasion on which local teenagers had vandalized the colony. Although these activities could be extremely destructive to the colony, the fact that only a few interviewees knew about them and that they happened 3–4 years ago suggests that such acts are rare.

Although professional and subsistence fishers were almost never seen near Porto da Fazenda during our study, sport fishermen were frequent visitors to the colony for the purpose of fishing and, in a few cases, tourism. All four sport fishers interviewed expressed the idea that their fishing experience was enriched by proximity to naturally diverse areas like the nesting colony. However, three of them challenged AMEC's request not to disturb the birds and stated that, without the express exclusion of boats from the colony by the forestry police, they would continue to fish directly under nests. With the growth of sport fishing since the 1980s, an additional category has developed based on the marketing of small bait fish (Programa Nacional do Meio Ambiente 1997).

Perceptions of bait fishing's potential importance to the dynamics of wading bird colonies fit into two categories. First, the human presence related to bait fishing and associated camping activities often occurs in close proximity to the colonies, and many respondents believed that this had been the demise of one colony that had been permanently abandoned by the birds. Second, people believed that bait fishers were competing with

**Table 2. Responses of stakeholders at a wading bird colony in the Brazilian Pantanal to the question, What activities other than tourism are detrimental to the birds in the colony?***

| | | *Detrimental activities* | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Respondents* | n | *bait fishing* | *sport fishing* | *fireworks* | *human presence* | *smoke from burning* | *hunting* | *camping* | *airplane over-flights* |
| Boat drivers | 24 | 6 | 1 | 5 | 9 | 1 | 2 | 1 | 0 |
| Professional guides | 7 | 6 | 5 | 2 | 1 | 0 | 0 | 1 | 1 |
| Hotel owners | 8 | 7 | 0 | 2 | 2 | 0 | 1 | 2 | 0 |

* *Numbers indicate numbers of individual respondents.*

Wood Storks for preferred prey items because there is a strong overlap in the size of fishes preferred by both. Forty-nine percent of local stakeholders (19/39) mentioned bait fishing as seriously detrimental to the colony.

Twelve stakeholders pointed out that mere human presence in the colony could harm the birds (Table 2). They explained that people walking under nests caused adults to fly and chicks and eggs to fall onto the ground. Ten of these stakeholders also mentioned that avian predators such as caracaras (*Caracara plancus*) were then able to take advantage of this kind of disturbance to destroy nests left unguarded by adult Wood Storks.

### Tourist Satisfaction with the Visit

Tourists were asked to rank their satisfaction with various aspects of their visit on a scale of 1, very impressive, to 5, completely disappointing. The majority of those who viewed the colony both by boat and by walking rated the two experiences as equally satisfactory (60%). However, 38.3% rated the boat tour from 1 to 4 points higher than the walking the trail (average of 1.6). About 20% of those who rated boat viewing higher complained that they were not able to get close enough to the birds using the walking trail. Two walking groups were given binoculars for viewing the birds, and all of these tourists ($n = 10$) commented in the questionnaires that this significantly enhanced their experience. Overall, the visit to the colony was a popular event. When asked about the most exciting thing seen or done that day, 40.3% of tourists chose the colony as the highlight of their day. Other choices included the Pantanal in general, the boat ride through it (23.3%), or specific animals or birds (30.1%).

To get some idea of how many groups could visit the colony at one time before satisfaction began to drop, we asked tourists whether their visit had been affected by other tourists. Only 53.0% of tourists saw another tourist group, and only three tourists (1.6%) claimed that the presence of another group affected their visit, stating that the other group littered, appeared to be breaking the rules, or were "speaking loudly and scaring the birds and animals." The fact that so few tourists complained about other tour groups affecting their visit indicates that, at the current level of visitation, the social carrying capacity of the colony in terms of tourist satisfaction is above current visitation levels (Manning & Lime 1996; DeRuyck et al. 1997; Seidl & Tisdell 1999).

## Discussion

In general, most stakeholders understood that human activities had the potential to negatively affect the wading bird colony. They suggested without prompting that bait fishing disturbed birds and removed resources that birds relied on to raise young, that hunting and walking tours increased depredation of nestlings and eggs, and that disturbance could eventually lead to abandonment of the breeding site by all the birds. This awareness appeared to be, in part, a result of environmental education by AMEC in the Barão de Melgaço community because AMEC was often mentioned by interviewees. However, the local belief that a much larger local colony, *Arrombardo*, is now completely deserted because of intense bait fishing and tourism was also mentioned frequently.

The greatest potential for conflict among stakeholders exists between consumptive users (bait and sport fishers, and locals who hunt and gather eggs in the colony) and nonconsumptive users (those using the colony for nature-based tourism). The former group's activities directly, and potentially severely, disturb nesting birds. Consumptive users also differ from tourism stakeholders in that their activities do not necessitate the use of the Porto da Fazenda colony in particular, and in some cases do not require the proximity of a wading bird colony at all. For example, sport fishers need not fish directly under nesting birds, and bait can be found in large quantities at a safe distance from the colony (S.N.B., personal observation).

Sport fishers accounted for 20% of the boats seen in the colony during 1998 (Bouton 1999). The results of our study of the biological effects of human activities indicate that it is the presence of boats in close proximity to the birds that causes the most disturbance (Bouton 1999). We recommend, therefore, that sport fishers be restricted to the main river and prevented from fishing in the colony, directly under nesting birds.

The majority of sport fishers are Brazilians but not local to the Pantanal, making it unlikely that community pressure will effectively regulate their behavior. In addition, they were the stakeholders most likely to contest the right of AMEC to control activities in the colony. Given this situation, it appears that on-site government enforcement is necessary to ensure that regulations are respected. Stakeholders generally agreed that the state governmental agencies should take responsibility for conservation of the colony, so including agencies such as the forestry police in management should not alienate the local community. We therefore recommend that a concerted, collaborative, on-site effort between state governmental agencies and local NGOs be initiated.

Given the extreme disturbance that hunting necessarily causes nesting birds, and the small number of interviewees that mentioned Wood Storks as a source of protein for local human communities, it seems that hunting is clearly unsustainable and of relatively little value to locals. In addition, although the impact of bait fishing on the prey base cannot be accurately assessed without further research, the local belief that the size of bait fish greatly overlaps with the size of fish preferred by the birds is supported by the literature (Kahl 1964; Ogden

et al. 1976, 1978). We therefore recommend that exploring the effects of bait fishing on wading bird colonies should be a priority for future research, as the activity is potentially very destructive. For the present, it can be assumed that conservation of the colony necessitates preventing these activities in the immediate vicinity of the site. We recommend a combination of traditional enforcement and local community action.

Our study demonstrates that the potential for community enforcement exists both because of the attitudes of local people and because of the system of benefits. In particular, both bait fishers and local people stand to benefit from conservation of the colony because many of them are involved in the tourism industry as boat drivers. In interviews, boat drivers showed overwhelming support of AMEC's attempts to manage the colony and a good understanding of the potential results of disturbing the birds. With regard to nature-based tourism, the benefits and costs were clearly recognized by all participants, and conservation of the colony emerged as a priority. Tourism is also potentially detrimental to the nesting success of the birds, however, and conservation of the colony necessitates a clear, well-enforced management plan (Bouton 1999).

Our analysis of local decision-making regarding the colony suggests that control of tourism can take several forms. For example, wading bird colonies are typically on private farms, and several hotel owners told us that they ask the landowner's permission to visit Porto da Fazenda every year. Because landowners typically grant access without restriction, they could potentially have a strong influence over hotel owners that they have not been exerting. An initiative by landowners to protect the colonies by denying access to hotels whose guides and boat drivers behave inappropriately would probably have a stronger impact than largely unenforceable government regulations. Cooperation could be rewarded through government incentives for landowners to protect areas of biological importance such as wading bird colonies.

Community support and peer pressure can also play a critical role in regulating tourist activities in the colony. The behavior of boat drivers, guides, and their tour groups directly determines the success of conservation and management efforts at the colony (Bouton 1999). The decisions of one individual can affect the quality of the resource for the entire community, creating a strong incentive for individuals to regulate one another's activities. For example, one boat driver reported fishermen who set off fireworks at the colony to the local forestry police (1998). Because they are often the first to interact with tourists and provide the mode of access to the colony, boat drivers potentially play a crucial role in conservation and should be a focus of education about how particular activities can affect the birds. However, they were also in the lowest ranks of the decision-making hierarchy and rarely exerted control over activities in the colony. Empowering them by providing a clear set of regulations and backing up their efforts with support from AMEC and forestry police could increase social pressure against and peer regulation of detrimental activities.

In the case we describe, the benefits of conservation and the costs of degradation are principally born by the same stakeholders. In addition, those that would necessarily be excluded from using the resource, such as sport fishers, would not incur a high cost because they would not be prevented from fishing altogether, only from fishing in a relatively small area of the Pantanal. This makes conservation of the colony with local support a realistic objective. Given the benefits of conserving the colony, the question is how to balance tourist satisfaction at lowest possible cost to the birds.

## Sustainable Management of the Colony for Tourist Satisfaction

The greatest challenge in management of tourism at the colony lies in satisfying tourists while not approaching the birds too closely. Although the majority of tourists (88.3%) were pleased with the viewing opportunities, some felt they had made a long and uncomfortable journey only to be kept at a distance from the birds. This perception would be exacerbated by prohibiting boat viewing, which will be necessary if conservation efforts are to be successful (Bouton 1999).

Due to the lack of an overt stress response exhibited by nesting birds when approached, the number of tourists who felt their visit disturbed the birds was low. However, our study of the effects of disturbance on the birds revealed that behavior does not indicate stress level (Bouton 1999). This implies that neither tourists, guides, nor researchers can intuit what is safe for the birds and that nature-based tourism must simply be kept at previously determined set-back distances from the colony.

When tourists did believe they had an effect, many referred to what they had been told during the orientation given by AMEC, indicating that they are open to education about impacts. Several studies suggest that tourists will respond most favorably if their initial expectations are realistic (see Hill et al. 1995). Satisfaction might therefore be enhanced by providing tourists with an explanation of the restrictions before their visit.

Although tourists expressed strong support for the initial management efforts of AMEC and concern about colony conservation, their responses to questions on the survey suggested that if boat viewing of

the colony were prohibited, alternative viewing options would be necessary to maintain tourist satisfaction. As a result of a positive reaction from tourists, the use of binoculars emerged as a possible alternative. Observation towers, additional walking trails, and spotting scopes would also allow tourists to see the birds more effectively and would probably add significantly to their experience. These viewing aids could be used to good effect at a distance that should not be detrimental to the birds.

Although the incentive system, local attitudes, and local control of access are all in place to control tourism in a sustainable manner, the most powerful incentive, tourist satisfaction, is in direct conflict with conservation and protection of the resource. Ensuring that tourists' expectations are realistic and using alternative viewing methods are both likely to help improve tourist satisfaction, but these ideas remain untested. This area should be a priority for future research if colony protection and sustained use by tourists are to be compatible.

Our analysis has two principal weaknesses. First, it inevitably carries the personal biases of the authors. The categorization of stakeholder groups, interpretation of responses to interviews, and interpretation of the decision-making hierarchy among stakeholders represent our personal understanding of the situation at Porto da Fazenda. In addition, the situation can and will change over time. Nevertheless, the analysis is important in that it provides an understanding of local anthropogenic sources of colony disturbance and insight into which conservation initiatives are realistic and on which groups they should focus.

Several studies have demonstrated that tourism can benefit wildlife conservation efforts through public education and economic support (e.g., Johnson et al. 1996). Tourism at wading bird colonies in the northern Pantanal is still in the early stages of development. The results of our stakeholder analysis suggest that sustainable development of tourism in the bird colonies is realistic. However, a strong management plan and continued environmental education and outreach are essential if the industry is to grow in such a way as to benefit local people and attract tourists without jeopardizing the breeding success of the birds.

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