

SHORT NOTE

ARE OTTERS AN EFFECTIVE FLAGSHIP FOR THE CONSERVATION OF RIPARIAN CORRIDORS IN AN AMAZON DEFORESTATION FRONTIER?

Darren NORRIS¹, Fernanda MICHALSKI^{2,3}

¹Av. Mariland 1367/1001, Porto Alegre, RS, 90440-191, Brazil. E-mail: dnorris75@gmail.com

²Department of Ecology, Bioscience Institute, University of São Paulo, Rua do Matão 321, travessa 14, São Paulo, SP, 05508-900, Brazil

³Instituto Pró-Carnívoros, C.P. 10, Atibaia, SP, 12940-970, Brazil



(received 6th June 2009, accepted 25th June 2009)

ABSTRACT: Using flagship species to generate support for conservation activities has been successfully applied in some regions. We investigated whether using otters as a flagship for the conservation of riparian corridors in an Amazonian deforestation frontier would be likely to result in similar success. Between December 2007 and May 2009, we conducted 64 interviews with local landowners in the region of Alta Floresta (MT, Brazil). These interviews revealed a neutral attitude towards otters, which indicates that direct persecution (e.g. retaliation against otter predation on fish) is unlikely in the region. However, it also suggested that using otters as a flagship to generate local support for regional conservation activities will not be effective. There was a sharp contrast with the replies to questions regarding riparian corridors, where interviews did reveal strong positive attitudes. These results suggested that to conserve Giant Otters in the Amazon “Arc of deforestation”, efforts should focus on the support of maintenance of riparian corridors connecting forest fragments by local people.

INTRODUCTION

Conserving wildlife species in fragmented landscapes is an immediate challenge facing conservation biologists and managers. One option proposed for mitigating the negative impacts of fragmentation on wildlife is the maintenance of connections (e.g. riparian corridors) between habitat patches. The maintenance of such features where land is privately owned is dependent on the goodwill and cooperation of local stakeholders. Flagship species have been used to encourage public participation in and support for conservation actions but the success of applying this concept has been shown to be species- and region- specific (Leader-Williams and Dublin, 2000).

The use of top vertebrate predators as flagship and/or umbrella species for biodiversity conservation has achieved mixed results, yet, if utilized appropriately, these concepts can directly and indirectly conserve biodiversity (Simberloff, 1998; Niemi and McDonald, 2004; Sergio et al., 2006; Sergio et al., 2008). As charismatic top predators, otters are recognized as both flagship and umbrella species in a variety of aquatic habitats, and have been used to raise financial support, environmental awareness and plan systems of protected areas - for example the Sea Otter (*Enhydra lutris*) and coastal habitats (Zacharias and Roff, 2001).

In South America, it has been proposed that Giant Otters (*Pteronura brasiliensis*) could be used as flagship species for the conservation and management of aquatic environments, specifically “focusing on advocacy with government authorities and

conservation organisations” (OSG, 2004). Such action may provide significant success for conservation of biodiversity, particularly in countries such as Brazil, where habitat conversion by humans is threatening a variety of aquatic systems (Agostinho et al., 2005).

Brazil governs approximately 40% of the 8,235,430km² Amazon Basin, which is recognised as one of the last strongholds for Giant Otters. However Brazil is also experiencing the world’s highest net loss of forest (FAO, 2005). During 2008 alone, it is estimated that 11,968 km² of Amazon forest were removed, with 80% (9,500 km² year⁻¹) occurring in the 3 states of Mato Grosso, Rondônia and Pará which constitute the “Arc of deforestation” (INPE, 2009). With habitat loss / alteration predicted to lead to a 50% reduction in wild populations of Giant Otters within 20 years, there is an urgent need to understand how to conserve this species in areas dominated by anthropogenic perturbations (Duplaix et al., 2008).

The persistence of otter populations has been shown to be strongly influenced by the ability of dispersing individuals to move across the landscape (Schenck et al., 2002), so maintaining features such as riparian corridors is likely to be important for these species in fragmented habitats. We investigated local attitudes towards riparian corridors and otters to determine if they can form an effective flagship for regional conservation activities in a highly fragmented region of the Brazilian Amazon.

This study was conducted in the region of Alta Floresta, a frontier town located in northern Mato Grosso, southern Brazilian Amazonia (09°53’S, 56°28’W). A Landsat time series shows that this once entirely forested region has been subjected to very high deforestation rates since the early 1980s: as of 2004, only 41.7% of the pre-frontier forest cover remained in the Alta Floresta region south of the Teles Pires river (Michalski et al., 2008). This resulted in a hyper-fragmented landscape containing forest patches of varying size, shape and degree of connectivity surrounded by a matrix of managed cattle pasture.

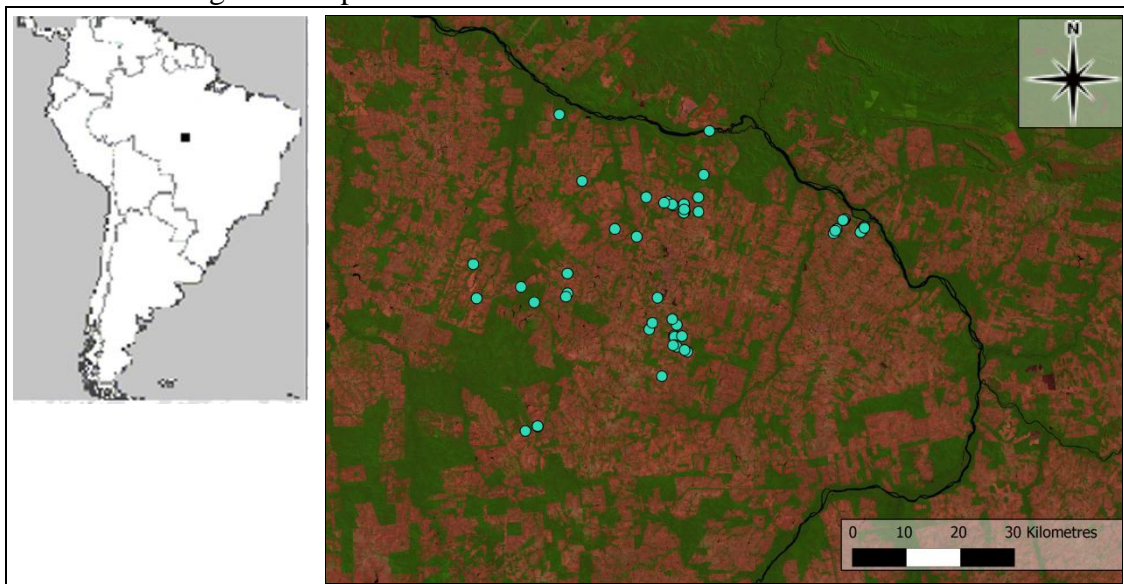


Figure 1. Survey summary. Location of the study region in Alta Floresta, northern Mato Grosso, Brazil. The location of 64 interviews (blue circles) conducted between December 2007 and May 2009 are shown. Green and pink areas on either bank of the Teles Pires river represent forest and non-forest cover, respectively.

Pre-elaborated interviews were carried out with either a worker (resident and living at the property for more than 1 year) or the landowner at 64 properties within a 50-kilometer radius of Alta Floresta town centre (Fig. 1). As we were interested in

obtaining a representative sample of landowner/worker “types” in the region, we conducted interviews across a range of property sizes from 5 to 12 100 ha (hectares). To understand attitudes towards riparian corridors we asked the interviewees their level of agreement (strongly agree, agree, neutral, disagree, strongly disagree, and don’t know) with the following statements: 1) Riparian corridors serve no function, 2) Riparian corridors should be removed, and 3) Riparian corridors are a beautiful feature in the property. In a subset of 21 interviews, we asked interviewees to 1) list the wild animals they liked and 2) list the animals they disliked and or that caused problems.

All analysis was performed in R (R Development Core Team, 2009). As predictors of interviewee responses, we used age (split into 4 classes following Groenendijk et al. (2005): 15–30, 31–45, 46–59 and ≥ 60 years) and whether the respondent was an owner (n=37) or worker (n=27). The influence of these predictors on the responses to riparian corridor questions was tested using proportional odds models (Agresti, 2002; Harrell, 2009).

None of the respondents mentioned otters as a liked or disliked animal, however questions relating to riparian corridors generated stronger opinions. Attitudes towards riparian corridors were generally positive, as only 6 (9%) of the 64 interviewees expressed a negative attitude (either agreed corridors serve no function (n=7), agreed that corridors should be removed (n = 1) or disagreed that corridors were a beautiful feature (n = 1). Interestingly, respondents always provided at least one positive reply regarding riparian corridors, so from our matrix of 192 replies (64 interviewees x 3 questions), only 8 (4%) were negative, and no respondent had a neutral attitude.

The level of agreement did not differ between the three questions on riparian corridors (proportional odds: $P=0.62$). Proportional odds models also revealed that age category ($P=0.33, 0.51, 0.19$) and ownership ($P=0.14, 0.14, 0.58$) did not influence responses to any of the three questions (serve no function, should be removed and beautiful feature, respectively).

From our 64 interviews, we discovered that local landowners have a neutral attitude towards otters, in that none of the respondents expressed a strong opinion towards the presence of otters on their property. This is to be expected, as landowners are unlikely to “like” the presence of otters as 1) they are rarely seen, and 2) provide little interest for owners / workers in an agricultural frontier. The positive aspect to this result is that direct persecution (e.g. retaliation against otter predation on fish) is unlikely in the region, as otters were never mentioned as disliked and/or problematic. However, it also suggests that using otters as a flagship for regional conservation activities will not be effective. There was an interesting contrast with the replies to questions regarding riparian corridors, where interviews did reveal strong attitudes.

Perhaps the most surprising result from our interviews was the number of individuals who agreed or strongly agreed that riparian corridors were a beautiful feature. Although the reasons may be different, this suggests the vast majority of both workers and owners place an intrinsic value on the corridors in their property. As such, conservation activities, which support and encourage these positive attitudes towards corridors, are likely to meet with success across our region.

We found that riparian corridors can be an effective flagship for the conservation of Giant otters and Neotropical otters across agricultural deforestation frontiers. Therefore, if: 1) the positive attitudes of local landowners towards riparian corridors are supported and encouraged, and 2) riparian corridors are actively maintained, we believe that, at least for Neotropical and Giant otters, there is a chance that agricultural expansion may not result in local extinction in our study area.

Acknowledgements - This research was supported by Fundação de Amparo à Pesquisa do Estado de São Paulo to FM (FAPESP: 2007/01252-2), the Wildlife Conservation Society, Conservation Food and Health Foundation, Cleveland Metroparks Zoo and The Cleveland Zoological Society and a Rufford Small Grant for Nature Conservation. We are deeply indebted to the landowners that contributed to this study and to Paula Prist for field assistance. We also thank two anonymous reviewers whose contributions significantly improved this manuscript.

REFERENCES

- Agostinho, A.A., Thomaz, S.M., Gomes, L.C. (2005).** Conservation of the Biodiversity of Brazil's Inland Waters. *Conserv. Biol.* **19**: 646-652.
- Agresti, A. (2002).** Categorical Data Analysis. John Wiley, New York.
- Duplaix, N., Waldemarin, H.F., Groenendijk, J., Munis, M., Valesco, M., Botello, J.C. (2008).** *Pteronura brasiliensis*. In: IUCN 2009. IUCN Red List of Threatened Species. Version 2009.1. URL: www.iucnredlist.org. Downloaded on 28 May 2009.
- FAO Food and Agriculture Organisation of the United Nations. (2005).** The global forest resources assessment 2005. URL: www.fao.org/forestry/site/fra2005. Downloaded on 12 February 2008.
- Groenendijk, J., Hajek, F., Duplaix, N., Reuther, C., van Damme, P., Schenck, C., Staib, E., Wallace, R., Waledmarin, H., Notin, R., Marmontel, M., Rosas, F., Ely de Mattos, G., Evangelista, E., Utreras, V., Lasso, G., Jacques, H., Matos, K., Roopsind, E., Botello, J.C. (2005).** Surveying and monitoring distribution and population trends of the giant otter (*Pteronura brasiliensis*) – Guidelines for a standardization of survey methods as recommended by the giant otter section of the IUCN/SSC Otter Specialist Group.
- Harrell, F.E. Jr. (2009).** Design: Design Package. R package version 2.2-0. URL: <http://CRAN.R-project.org/package=Design>.
- INPE National Institute for Space Research. (2009).** Deforestation estimates in the legal Brazilian Amazon, 2009. São Jose dos Campos, Brazil. URL: <http://www.obt.inpe.br/prodes/index.html>. Downloaded on 31 May 2009.
- Leader-Williams, N., Dublin, H.T. (2000).** Charismatic megafauna as 'flagship species'. In: **Entwistle, A. Dunstone, N. (Eds.)**. Priorities for the conservation of mammalian diversity. Has the panda had its day? Cambridge, Cambridge University Press, pp. 53-81.
- Michalski, F., Peres, C.A., Lake, I.R. (2008).** Deforestation dynamics in a fragmented region of southern Amazonia: evaluation and future scenarios. *Environ. Conserv.* **35**: 93-103.
- Niemi, G.J., McDonald, M.E. (2004).** Application of ecological indicators. *Annu. Rev. Ecol. Evol. Syst.* **35**: 89-111.
- OSG - IUCN Otter Specialist Group. (2004).** Recommendations and Results of the IXth International Otter Colloquium (IOC). Downloaded on 31 May 2009: URL: http://www.otterspecialistgroup.org/Library/Colloquium_XI_Recommendations.html.
- R Development Core Team. (2009).** R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0, URL: <http://www.R-project.org>.
- Schenck, C., Groenendijk, J., Hajek, F., Staib, E., Frank, K. (2002).** Linking Protected Area Conditions to Species Needs. In: **Bissonette, J.A., Storch, I. (Eds.)**. Landscape Ecology and Resource Management, Linking Theory with Practice. Island Press, pp. 341-357.
- Sergio, F., Newton, I., Marchesi, L., Pedrini, P. (2006).** Ecologically justified charisma: preservation of top predators delivers biodiversity conservation. *J. Appl. Ecol.* **43**: 1049-1055.
- Sergio, F., Caro, T., Brown, D., Clucas, B., Hunter, J., Ketchum, J., McHugh, K., Hiraldo, F. (2008).** Top Predators as Conservation Tools: Ecological Rationale, Assumptions, and Efficacy. *Annu. Rev. Ecol. Evol. Syst.* **39**: 1-19.
- Simberloff, D. (1998).** Flagships, umbrellas and keystones: is single-species management passe in the landscape era? *Biol. Conserv.* **83**: 247-257.
- Zacharias, M.A., Roff, J.C. (2001).** Use of focal species in marine conservation and management: a review and critique. *Aquatic Conserv: Mar. Freshw. Ecosyst.* **11**: 59-76.

RESUME

LES LOUTRES SONT-ELLES DE VERITABLES SYMBOLES DE LA CONSERVATION DES CORRIDORS AQUATIQUES EN LIMITE AMAZONIENNE DE DEFORESTATION?

L'utilisation d'espèces symboliques pour favoriser le soutien aux activités de conservation a déjà été appliquée avec succès dans d'autres régions. En limite amazonienne de déforestation nous avons testé la symbolique des loutres au profit de la conservation de ses corridors aquatiques avec des résultats qui sont de la même portée. Entre décembre 2007 et mai 2009 nous avons interviewé 64 propriétaires terriens dans la région d'Alta Floresta (MT, Brésil). Ces derniers se sont révélés plutôt neutres quant à la présence des loutres ce qui signifie que les persécutions directes en raison de la prédation sur le poisson, ne semble pas exister dans la région. Quoi qu'il en soit, cette réaction suggère aussi que l'utilisation de la Loutre pour générer un soutien local aux activités régionales de conservation ne sera pas efficace. Par contre, il existe un contraste marqué avec les questions concernant les corridors aquatiques pour lesquelles les réponses sont bien plus positives. Ces résultats montrent que pour conserver indirectement les loutres géantes dans «l'Arc de déforestation» amazonien, les efforts devront se focaliser sur le maintien des corridors aquatiques par les populations locales et la connexion des fragments forestiers.

RESUMEN

SON LAS NUTRIAS UNA ESPECIE BANDERA EFECTIVA PARA LA CONSERVACIÓN DE CORREDORES RIBEREÑOS EN LA FRONTERA DE LA DEFORESTACIÓN DEL AMAZONAS?

El uso de especies bandera para apoyar actividades de conservación ha sido implementado exitosamente en diversas regiones del mundo. Estudiamos si el uso de nutrias como especies bandera para la conservación de corredores ribereños en la frontera de la deforestación del Amazonas puede ser exitoso. Entre Diciembre 2007 y Mayo 2009 realizamos 64 entrevistas a propietarios de parcelas en la región de Alta Floresta (MT, Brasil). Estas entrevistas revelaron una actitud neutral hacia las nutrias, lo que indica que la persecución directa (e.g., agresiones hacia las nutrias por depredar peces) no es muy común en la región. Sin embargo, los resultados también sugieren que el uso de nutrias como especie bandera para generar apoyo local para actividades de conservación a nivel regional no sería efectiva. Documentamos un contraste marcado entre las respuestas relacionadas con corredores ribereños, en las que los entrevistados no revelaron actitudes positivas de manera consistente. Estos resultados sugieren que para conservar a las nutrias gigantes en el "Arco de la deforestación" del Amazonas, es necesario apoyar a los pobladores locales para que participen en el mantenimiento de los corredores ribereños que conectan fragmentos de bosque.