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Introduction to the Special Issue on giant river otter *Pteronura brasiliensis*

Miriam Marmontel[†,*], Fernando Trujillo[‡], Danielle Lima[†,§], Paul André Van Damme[ʻ] and Jessica Groenendijk[#]

[†]Instituto de Desenvolvimento Sustentável Mamirauá. Estrada do Bexiga 2584, Bairro Fonte Boa, 69553-225 Tefé AM, Brazil
[‡]Fundación Omacha, Calle 84-21-64, Bogotá, Colombia
[§]Instituto de Pesquisas Científicas e Tecnológicas do Amapá. Rodovia Juscelino Kubitschek km 10, Bairro Fazendinha, 68903-419 Macapá, AP, Brazil
[ʻ]FAUNAGUA, Arocagua Norte, Sacaba-Cochabamba, Bolivia
[#]San Diego Zoo Global - Institute for Conservation Research, Cusco, Peru
* Corresponding author, email: marmontel@mamiraua.org.br

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Introduction

The giant river otter (*Pteronura brasiliensis*) is a semi-aquatic member of the family Mustelidae, subfamily Lutrinae, that may attain 1.8-2.0m length, making it the largest among the 13 species of otters (hence the common name) and one of the largest South American carnivores. It preys mainly on fish (Duplaix, 1980; Rosas *et al.*, 1999), but its diet may also include invertebrates and other small vertebrates (Laidler, 1984; Carter and Rosas, 1997; Ribas *et al.*, 2012; Silva *et al.*, 2014).

Unlike most other otter species (Bekoff *et al.*, 1984; Kruuk, 2006), giant otters are gregarious, forming groups of up to 10, rarely up to 20 individuals, led by a reproductive alpha couple. During most of the time these groups are cohesive, traveling, grooming, hunting, feeding and sleeping together. Group life allows giant otter to monopolize good fishing territories, share territory patrolling, confound prey and therefore catch them more easily (Mason and Macdonald, 2008), deter or defend from predators such as caimans and jaguars, share the care of cubs and possibly facilitate learning (Gittleman, 1989). Giant otters are most active during the day, especially at dawn and dusk (Leuchtenberger *et al.* 2014), and extremely conspicuous. They are territorial, cleaning an area and marking a territory by deposition and mixing of spraints. Territory sizes may vary (Duplaix; 1980; Laidler and Laidler, 1983; Ribas Pereira, 2004; Utreras *et al.*, 2005; Groenendijk *et al.*, 2015*b*) and dens are not always occupied (Laidler and Laidler, 1983; Marmontel pers. obs.; Leuchtenberger *et al.*, 2013*a*) or some of them may be used simultaneously in the same day or week[1]. Giant otters are usually sympatric to Neotropical otters (*Lontra longicaudis*) throughout their area of occurrence, since there are favorable conditions for the two species co-inhabiting the same area (Groenendijk *et al.*, 2005; Silva *et al.*, 2014).

Due to their social nature, vocal communication is also very important in giant otters. Besides being quite noisy, when they are in groups they are inquisitive, raising and lowering the neck out and into the water, to identify those who enter the territory; in this behavior they may also approach boats, which tends to frighten people. When they are alone or in few numbers, they may remain quiet and alert avoiding human disturbance[1]. A fortuitous attack on a careless visitor by a giant otter group with cubs in captivity in a Brazilian zoo in 1977 imprinted the image in everyone´s minds (at least in Brazil) of a ferocious and aggressive species. However, there are no published reports of predatory attacks to humans in natural conditions. Territorial attacks are usually directed to conspecifics (Conover, 2002).

Historical perspective

Giant otters have been culled by fear, revenge, profit, fashion, medicinal interest or simply for being there. As other furred animals, they suffered decades of persecution for the pelt trade, even though they have the shortest fur among otters, and very little underfur (Yoxon and Yoxon, 2014). Despite the prohibition on killing, smuggling episodes have been documented in the late 1970s, in the 1990s and even in the 2000s (Laidler and Laidler, 1983; Allen, 2010)[2]. The present extent of poaching and illegal trade is unknown, but likely small throughout the distribution range.

[1]C. Rocha-Campos, pers. comm., 08 December 2015

[2]F. Rosas, pers. comm., 18 May 2005

Different from the Eurasian otter *Lutra lutra* (Allen, 2010), giant otters have never been hunted for sport. However, parts of their bodies have been used for alleged medicinal properties (Marmontel and Lima, pers. obs) and sporadically for consumption of their meat (Gomez, 2004; Lasmar *et al.*, 2013). Although hunting is nowadays prohibited in every country of the current distribution, local inhabitants may steal cubs from dens to raise them as pets (Lima and Marmontel, 2011).

The ever-present allegation that giant otters steal or frighten fish from fishermen´s nets is a continental-wide problem (Gomez and Jorgenson, 1999; Rosas-Ribeiro *et al.*, 2011; Lima *et al.*, 2014)[3]. Giant otters may be viewed as vermin in fishing areas, and have been blamed for the disappearance of some particular fish species in parts of Brazilian, Peruvian, Ecuadorian and Colombian Amazon, as well as in the Brazilian Cerrado[1] especially in relation to the Arowana fish (*Osteoglossum bicirrhosum*) (Recharte *et al.*, 2008). In addition to vulnerable to current conflicts with fishermen, giant otters also suffer the effects of habitat destruction and fragmentation, building of dams, poorly-planned tourism activities and environmental pollution, especially by oil exploitation and mining (Gutleb *et al.*, 1997; Groenendijk *et al*,. 2015*a*).

Giant otters were originally present throughout most of northern South America, but decades of hunting greatly reduced their distribution. Of the 12 countries of known historical occurrence, the species is considered extinct in Uruguay (but see Buschiazzo *et al.*, this issue), likely extinct in Argentina, critically endangered in Ecuador and Paraguay, threatened in Bolivia, Colombia, Peru and Venezuela, and vulnerable in Brazil. The Guianas (Guyana, French Guiana and Suriname) were considered strongholds for the species in the 1990s (Foster-Turley *et al.*, 1990). In these countries, the species is protected by legislation; however surveillance is lacking (Groenendijk *et al.*, 2015*a*). Numbers for this species as a whole are thought to range between 1000 and 5000 animals in the wild (Allen, 2010). Protected continent-wide, some populations are showing signs of slow recovery after the pelt trade era. Over the last few years, the reappearance of populations in Peru, Brazil (Amazonia, Cerrado and Pantanal), Colombia, Ecuador and Bolivia has been documented or observed (Recharte and Bodmer, 2009; Zambrana *et al.*, 2012; Lima *et al.*, 2013; Marmontel, pers. obs; Trujillo *et al.*, this issue)[1,4].

Research and Conservation

A seminal work on giant otters was published by Nicole Duplaix in 1980, and during approximately two decades it was the most important reference focusing on the species, summarizing several topics about ecology and habitat requirements, based on field trips in Suriname. In 1992 Jorge Schweizer published a popular book on giant otters reporting his observations and interpretations of behavior from a ranch in the Brazilian Pantanal. Intensive fieldwork continued that resulted in doctoral dissertations by Laidler (1984), Schenck (1999), Staib (2002, translated into a book in 2005) and Davenport (2008) in Guyana and Peru. Up until that point, however, most efforts with *Pteronura* were highly localized.

In June and November 2003 two workshops supported by Frankfurt Zoological Society in Peru and conducted by Jessica Groenendijk gathered 14 giant otter researchers and resulted in the publication of guidelines for standardization of survey methods (Groenendijk *et al.,* 2005). This stimulated the initiation or continuation of several projects with giant otter in South America. Research groups were created and strengthened; today there are consolidated groups working for several years in Brazil, Bolivia and Peru. The researchers also started meeting more frequently at events such as the International Otter Colloquium and other venues to discuss subjects relevant to otter species in South America, especially *Pteronura*, such as its status and distribution. In recent years we have seen great advances in conceptual topics and the use of innovative techniques that have improved our knowledge on giant otter ecology. The use of new technology has aided in breaking paradigms and unveiling aspects of biology that could not be accessed in the past.

In 2007 Carter and Rosas published a work based on scientific research and on a wide compilation about the biology, ecology, biogeography and conservation of giant otter, that became one of the most complete references on the species. In the same year the first scientific capture of giant otters was performed in Cantão State Park, state of Tocantins (Brazilian Cerrado) and then replicated in other areas of Amazonia and in the Brazilian Pantanal. With the intra-peritoneal implant of a VHF transmitter and its monitoring by radio-tracking, it was possible to monitor individuals and their movement patterns not only during the dry season but also during the flood period (Silveira *et al.*, 2011; Leuchtenberger *et al.*, 2013*a*; 2015). Monitoring of giant otters in the wild has benefitted from the use of camera traps (Utreras and Pinos, 2003), helping to document behavior and pack membership as well as to understand movement patterns, including nocturnal activities (Pickles *et al.*, 2011*b*, Leuchtenberger *et al.*, 2013*b*).

Molecular population studies using microsatellites in the Brazilian Pantanal demonstrated that not all animals in one group are related, which contradicts the current understanding of an exclusively parent-brood model (Ribas *et al.*, 2015) and corroborates Groenendijk *et al.*´s (2014) findings in Peru. The use of genetic markers also helped to define the existence of evolutionarily distinct units (Garcia *et al.*, 2007; Pickles *et al.*, 2011*a*; 2012). A new and unique evolutionarily significant unit was recently described for the

[3]Zucco, C.A. and Tomas, W. (2004) Diagnóstico do conflito entre os pescadores profissionais artesanais e as populações de jacarés (*Caiman yacare*) e ariranhas (*Pteronura brasiliensis*) no Pantanal. *In* IV Simpósio sobre Recursos Naturais e Sócio-econômicos do Pantanal. Corumbá, MS 23-26 Novembro 2004: 7 pp.

[4]Victor Utreras, pers. comm., 16 Deciembre 2015

Colombian Orinoco (Caballero *et al*., 2015) and the levels of genetic differentiation and diversity found in this region were an important contribution to reintroduction and captive breeding programs currently underway in Colombia. Long-term studies carried out in Manu National Park (Peru) have allowed the first analysis of demographic parameters of a giant otter population (Groenendijk *et al*., 2014; 2015*b*).

In an attempt to focus on the conservation of the giant otter, the government of Brazil developed a National Action Plan[5] exclusively for the species (which until 2001 was included in the Aquatic Mammals Action Plan) with the collaboration of several researchers. The group established objectives, goals and actions to minimize the conflicts between otters and humans, promote research to better understand their biology, ecology and conservation status, identify gaps in knowledge, as well as to recover populations and suggest public education and policy. A national action plan for giant otters has also been published in Ecuador (Utreras *et al*., 2013) and a Colombian national action plan is currently being prepared.

A *Pteronura* meeting in Santa Cruz, Bolivia

During the IX Congress of Wildlife Management, in May 2010, in the city of Santa Cruz de la Sierra, Bolivia, Paul Van Damme called a meeting with attending giant otter researchers, to discuss the progress of research and conservation of *Pteronura brasiliensis*. The meeting took place in the International Convention Center of Santa Cruz (FEXPOCRUZ) with the participation of 13 researchers from Bolivia, Brazil, Colombia and French Guiana. During the meeting it became clear that new research was being conducted with giant otters in different countries but that few of the results were being published in the scientific literature. Fernando Trujillo proposed then the idea of producing a special issue of the *Latin American Journal of Aquatic Mammals* on *Pteronura*, which would put out a request for contributions from the region. He explained that this journal was particularly focused on aquatic mammals and that in addition to regular issues it also produced special issues focused on particular species such as franciscana (*Pontoporia blainvillei*) and Guiana and tucuxi dolphins (genus *Sotalia*). The participants of the meeting welcomed the idea and a group of Guest Editors was proposed to consolidate this initiative. In this process, the Yaqu Pacha Foundation offered the financial support for the special issue; this issue is the result of that process.

Contents of the Special Issue

This special issue on *Pteronura* brings you one review, five articles and six notes. In their review, Duplaix *et al*. provide an update on the new information generated on the ecology and biology of giant otters in the past 35 years. Bozzetti *et al*. report on a long-term study of giant otters in a reservoir in Brazil, where they were able to follow reproductive events and provide information on reproductive period, litter size and size of newborns. The nutritional care of a very young cub with artificial formula is described in detail by Cabral *et al*. Distribution and abundance is a theme extensively dealt with in this special issue. Ayala *et al*. performed an assessment of giant otter status in northwestern Bolivia and argue that that region along with southeastern Peru represents a major stronghold for giant otters. The Brazilian Pantanal is also an important area for the species, as exemplified by Tomas *et al*. who found groups in most water bodies of the wetland and estimated a population of 3000-5000 animals. This estimate is as large as the existing estimate of range-wide numbers for the species as a whole (Allen, 2010), suggesting that a concerted effort is necessary to come up with more accurate estimates for the various populations. Evangelista and Tosi present the results of a survey in the previously unassessed Brazilian state of Rondônia, following the IUCN guidelines (Groenendijk *et al*., 2005), with positive results for all areas surveyed. The same methodology was applied to a survey within Cantão State Park in the northwestern Brazilian Cerrado (an ecotone region between Amazon and Cerrado biomes), where Georgiadis *et al*. identified 41 individuals in 16 lakes, which represents only a small proportion of the protected area. In another protected area, in the western Brazilian Amazon, Marmontel *et al*. documented the reappearance of giant otters in an area where they had been considered locally extinct due to hunting in the past. Buschiazzo *et al*. review past and recent reports of giant otters in Uruguay, where they are suspected to be extinct, and recommend more extensive fieldwork. The recovery of giant otter populations may bring about the issue of giant otter-human conflict due to interactions with fisheries, which is explored by Trujillo *et al*. in Colombia´s Amazonia and Orinoquia. Becerra Cardenas *et al*. provide a method to identify fish species and estimate their size from premaxillary bones found in giant otter latrines, which may be useful in studies of fishery conflicts that are appearing in different areas. Closing the issue, Groenendijk and Hayek describe a method to sex giant otters in the wild based on the angle they defecate and urinate. Good reading!

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[5]ICMBio (2014) *Sumário executivo do Plano de Ação Nacional para a conservação da ariranha.* http://www.icmbio.gov.br/portal/biodiversidade/fauna-brasileira/plano-de-acao/149-plano-de-acao-nacional-para-conservacao-da-ariranha.html Accessed 11 August 2015

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