NOTE FROM THE EDITOR

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Dear Friends, Colleagues and Otter Enthusiasts!

This is a premiere – four issues in one year have never been published in one volume! I would like to thank all authors for the trust in submitting so many interesting manuscripts and all the reviewers who have done one or several reviews during the last months. My personal conclusion is that you consider the quality and the recognition you get by publishing in the IUCN OSG Bulletin as increasing, and of interest for your work.

We are always looking for good photos and it would be of real great support if some of you could provide us photos for which you hold the copyright, as we need good resolution pictures for the title page.

Lesley – thank you so much for all your work! Without your efforts there would be no Bulletin.

Keep an eye on the website of our journal as with the next issue in 2016 you will experience a complete new layout and functionalities! I do already now hope that you will like it! See you soon back on the new website.

R E P O R T

FIRST PHOTOGRAPHIC DOCUMENTATION AND DISTRIBUTION OF THE SMOOTH-COATED OTTER *Lutrogale perspicillata* IN SIMILIPAL TIGER RESERVE, ODISHA, INDIA

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ABSTRACT: Decline in the populations of the Smooth-coated otter throughout its range of distribution is coupled with a perception that it is a key stone species for riverine ecosystem. The species inhabits major freshwater wetlands throughout the south and south-east Asia and often comes into the direct conflict with humans for food and habitat. Furthermore, the species is also suffering with neglectful attitude and mismanagement due to lack of baseline information. This paper presents the first camera trap evidence, and distribution pattern of, smooth-coated otters in Similipal Tiger Reserve as the result of a camera trap exercise.

Key words: Smooth-Coated Otter, Camera trap, Similipal Tiger Reserve

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INTRODUCTION

Smooth-coated otter (*Lutrogale perspicillata*) is listed as vulnerable in the IUCN Red List. The species is protected under Schedule II of Wildlife Protection Act 1972 of India. It is listed in Appendix II of CITES (CITES 2017). Otters are emblematic species for nature conservation in a broad societal context; hence they are often advocated as a model species in studies of fluvial ecosystem functioning and anthropogenic stress (Norris and Michalski, 2009).The amphibious life style of otters

allows them to disperse over wide areas of riverine landscapes, and as a result, they influence the ecological processes of the river floodplain in a direct manner (Khan et al., 2014). Smooth-coated otters (*Lutrogale perspicillata*) play a vital role in balancing the freshwater ecosystems as a top carnivore species and may therefore significantly influence the overall spatio-temporal dynamics of the ecoregion over a long period of time (Khan et al., 2014). There is little information available on the status of otter populations in India, although there seems to have been a rapid decline due to loss of habitat and intensive poaching (de Silva et al, 2015). Currently, the otter population is severely fragmented throughout its distribution range and isolated populations are restricted mostly to protected areas (Hussain, 1999; Nawab, 2007; Nawab, 2009).

Smooth-coated otters inhabit major freshwater wetlands throughout south and south-east Asia (Nawab, 2009). Being found in one of the world's most human dominated and economically poor landscapes, their ecological requirements often conflict with human food and water security. Even though the species is protected under Indian Wildlife (Protection) Act, 1972, and listed in Appendix II of CITES (CITES 2017), it is still subject to poaching for skin and fat (Shenoy et al., 2006; Nawab and Gautam, 2008; Hussain, 1999; Nawab, 2007, 2009; De Silva et al, 2015). Deficiency of baseline data on its distribution and ecology is another major constraint that hampers the protection of the species in India (Nawab and Gautam, 2008; Hussain, 1999; Nawab, 2007, 2009; De Silva et al (2015)). No reliable estimates of its population are available from India. However, based on the available data, it is projected that the population will continue to decline in the future due to habitat loss, and it has hence been classified as Vulnerable by the IUCN (De Silva et al (2015)). Once commonly found throughout its distribution range, the species started disappearing from a number of its known distribution locations. This shrinking span of distribution limits the species to the protected area,s and these isolated sub-populations are subjected to still further anthropogenic threats like construction of large–scale hydroelectric projects, reclamation of wetlands for settlements and agriculture, reduction in prey biomass, poaching and pollution (Shenoy et al., 2006; Nawab and Gautam, 2008; Hussain 1999; Nawab, 2007, 2009; De Silva et al (2015)). Being sensitive towards the environmental changes, smooth-coated otters are suitable indicators for the health of wetland ecosystem (Nawab, 2009). Hence the presence of otters gives a more accurate, integrative and direct indication of the overall health of wetland and the river systems.

STUDY AREA

Similipal Tiger Reserve is located in the Mayurbhanj District of Odisha and spreads over 2750 km^2 of the Chotanagpur plateau (Figure 1). The park is surrounded by high plateaus and hills, the highest peak being the twin peaks of Khairiburu and Meghashani (1515 m above mean sea level). At least twelve rivers cut across the plain area, all of which drain into the Bay of Bengal. The most prominent among them are Budhabalanga, Palpala, Bandan, Salandi, Khairi, Khadkei, Budhabalanga, West Deo and East Deo. An astounding 1078 species of plants, including 94 species of orchids, find their home in the tiger reserve. It hosts 55 species of mammals, 304 species of birds, 60 species of reptiles, 21 species of frogs, 60 species of fishes and 164 species of butterflies that have been recorded from the park. The core area comprises of ranges with an area of 1194.75 km^2.

The Similipal is a densely forested hill range in the heart of Mayurbhanja lying close to the eastern-most end of the Eastern Ghat in the Mahanadian Biogeographical Region and within the Biotic province Chhaotanagpur plateau. Similipal is the richest watershed in Odisha giving rise to many perennial rivers. The natural vegetation is

moist deciduous type and is dominated by *Shorea robusta*, *Anogeissus latifolia*, *Buchanania lanzan*, *Dillenia pentagyna*, *Syzygium cumini* and *Terminalia alata*. During the camera trapping exercise in Similipal, as many camera traps as possible were placed in the footpaths, river banks and the forest roads in order to maximize the number of photos captured. During the camera trapping exercise, images of smooth-coated otters were captured close to river System of West Deo river systems in Upperbabrakamuda and East Deo river systems in Jenabil.

METHODOLOGY

The success of camera-trapping depends on the selection of ideal locations to deploy the camera traps so as to maximize the number of captures. Prior to camera placement, survey were done along the forest paths, animal trails, dirt tracks, dried stream beds etc. to record carnivore presence through indirect signs (pug marks, tracks, scat, scrapes, rake marks, scent deposits and kills). Potential locations of camera trap stations were then mapped using ArcGIS 9.3. During the exercise cameras were deployed a sampling grid of 4.0s km (2.0x2.0km) for camera trapping; pairs of "Cuddy back 1" camera traps were placed opposite to each other so as to capture photograph of both sides of a passing animal.

The camera trapping exercise lasted from February 2016 to May 2016, for 119 days, and November 2016 to June 2017 for a period of 175 days. The cameras were active for 24h periods each defined as one sampling occasion. Each camera was assigned a unique identification number. Date, time, temperature and camera ID was recorded for every capture. The location of each photo-capture of otters was recorded and mapped to understand their geographic distribution in the study area (Figure 2, Table 1).

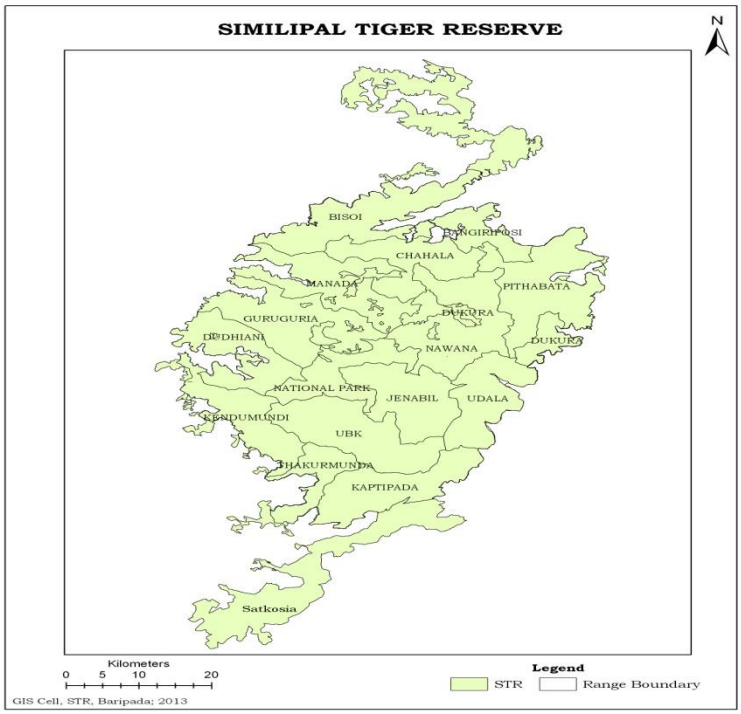

Figure 1. Map showing the study area

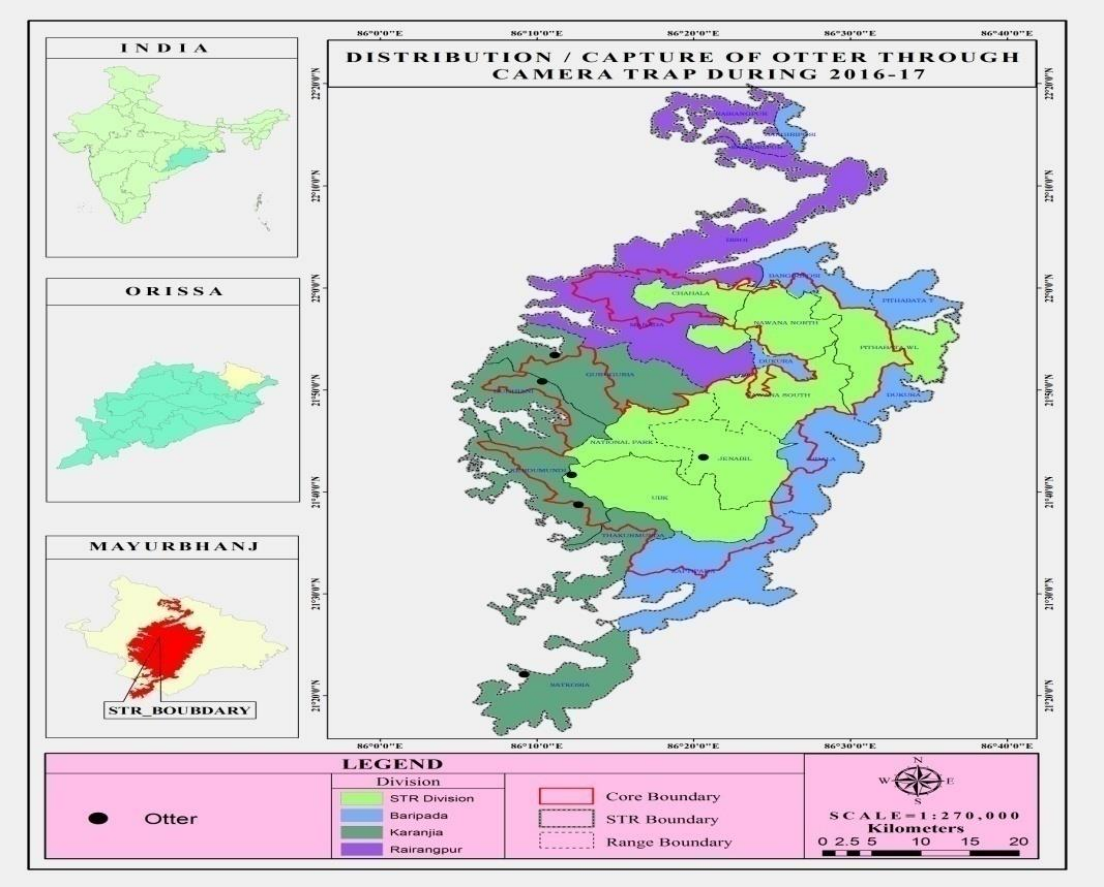

Figure 2. Distribution pattern of Smooth Coated Otter during Camera trapping

Table 1. Location of Smooth-coated otter images

SL.No	Division	Camera ID	No. of photos captured
1	STR Core	131	1
2	STR Core	372	1
3	Karanjia	110	1
4	Karanjia	128	7
5	STR Core	078	4
6	STR Core	42	2

Figure 3. Example pictures taken by the camera traps

RESULTS

The camera trapping results revealed *L. perspicillata* were present during 2016 to 2017. Samples of 30 days were taken from each block. 16 photos (e.g. Figure 3) of *L. perspicillata* were captured from four ranges in the study areas, covering both the core and buffer divisions (Table 1). The greatest number of photos were captured in the Upper Baraha Kamuda (UBK) part of the STR core. The next highest number were in the Kendumundi and Gurguria Ranges. The results revealed that UBK showed appropriate vegetation, water sources and landscape structures for the population of *L. perspicillata* in STR. Similipal is the richest watershed in Odisha giving rise to many perennial rivers. Four types of forest habitat, semi evergreen, tropical moist deciduous, dry deciduous hill forests and high level sal forests are found in Similipal Tiger Reserve. The major plant species include *Shorea robusta*, *Dillenia pentagyna*, *Syzygium cumini*, *Terminalia tomentosa*, *Syzygium cerasoides*, *Michelia champaca*, *Bombax ceiba*, and *Schleichera oleosa*. Perennial river streams cross the whole forest. *L. perspicillata* images were captured from camera points on the main forest tracks as well as interior animal trails (foot paths); these areas are covered with moist deciduous and semi evergreen forest, and crossed by the perennial rivers East Deo and West Deo.

These records indicate the suitability of the area for this species of otter.

DISCUSSION

Smooth-coated otter has been categorized as vulnerable in IUCN's Red List of Threatened Mammals and in Appendix II of CITES. It is also considered as endangered and included in schedule I of Indias Wildlife Protection Act 1972. The populations of all three otter species found in the Indian sub-contient are declining, mainly due to habitat loss and extensive trapping of the species. Mainly due to habitat loss and over-exploitation the population of Smooth-coated otters is declining throughout their range of distribution and this trend of population decline is expected to continue. A deficiency of baseline data on the ecology of the species is another constraint for its conservation. Otters are facing extreme threats by human-induced habitat destruction. The expansion of agriculture has led to the destruction of huge areas of natural habitats, including forests, grasslands and wetlands in nearly all regions of the world. The otter at the apex of the fresh water food web are good indicators of healthy riverine ecosystems, which they inhabit.

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RÉSUMÉ

PREMIERE DOCUMENTATION PHOTOGRAPHIQUE ET DISTRIBUTION DE LA LOUTRE A PELAGE LISSE, *Lutrogale Perspicillata*, DANS LA RESERVE DE LA BIOSPHERE DE «SIMILIPAL TIGER», ETAT D'ODISHA, INDE

Le déclin des populations de loutre à pelage lisse sur l'ensemble de leur aire de répartition donne le sentiment qu'il s'agit d'une espèce clé de voute des écosystèmes rivulaires. L'espèce est présente dans la majorité des zones humides d'eau douce du sud et du sud-est de l'Asie et entre souvent en conflit direct avec l'homme pour l'alimentation et l'habitat. De plus, l'espèce souffre également d'une attitude désinvolte et d'une gestion défectueuse due à un manque d'information élémentaire. Cet article présente un premier modèle de distribution de la loutre à pelage lisse dans la réserve de la biosphère de «Similipal Tiger» réalisé à l'aide d'un réseau de pièges photographiques sur une période donnée.

RESUMEN

PRIMERA DOCUMENTACIÓN FOTOGRÁFICA, Y DISTRIBUCIÓN DE LA NUTRIA LISA *Lutrogale perspicillata* EN LA RESERVA DE TIGRES SIMILIPAL, ODISHA, INDIA

La declinación de las poblaciones de la nutria lisa en toda su área de distribución está acoplada a una percepción de que es una especie clave para los ecosistemas fluviales. La especie habita los principales humedales de agua dulce del sur y sureste de Asia, y a menudo entra en conflicto directo con los humanos, por alimento y hábitat. Más aún, la especie también está sufriendo de una actitud de descuido y de desmanejo, debido a falta de información de base. Este trabajo presenta el primer relevamiento de distribución, y con cámaras-trampa, de la nutria lisa en la Reserva de Tigres Similipal.

R E P O R T

NEW ALTITUDINAL RECORD OF NEOTROPICAL OTTER (*Lontra* longicaudis Olfers, 1818) AND CONFLICT WITH FISH FARMERS IN MEXICO

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No photo of Noé Hernández García

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ABSTRACT: The Neotropical otter has a wide distribution in the Neotropics, including Mexico, where is listed as a threatened species (Gallo-Reynoso 1997), but there remain many unknown aspects of its ecology and distribution. A participatory monitoring committee was established to conduct field monitoring to document the presence of the Neotropical otter in the community of Tonalaco, located in the National Park Cofre de Perote in Veracruz State, México. Interviews were carried out with local inhabitants of Tonalaco to obtain information about the presence of the species. The present study documents a new elevational record for the neotropical otter in Mexico. Scats were found in the area, and a local resident possessed a stuffed specimen hunted in the area. Ranchers and cultivated trout producers of Tonalaco were not aware of the presence of the species before 2014. Our study provides new information about the presence of otter in the mountains of Mexico, outside of optimal habitat for the species (Carrillo-Rubio and Lafón, 2004; Hernández-Romero, 2011). It is likely that fish farms have allowed otters to move into the area, but this has created a conflict between trout farmers and otters. Management strategies for the conservation of the species in this and other similar areas in Mexico need to be developed.

Key words: Neotropical otter, elevational distribution, human-otter conflict, conservation, Veracruz

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INTRODUCTION

Knowledge of the distribution of a species allows an understanding its biological requirements (Brown et al., 1996), especially important for species with protected status. The Neotropical otter, (*Lontra longicaudis*) has a wide distribution in

freshwater ecosystems from northern Mexico to Argentina (Larivière, 1999). In Mexico, its distribution is continuous from the southern part of the country to the Trans-Mexican Volcanic Belt, where it is restricted by the central highlands (Gallo-Reynoso 1997). The Neotropical otter inhabits a wide variety of aquatic environments, including rivers, lakes, mangroves, wetlands and coastal lagoons, and often co-exists with human activities (Monroy-Vilchis and Mundo 2009). Neotropical otters have been reported from sea level up to a maximum elevation of 2,200 m.a.s.l (Charre-Medellín et al., 2011, Santos-Moreno et al., 2003, Servín et al., 2003). However, the two South American subspecies of *L. longicaudis* (*L. l. enudris and L. l. longicaudis*) have been recorded at elevations around 3,000 m.a.s.l. in Ecuador, Colombia and Argentina (Andrade-Ponce and Angarita-Sierra, 2017; Castro-Revelo and Zapata-Ríos, 2001; Eisenberg and Redford, 1999).

This species has a flexible diet and is considered opportunistic in its feeding habits (Rheingantz et al., 2017), although more than 85% of its diet in Mexico is composed of fish and crustaceans (Briones-Salas et al., 2013; Duque-Dávila et al., 2013; Rheingantz et al., 2017). Despite this versatility, the presence of otters in aquatic habitats is limited by the quantity of food available (Latorre-Cárdenas, 2013) and the quality of the habitat, such as preserved riverbanks, low human disturbance, refuge availability and clean water (Carrillo-Rubio and Lafón, 2004; Hernández-Romero, 2011).

The community of Tonalaco (longitude -97°07'42.9", latitude 19°25'51.9") is located in the municipality of Xico in central Veracruz State at an elevation of 2,600 m.a.s.l. (Fig. 1). The predominant vegetation is pine-oak forest. The Magueyitos and Temazate Rivers have water levels less than 1m deep for most of the year, and there are high rates of deforestation on the riverbanks--negative elements for good otter habitat. Also, the Tonalaco area has an intensive production of cultivated rainbow trout (*Oncorhynchus mykiss*), a species introduced to the area and other regions in Mexico. Trout are produced in ground-level ponds near the Magueyitos and Temazate Rivers. The local inhabitants indicate that traditional fishing in the streams is poor because of overfishing. While trout aquaculture may attract otters, other habitat conditions are unfavorable in these highlands (Andrade-Ponce and Angarita-Sierra, 2017; Guerrero-Flores et al., 2013).

Between August and December 2015, as part of a study to verify the presence of the otter in the area of influence of the Cofre de Perote National Park (PNCP), monitoring teams, together with people from Tonalaco and the staff of Cofre de Perote National Park, searched for evidence of neotropical otters in the area. Monitoring was carried out several times in the Magueyitos and Temazate streams. Additionally, 30 informal interviews were conducted with the local inhabitants, who were asked about the presence of otters in the area.

We obtained evidence of the presence of Neotropical otters in the Tonalaco region at 2,500 m.a.s.l., higher than previously reported in Mexico for the species. Evidence consisted on scats, tracks and reports of sightings of the species in both streams by the local people (Table 1). Otter presence was confirmed by a stuffed otter, an adult male specimen, killed in 2014 by a trout producer in the Temazate River (19 ° 25'52.59 "N, 97 ° 7'35.46" W, 2,550 m.a.s.l.) (Figure 2). Locals also reported the capture of another adult individual in a trap, in the same year and in the same river, although the otter managed to escape.

Most of the interviewees, including older people and trout producers, indicated that they has not seen the species before 2014, when otters were first observed visiting the trout ponds to feed. This caused the local people to begin to hunt and kill them (Fig. 2).

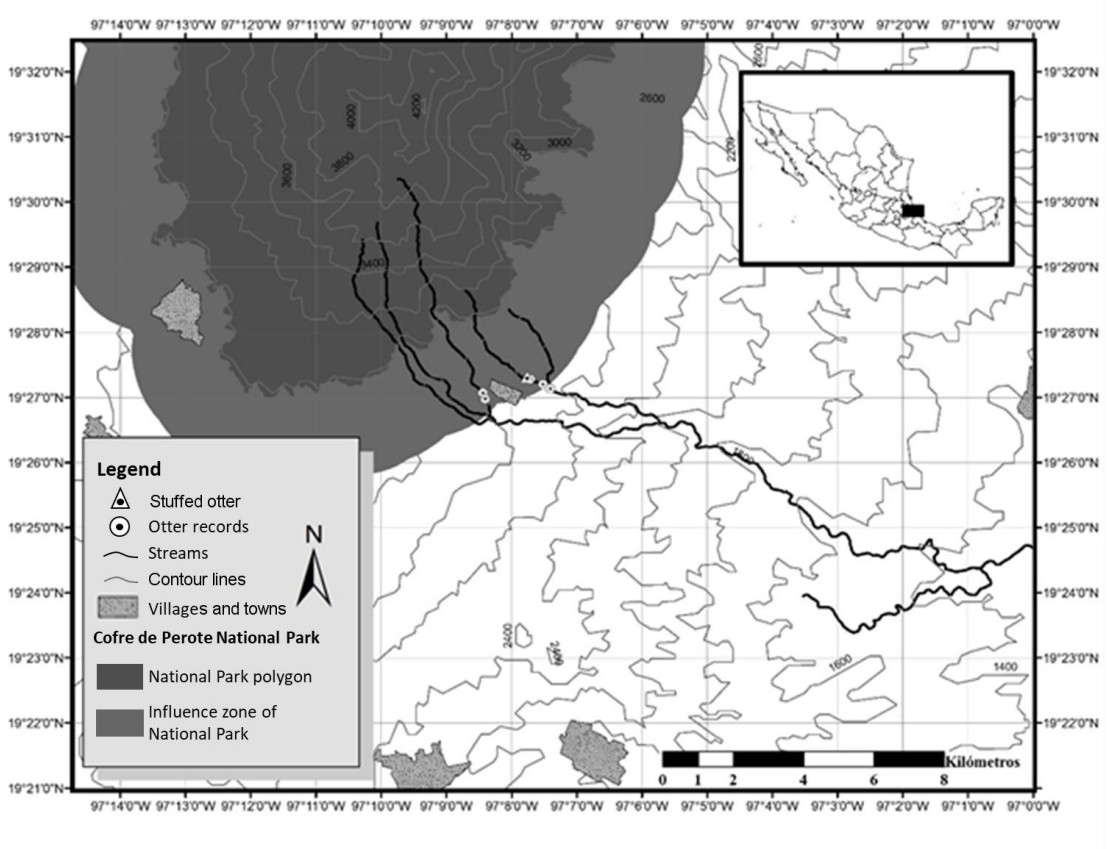

Figure 1. Location map of the records of the neotropical otter in the community of Tonalaco, México.

Figure 2. Stuffed specimen of adult neotropical otter hunted in the community of Tonalaco in 2014.

The unfamiliarity of the inhabitants (mainly the older ones) with otters suggests that they have only recently migrated into the area, possibly due to an increase in food availability due to escaped rainbow trout. Otters may be migrating upstream from the larger La Antigua River, into which these two rivers flow. This highland area does not present adequate natural habitat for the species, but is apparently adequate when supplemented by introduced cultivated fish species,

causing an artificial expansion of the otters' range (Andrade-Ponce and Angarita-Sierra, 2017; Guerrero-Flores et al., 2013).

Table 1. Trail records of the neotropical otter, *L. longicaudis*, at the Tonalaco community, Veracruz, Mexico.

Record No.	Evidence	Latitude	Longitude	Elevation (m.a.s.l.)
1	Faeces	19°25'50.38"N	97° 7'29.20"W	2,428
2	Faeces	19°25'41.94"N	97° 7'9.99"W	2,346
3	Footprints	19°25'29.60"N	97° 8'7.33"W	2,617
4	Faeces	19°25'24.95"N	97° 8'7.68"W	2,569
5	Hunted specimen	19°25'52.59"N	97° 7'35.46"W	2,550

Although the presence of neotropical otters in the area appears to be recent, their depredation of cultivated fish has created a conflict with fish farmers. A negative perception of the otters is causing the animals to be hunted, threatening their survival in the area. We recommended an assessment of the impact of otters on fish farming in the region, and the establishment of a monitoring and assessment program for the resolution of the conflict.

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RÉSUMÉ

NOUVEAU RECORD D'ALTITUDE POUR LA LOUTRE À LONGUE QUEUE (*LONTRA LONGICAUDIS*, OLFERS, 1818) ET CONFLIT AVEC DES PISCICULTEURS AU MEXIQUE

La loutre à longue queue a une large répartition dans les tropiques, en ce compris au Mexique, où elle est considérée comme une espèce menacée . Cependant, il subsiste de nombreux aspects méconnus de son écologie et de sa répartition. Un comité de suivi participatif a été mis en place pour effectuer un suivi sur le terrain afin de mettre en évidence la présence de la loutre à longue queue dans la communauté de Tonalaco, située dans le parc national Cofre de Perote, dans l'État de Veracruz, au Mexique. Des entretiens ont été menés avec des habitants de Tonalaco pour obtenir des informations sur la présence de l'espèce. La présente étude relate un nouveau record d'altitude pour la loutre à longue queue au Mexique. Des épreintes ont été trouvées dans la région, et un habitant local possédait un spécimen empaillé chassé dans la région. Les éleveurs et les producteurs de truites de Tonalaco n'étaient pas au courant de la présence de l'espèce avant 2014. Notre étude fournit de nouvelles informations sur la présence de loutre dans les montagnes du Mexique, en dehors de l'habitat optimal pour l'espèce. Il est probable que les pisciculteurs ont permis aux loutres de se déplacer dans la région, mais cela a créé un conflit entre éleveurs de truites et les loutres. Des stratégies de gestion pour la conservation de l'espèce dans cette zone et dans d'autres zones similaires du Mexique doivent être développées.

RESUMEN

NUEVO REGISTRO ALTITUDINAL DE LA NUTRIA NEOTROPICAL (*Lontra longicaudis* Olfers, 1818) Y CONFLICTO CON PISCICULTORES EN MÉXICO

Es fundamental conocer las áreas de distribución de las especies y las condiciones ambientales que delimitan éstas distribuciones para el establecimiento de estrategias adecuadas de conservación. La nutria neotropical, *Lontra longicaudis*, es una especie con una amplia distribución a lo largo del Neotrópico incluyendo en México, donde es una especie amenazada. Sin embargo se desconocen aún varios aspectos sobre su ecología y distribución. Se conformó un comité de monitoreo participativo con pobladores locales para realizar muestreos para encontrar evidencia de la presencia de la nutria en la comunidad de Tonalaco ubicada en la zona de influencia del Parque Nacional Cofre de Perote. El presente estudio muestra un nuevo registro altitudinal para la nutria neotropical en México. Los pobladores y productores de truchas de Tonalaco no tenían conocimiento de la presencia de la especie en la zona antes de la colocación de estanques de trucha arcoíris en el 2014. Los resultados aportan nueva información sobre la presencia de la nutria en ambientes montañosos de México, donde las condiciones ambientales no presentan las características óptimas descritas para la especie, sin embargo la presencia de la nutria en la zona podría estar dada por los criaderos de truchas que ahí se han establecido. Esta actividad productiva presenta un conflicto entre productores de truchas y la nutria en la zona, lo cual debe evaluarse para proponer estrategias de manejo y conservación de la especie en ésta y otras zonas con condiciones similares de México.

R E P O R T

NOTES ON NEOTROPICAL OTTER (*Lontra longicaudis*) HUNTING, A POSSIBLE UNDERESTIMATED THREAT IN COLOMBIA

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ABSTRACT: Since Neotropical otter (*Lontra longicaudis*) hunting was legally banned in 1973 in Colombia, hunting is no longer considered to be a high priority conservation concern in the Country. The species is still classified as Vulnerable in the country, but the *National Mammals Red List* and the *National action plan for aquatic mammals' conservation in Colombia* do not consider any use of the species besides keeping it as pet (an illegal activity in Colombia). A preliminary survey to identify current hunting activity was conducted professionals at biological research institutions, environmental NGO's, university professors and regional environmental authorities, to identify current hunting among the five ecoregions in Colombia. The overall results among ecoregions show the main reasons for hunting Neotropical otters are: keeping as pet (29%), pelt use (24%) and bushmeat (22%). The results create a basis for gathering more information on the hunting of Neotropical otters in Colombia.

Keywords: Bushmeat, Colombia, hunting, *Lontra longicaudis,* Neotropical otter, wildlife use.

Citation: Morales-Betancourt, D and Medina Barrios, OD (2018). Notes on Neotropical Otter (*Lontra longicaudis*) Hunting, a Possible Underestimated Threat in Colombia . *IUCN Otter Spec. Group Bull*. **35** (4): 198 - 204

In Colombia, wildlife hunting is only permitted for subsistence (Congreso de Colombia, 1989). Although this is legally allowed only to obtain wildlife meat for personal consumption, the illegal sale of bushmeat is a persistent conservation concern for certain species, including, for example, the capybara (*Hydrochoerus hydrochaeris*) (van Vliet et al., 2016).

In 1973 the killing of mustelids, felines and large mammal species with fur of economic value was banned in Colombia due to overexploitation. At that time, the main threat to the Neotropical otter was hunting for the international pelt trade but, beginning some time in the early 1990s, the species was killed to reduce its

depredation of shrimp and fish-culture facilities. This killing coincided with aquatic and riparian habitat degradation and pollution, which combined to contribute to the isolation and reduction of Neotropical otter populations, including extirpations in some watersheds (Trujillo and Arcila, 2006). In the National Red List for mammals, two hunting motivations are listed for Neotropical otter hunting: to sell caught pups as pets; and to make "carrieles" (a traditional man bag) and drums with the pelt, but the latter only occurred in a few communities, some decades ago (Trujillo and Arcila, 2006).

The National action plan for the conservation of aquatic mammals in Colombia (Trujillo, et al., 2014) bases its conservation strategy on a problem tree analysis, which only includes the threats identified in the *The National Red List* published in 2006. Unfortunately, during the workshops conducted in 2015 for the National Conservation Plan for Otters (*Lontra longicaudis and Pteronura brasiliensis*) in Colombia (Ministerio de Ambiente, y Desarrollo Sostenible & Fundación Omacha, 2016), the same threats for the species were evaluated, despite the participation of many regional environmental authorities and NGOs. In consequence, the strategies for this species do not correspond to the likely current situation.

During the research project that preceded the development of a Management Plan for Neotropical otter conservation in La Guajira (Colombia), some of the purposes for which the species has been hunted (past and present) were identified and established as a concern for the conservation of the species (Morales-Betancourt et al., 2015). Nevertheless, otter hunting was not included as a threat for this species in later conservation plans (Ministerio de Ambiente, y Desarrollo Sostenible & Fundación Omacha, 2016). The results in La Guajira department[1] research provided motivation to conduct an initial assessment to determine if hunting is a conservation concern for Neotropical otters in Colombia. To accomplish this initial assessment, a questionnaire was designed and sent it to different research institutions, NGOs, university professors and regional environmental authorities, with the aim of gaining insight on the potential threat hunting may pose for the conservation of Neotropical otters.

An open question survey to gather otter hunting information (hunting activity presence, how recently, purpose or motivation, and related information about hunting), were sent to 148 conservation professionals (independent researchers, researchers at universities and national research institutes and professionals at regional environmental authorities) by email. In total, 37 responses were received; within these, 49 uses and purposes for hunting Neotropical otters were reported.

The results were organized according to the five biogeographic regions in Colombia: Andean, Pacific, Caribbean, Orinoco and Amazon (Figure 1). Responses were categorized according to the hunting reason or use: good luck, medicinal, "ombligar" (cutting the umbilicus of a newly born child), bushmeat, pet use, conflict with fisheries, and other unknown reasons.

The majority of experts providing responses represented the Andean ecoregion (63.3%; Figure 1). Hunting Neotropical otters for pelts remains problem and was the main use reported in that region (32.2% of responses), followed by the capture of otters for use as pets (29% responses). This pelt trade is well known to the regional authority Corantioquia, which developed an awareness campaigns to avoid otter pelt usage to make "carrieles." (satchels carried by men over the shoulder). The information from this region is concentrated in the east area of Antioquia department and the area of Magdalena Medio (the Middle Magdalena river valley area) in

[1] Department is the first-level country subdivision, similar to state for other countries.

Santander department. There are also indications of hunting in the Huila department, but the evidence is poorly verified and needs additional investigation.

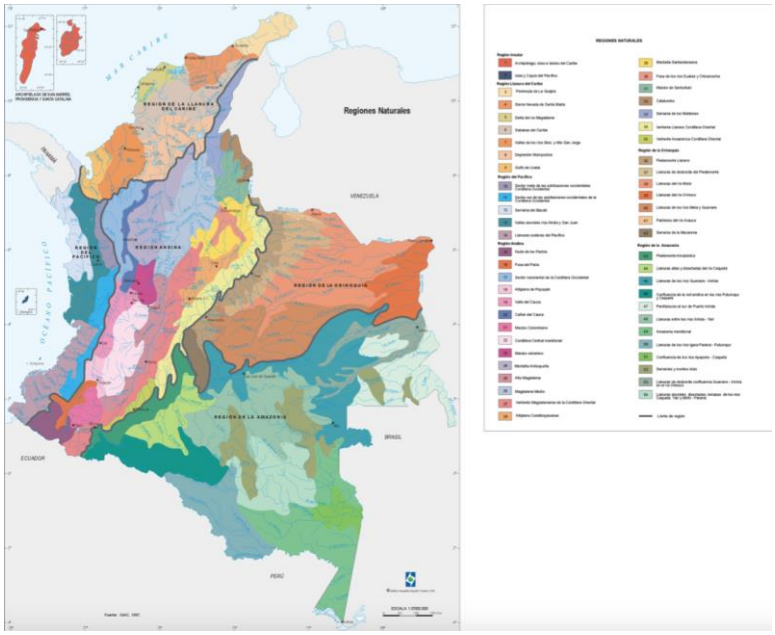

Figure 1. Map of Colombia. The five biogeographic regions in Colombia: Andean, Pacific, Caribbean, Orinoco and Amazon (divided with grey lines) . Within the regions, colors represent natural geographic areas. Source: Instituto Geográfico Agustín Codazzi - IGAC (http://www2.igac.gov.co/ninos/UserFiles/Image/Mapas/regiones%20naturales.pdf).

The Caribbean ecoregion responses represented 14.3% of the total data gathered. Currently, hunting of Neotropical otters is reportedly taking place in the area, primarily for pets (cubs are caught for this purpose) and/or killing for bush meat, although other, lesser reasons for hunting were reported. Hunting otters for pets and bushmeat were both indicated by 29% of respondents from the region. Use as pets was reported in the Córdoba department and bushmeat use in the La Guajira department. For bushmeat use, women oversee post-hunting procedures to process the carcass (e.g., gutting, skinning, quartering, and hauling meat), and procedures important to make the meat palatable, especially avoiding contamination from anal scent glands. Following this, meat is salt-cured, and after a couple of days it can be prepared as food: the meat is first cut or shredded and then cooked in liquid for a stew or soup or simply pan-fried. An alarming fact is that the woman stated that although men do not go hunting specifically for otters, they will always hunt them if otters are available.

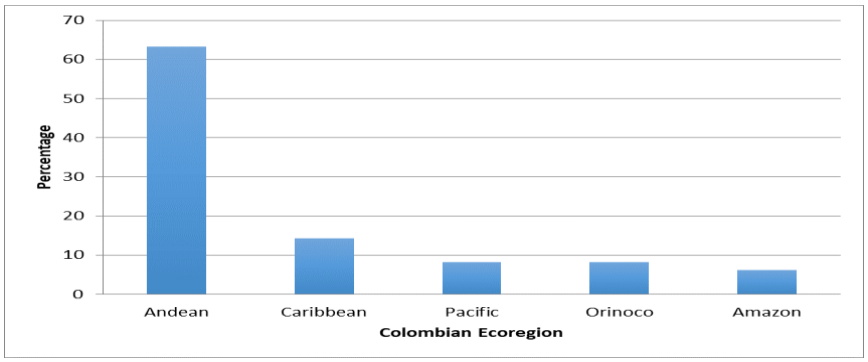

Figure 2. Percentage of respondents to a survey conducted during 2016 (February – November) , assessing current hunting activity and hunting reasons for Neotropical otters, classed by Colombian Ecoregions

Prior to this investigation, consumption of otters had never been reported in Colombia. A new use of otters was also described among survey responses, where otters were reportedly to once have been hunted to extract their eyes, which were then used as the eyes of religious figures in Catholic statues. Members of local communities recall that hunters were well paid for the eyes (no specific amounts were provided), but this use is no longer a practice.

The Pacific ecoregion represented 8.2% of respondents. Here, it was reported that some Afro-Colombian communities use parts of the Neotropical otter as an element of their traditional beliefs, including medicinal purposes and for good luck (i.e. there is a ritual that include the use of otter eyes to increase a person's good luck). There is also a traditional practice from some indigenous communities in the region called "ombligar," which is associated with newborn children. Specifically, a midwife uses the toenail of a Neotropical otter to severe the umbilical cord from a newborn infant; afterwards the umbilical cord is buried and a tree is planted above to create deeply-rooted feelings into the newborn to his or her native land. There is no use as bushmeat in this ecoregion because the local communities think that the meat tastes "very marshy".

In the Orinoco and Amazon ecoregions (8.2% and 6.1% of responses, respectively), the giant otter (*Pteronura brasiliensis*) is also present, which make it difficult to determine whether information derived by local people pertains to this species, the Neotropical otter, or both. In the Orinoco ecoregion, bushmeat, use as pets, and killing to reduce conflicts with fisheries were reported as purposes for hunting otters. In the Amazon there was one report of otters being used for bushmeat (in the Andean foothills), and two reports of otters being kept by local people as pets.

This preliminary research indicates that hunting of Neotropical otter occurs in all the Colombian ecoregions, and for various purposes (Figure 3). However, there was considerable variation in the amount of information collected among regions and additional information is needed to better elucidate the purpose, types, and potential impacts of hunting on Neotropical otter. The consolidated results among ecoregions shows that main hunting reasons for hunting Neotropical otters are: keeping as pet (29%), pelt use (24%) and bushmeat (with 22%). In relation to pet commercialization and ownership, data show that the number of confiscated or voluntarily surrendered animals oscillates between one to five individuals at a time; this indicates that each report of commercialization and ownership involves multiple individuals, which may lead to this threat having a more severe impact on this species than the other threats.

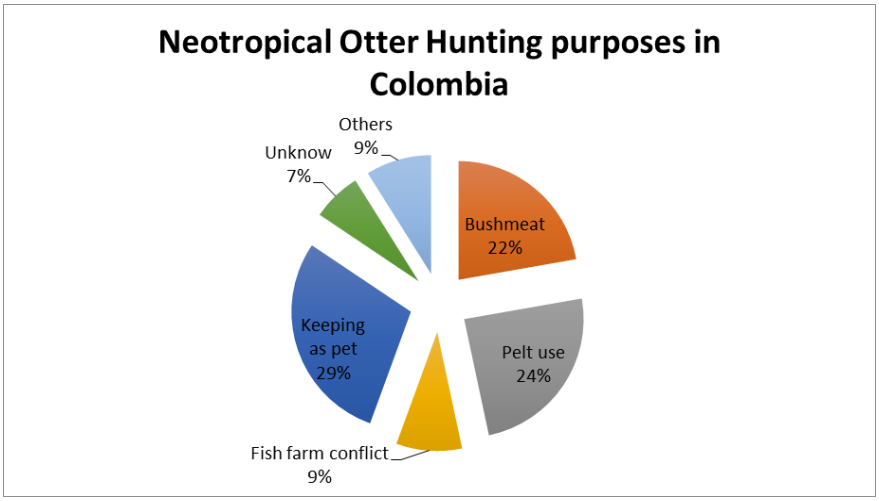

Figure 3. Reasons for Neotropical Otter hunting in Colombia, according to results of a survey conducted during 2016 (February – November).

In conclusion, we determined that Neotropical otters are currently hunted in all five ecoregions and at least 13 departments in Colombia. This project provides an important basis for conducting further research on the potential impacts of hunting on Neotropical otter populations. Future research should include ethnozoological and anthropological investigations related to hunting Neotropical otters, including the collection of more detailed data from specific areas of potential conservation concern, but also to continue collecting generalized information from areas poorly represented in our survey to fill geographical gaps of information. Even though the Neotropical otter is not currently prioritized as a species of high conservation concern in Colombia, synergistic effects can cause extirpation in some areas, especially where populations are isolated. We specially recommend that data on the hunting of Neotropical otters be gathered in Nariño, Tolima, Caquetá, Cundinamarca, Casanare, Boyacá, Chocó, Arauca, Norte de Santander, Sucre, Bolívar, Atlántico Magdalena and Cesar departments.

Acknowledgement - To all the organizations and people that collaborate with information in order to make possible this scientific note, specially to regional environmental authorities: Corantioquia, CVC, Corpourabá, CRQ, CAM, CAR, and other institutions such as: Fundación Bosques y Humedales, Biotica Consultores LTDA, Universidad Católica de Oriente and to researcher Carolina Zapata Escobar.

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RÉSUMÉ

NOTES SUR LA LOUTRE À LONGUE QUEUE (*Lontra longicaudis*), LA CHASSE, UNE MENACE POSSIBLE SOUS-ESTIMÉE EN COLOMBIE

Depuis que la chasse à la loutre à longue queue (*Lontra longicaudis*) a été légalement interdite en 1973 en Colombie, elle n'est plus considérée comme une préoccupation de conservation hautement prioritaire dans le pays. L'espèce est toujours classée comme vulnérable en Colombie, mais la Liste Rouge National des Mammifères et le plan d'action national pour la conservation des mammifères aquatiques en Colombie ne prennent en compte aucune utilisation de l'espèce, sauf comme animal de compagnie (une activité illégale en Colombie). Une enquête préliminaire visant à identifier les activités de chasse actuelles a été menée auprès d'instituts de recherche en biologie, d'ONG de défense de l'environnement, de professeurs d'université et d'autorités régionales de l'environnement, afin d'identifier la chasse actuelle dans les cinq écorégions de Colombie. L'ensemble des résultats dans les écorégions montrent que les principales raisons de chasser les loutres à longue queue sont : de les prendre comme animal de compagnie (29%), d'utiliser leur peau (24%) et la viande de brousse (22%). Ces résultats constituent une base pour rassembler davantage d'informations sur la chasse à la loutre à longue queue en Colombie.

RESUMEN

NOTAS SOBRE LA CAZA DE LA NUTRIA NEOTROPICAL (*Lontra longicaudis*), UNA AMENAZA POSIBLEMENTE SUBESTIMADA EN COLOMBIA

Desde que la caza de la Nutria Neotropical (*Lontra longicaudis*) fue legalmente prohibida en 1973 en Colombia, ya no es considerada como una preocupación de conservación de alta prioridad en el país. La especie aún está clasificada como Vulnerable en el país, pero la *Lista Roja Nacional de Mamíferos* y el *Plan de acción nacional para la conservación de los mamíferos acuáticos de Colombia* no consideran ningún uso de la especie aparte de la tenencia como mascota (actividad ilegal en Colombia). Un relevamiento preliminar para identificar la actividad actual de caza fue conducido entre profesionales de instituciones de investigación biológica, ONGs ambientales, profesores universitarios y autoridades ambientales regionales, en cinco ecoregiones de Colombia. Los resultados globales de todas las ecoregiones muestran que las principales razones detrás de la caza de nutrias Neotropicales son: tenencia como mascota (29%), uso de la piel (24%) y uso de la carne (22%). Los resultados crean una base para colectar más información sobre la caza de nutrias Neotropicales en Colombia.

A R T I C L E

THE INFLUENCE OF WATER LEVEL ON THE DETECTION OF SIGNS OF NEOTROPICAL OTTERS (*Lontra longicaudis*) ON A FLOOD PLAIN.

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ABSTRACT: The aim of this study was to characterize the habitat used by the Neotropical Otter on a section of the floodplain, and to examine the influence of river level on the detection of scent marking, defined as spraint and/or anal mucus. Over one year, a section of 6 km of the left bank of the Paraná River was searched for scent marking. Those sites were classified by the type of substrate and frequency of use. A linear regression analysis was applied between river level and the number of marking sites found. Most of the positive sites have rocky substrate, followed by sandy. Just over half of the marking sites were only used occasionally, and few sites were associated with high activity. The abundance of rocky substrate when river level is low is probably responsible for the high frequency of otter sign detected. We suggest that studies on *Lontra longicaudis* marking in a floodplain should be carried out during periods of lower river level to facilitate the finding of otter sign. We emphasize that estimates of density and habitat preference cannot be based solely on marking sites, because both this behaviour and its detection are subject to variations due to many factors, including the oscillation of the river level.

Keywords: Scent Marks; Substrate; *Lontra longicaudis*; Paraná River; Atlantic Forest.

INTRODUCTION

The Neotropical otter, *Lontra longicaudis* (Olfers, 1818), is a semiaquatic mustelid, distributed from Mexico to Uruguay, including most of Brazil (Almeida and Pereira, 2017; Rheingantz et al., 2017). Habitat includes rivers, brooks, lakes, riverbanks, flooded areas, artificial ponds, coastal areas and estuaries; this species can be diurnal or nocturnal, depending on where they live, and can live in pairs or be solitary (Indrusiak and Eizirik, 2003; Rheingantz et al., 2016; Rheingantz et al., 2017). Otters are known for marking their territory with scratches, faeces and anal mucus (Pardini and Trajano, 1999). However, territoriality in these species is different from other carnivores, as otters mark high trophic resource areas in their territories rather than territorial boundaries (Roberts et al., 2016). Marking sites are usually conspicuous places, such as natural rock formations, outside burrows carved in ravines, fallen logs and spaces between tree roots along the banks of watercourses (Quadros and Monteiro-Filho, 2002), or structures built by man, such as concrete slabs (Louzada-Silva et al., 2003).Several ecological and biological studies with otters use scent marks to understand the use of these marking sites, including research on the type of substrate and the method of use (Quadros and Monteiro Filho, 2002; Kasper et al., 2004; Uchôa et al., 2004; Kasper et al., 2008). In addition, they

associate the otter's marking behavior with seasonality, mainly in relation to the seasons (MacDonald and Mason, 1987; Soldateli and Blacher, 1996; Ruiz-Olmo and Gósalbez, 1997; Uchôa, 2004; Olson et al., 2008; Crimmins et al., 2009).

River floodplain systems present temporal variations in biotic and abiotic factors (Vazzoler et al., 1997). In these systems, the hydrological regime is the main factor for maintaining biodiversity and ecological processes (Neiff, 1990). This hydrological regime is naturally regulated by flood pulses (Junk et al., 1989), which are responsible for temporarily connecting the flooded areas with the main river. The increasing number of hydropower dams worldwide is now considered one of the greatest threats to the biota of continental aquatic environments (Rahel, 2007). In addition, the operation of dams directly influence the flood pulse of rivers, because the dams are controlled according to the need for energy production, and thus river levels on dammed rivers are no longer determined by natural climatic conditions (Agostinho et al., 2013; Winemiller et al., 2016). The floodplain of the Upper Paraná River is located between two dammed reservoirs (Agostinho et al., 2013), and a reduction of the flood pulse frequency and intensity after the construction of the Porto Primavera dam has been observed (Rocha, 2010). This variation in the flood pulse directly interferes with otter habitat, since they use the water margins as shelter and for defaecation and marking of territory (Waldemarin and Colares, 2000; Quadros and Monteiro-Filho, 2002).

In this context, the objectives of this work were: (i) to determine the type of substrate where scent marking is commonly found and (ii) investigate the influence of river level on the detection of marking sites. These results are important to underpin data from future studies in flooded areas that are subjected to different anthropic pressures, like the construction of more hydropower dams.

MATERIALS AND METHODS

Study Area

The Paraná river is the main river of the floodplain, being the tenth in the world in river outflow (5x108 m^3 $year^{-1}$) (Agostinho et al., 2013). The study area is on the floodplain of the Upper Paraná River, located in the Environmental Protection Area of the 'Islands and Floodplains of the Paraná River'; it is between the confluences of the Paranapanema and the Ivinhema Rivers with the main watercourse. The location has many types of aquatic environment, such as rivers, ponds and streams, and is characterized by the occurrence of seasonally flooded environments (Thomaz, 1997).

Sampling was carried out on the left bank of the Paraná River. Two sections of 3 km each were selected, both located next to urban areas (22º45'21"S/53º14'19"W and 22º46'7"S/53º15'59"W; 22º43'3"S/53º10'39"W and 22º42'13"S/53º9'0"W) and with a distance of 8 km between them (Figure 1). The two stretches were considered a single study area, amounting to 6 km of sample distance. In this region, the bank consists mainly of rocky cliffs, and the riparian forest is composed of typical species of the Atlantic Forest.

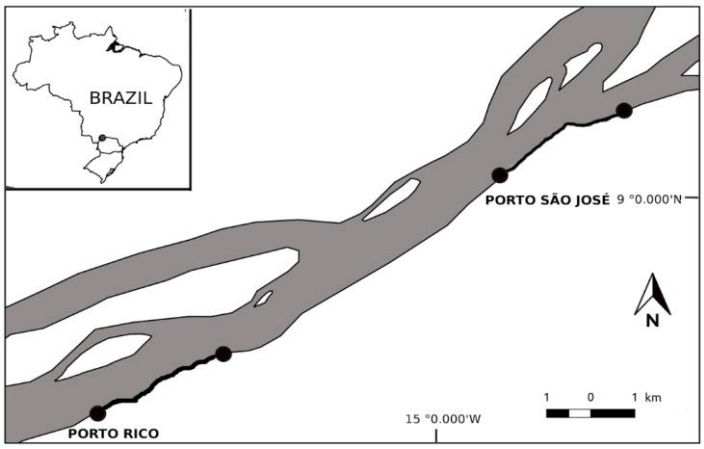


Figure 1: Study area on Paraná River, Brazil.

Sampling

The monthly surveys were carried out between January and December 2016, apart from May. The bank in each section was traversed on foot and by boat in search of marking sites, which we defined as a place with at least one faecal sample and/or anal mucus (Quadros and Monteiro-Filho, 2002). The observations were restricted 1 - 3 m from the water's edge, since several studies most otter movement is within this margin (Kasper et al., 2008; Pardini and Trajano, 1999). The marking sites were classified according to the type of substrate, which can be rocky, sandy, trunk or mixed (presence of branches, trunks, sand and stones), georeferenced using the GPS Network and monitored every subsequent month.

Data Analysis

In order to understand the behaviour of *L. longicaudis* in these sections, a descriptive analysis was carried out based on the frequency of each type of substrate and the frequency of use of the marking sites. They were classified as occasional (1 to 3 months of use seen), frequent (4 to 7 months of use) and intense (8 to 11 months of use) (Colleti et al., 2013). To identify the relationship between the detection of the site and the variation in river level, a linear regression was performed, with the number of marking sites detected as a response variable and the mean of the river level of sampling days as a predictor variable in each sample. A log transformation was applied to meet the assumption of homoscedasticity of this analysis. The same analysis was performed using the mean rainfall on sampling days to compare the data, and to exclude the possibility that rain might remove the spraints. All analyses were performed in STATISTICA 7.0.

RESULTS

During the period of the study, 105 marking sites were found on various substrates. The most frequently used sites were rocky substratum (86.7%), some with cavities and others by bare rock. Sites with sandy substrate (6.7%) were generally covered by roots of tree species and occasionally other types of traces were found, such as footprints and scratches (Figure 2A). The majority (53.3%) of the sites were used only occasionally; 37.1% appeared to be frequently used. Both of these covered all types of substrates except tree trunks, which were only occasionally used. Only 9.5% of the marking sites were classified as heavily used; all of these consisted of rocky substratum. Of these, two were formed by a large rocky cavity surrounded by roots (Figure 2B).

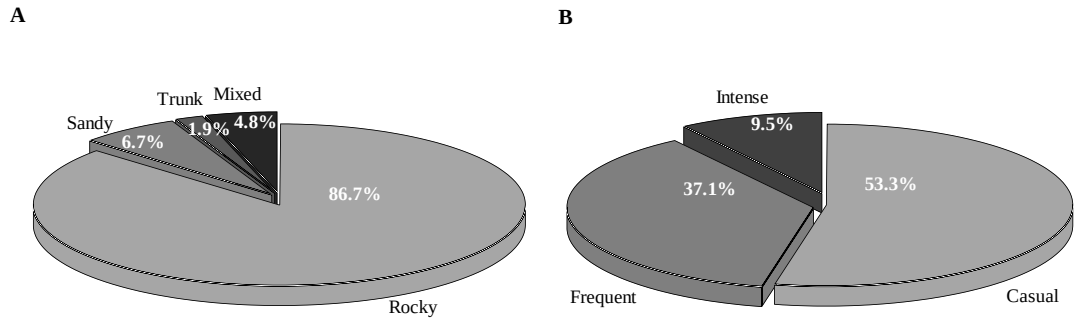


Figure 2: Frequency of substrate type (A) and use of marking sites (B) by *Lontra longicaudis* in a section of the left margin of the Paraná River during 2016.

The linear regression analysis between river level and the number of marking sites detected revealed a statistically significant relationship (R^2=0.73 and P<0.05): these variables were negatively correlated, i.e. as the river level increases, fewer marking sites are observed (Figure 3). In January, the month with the maximum peak of medium depth (595.8 cm), no marking sites were observed at all. Similarly, in March only two were observed, when the average level of the river was 422.1 cm. On the other hand, in July, a drought month with low average depth (200.3), 56 sites were observed, with levels being lower only in August (66 sites in 207 cm of depth), September (58 sites in 220 cm) and November, a month which, according to the literature is the beginning of flood, but that still showed only 241 cm of depth, and with 62 marking sites observed. February presented a low average depth of river (281 cm), even though it was supposed to be a flood season month, but only four marking sites were found (Figure 4). The analysis with the rainfall showed no correlation with the detection of marking sites (R^2=0.01 and P =0.76).

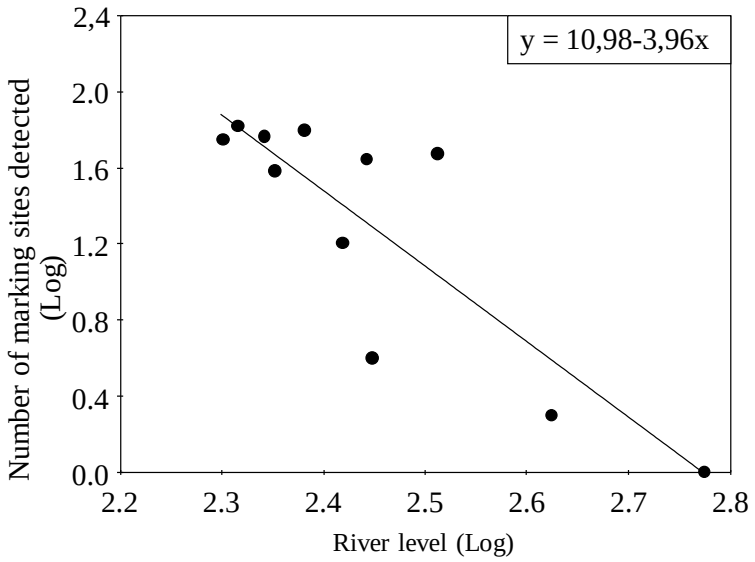


Figure 3: Correlation (line) among the river water level on the *Lontra longicaudis* marking sites observed during 2016. Both variables were log-transformed.

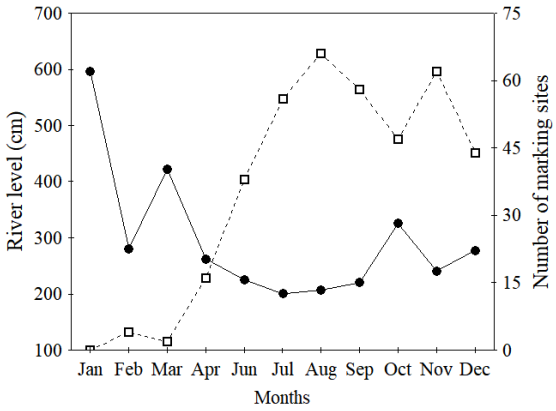


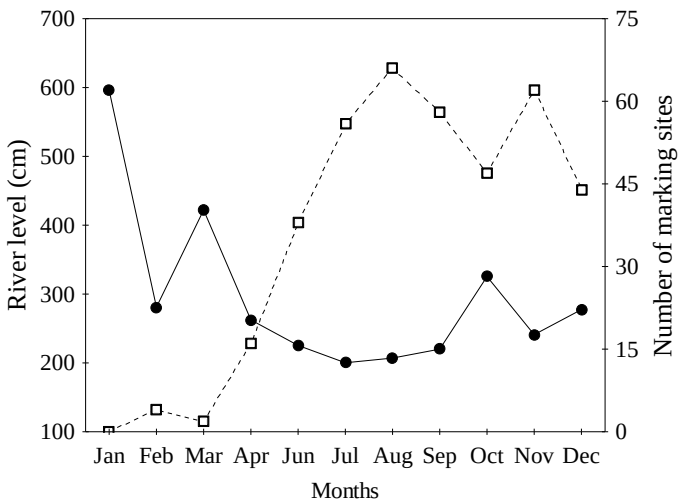
Figure 4: Values of the water level of the Paraná River (circles) and marking sites (squares) observed during 2016.

DISCUSSION

The most used sites found were on rocky substrates, agreeing with the findings in other studies, in which the majority of spraints were found on rocks, followed by sandy cavities (Pardini and Trajano, 1999; Kasper et al., 2004; Uchôa, 2004). These markings were also observed on fallen logs, as also recorded by Kasper et al. (2004; 2008). On the other hand, Santos and Reis (2012), found spraint mainly on bare soil and grass along streams. This indicates that the choice of marking position on the conformation of the banks, and thus the substrate available – in this study, the banks were mainly rocky, indicating that otters did not show any bias against rocky substrates, but does not establish a preference for it. In fact, it appears that the Neotropical otter shows high plasticity in the choice of scent marking sites, tending to be generalist in relation to the habitat structure (Coletti et al., 2013).

Most marking sites were only used occasionally; this pattern was found in several other studies (Pardini and Trajano, 1999; Quadros and Monteiro Filho, 2002; Kasper et al., 2004; Colleti et al., 2013). The higher concentration of spraints at certain points is possibly associated with sites most used by the animal, a behaviour also observed for *Lutra lutra* (Green et al., 1984) and *Lontra canadensis* (Melquist and Hornocker, 1983). However, observational studies of faeces alone cannot confirm preference of use for that location by the species, since many factors can hinder observation of evidence, such as the presence of litter and changes in river level (Quadros and Monteiro-Filho, 2002).

When the river level was low, more marking sites were found, which could be explained by the greater availability of suitable sites on exposed rocky substrate, which also easier to find otter sign on (faeces, scratches, footprints, anal mucus, etc) than other substrates.. In addition, since high water levels wash away the markings, an increase in “re-marking” could be expected following this (Quadros and Monteiro-Filho, 2002; Roberts et al., 2016). Roberts et al. (2016) found greater relative occurrence of spraints with mucus in similar post-flood conditions. Almeida et al.



(2012) observed a greater probability of finding latrines when the river depth was lower. There are many possible factors for this result, such as prey availability and reproduction (Roberts et al., 2016). This way, the oscillation of spraint number with the alternation of the periods is not necessarily related to the density of otters, so it is therefore not possible to estimate population indirectly using only otter sign (Jenkins and Burrows, 1980; Pardini and Trajano, 1999; Ruiz-Olmo et al., 2001).

As the river level rises and floods the adjacent areas, most of marking sites and are washed away (Ruiz-Olmo and Gosálbez, 1997). During flooding, in some places, the river bank will have steep rocky walls or, in others, a flatter area covered by vegetation, thus reducing the number of places available for spraint deposition. As a result of physical conditions, access to certain sites for researchers is hampered by the slope of the terrain or the density of vegetation. In addition to inaccessibility, the areas next to the water margin are typically litter-strewn, which makes it much harder to see tracks or spraint (Quadros and Monteiro-Filho, 2002). The lack of traces in February, a month with low river level but only four observed sites, can be attributed to the high fluctuation of the river level in this specific year. Historically, it would be expected that the river level would be high in this month, but due to climatic factors, it had dropped in February and risen again in March. Thus, our results showed that the regulation of river level influences the available habitat of otters on Paraná River, and the operation of hydroelectric situated upstream could be a limiting factor on the living area available to the otter population.

CONCLUSION

If a study area is situated on a floodplain, it will undergo seasonal variations due to the flood pulse, which would normally be heavily influenced by rainfall. When, however, there are upstream dams, operated to regulate flow for energy generation, (Agostinho et al., 2009), this has a much greater effect on flow, with river level potentially oscillating even over a single day.

According to our results, the detection of scent marks (spraint, anal mucus and other otter sign) is affected by river level, which negatively affects the accuracy of visualization of the marking behaviour of the species. The absence of relation between the detection of scent marks and rainfall supports the accuracy of this discovery, indicating that river level acts as the major regulatory agent of the detection of scent marking. This indicates that river level fluctuations, must be taken into account when designing studies or drawing conclusions based on detection of otter spraint.

We also conclude that the greater availability of rocky substrate, and the greater ease of observation of otter spraint etc on it, means that more otter sign was observed on this type of substrate, rather than it being a preference of the animal. We suggest that low river level is the best period to look for signs of otters, because the available substrate is easier to access for survey, and otter sign is easier to see.

The great influence of upstream hydroelectric dams on river level, and available habitat for otters, and the fact that flow is regulated entirely to meet the demands of energy production, means that they should be considered a potential threat to the otter population.

For this reason, long-term studies are necessary to monitor the otter population, and are essential for the development of mitigation and conservation measures. We emphasize that marking studies alone do not indicate habitat preference or population density, because spraint and so on are so easily removed by environmental factors such as river level. Moreover, we suggest that future research should be carried out to investigate seasonality of otter marking behavior and the impact of daily fluctuations of river level as a result of dam flow regulation on otter behavior.

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RÉSUMÉ

LA DÉTECTION DU MARQUAGE DE LA LOUTRE À LONGUE QUEUE (*Lontra longicaudis*) INFLUENCÉE PAR LE NIVEAU D'EAU EN PLAINE INONDABLE

Le but de cette étude était de caractériser l'habitat utilisé par la loutre à longue queue sur une section donnée de la plaine inondable et d'examiner l'influence du niveau de la rivière sur la détection du marquage olfactif, défini comme épreinte et/ou sécrétion anale. Durant un an, des marquages olfactifs ont été recherchés sur une section de 6 km en rive gauche de la rivière Paraná. Nous avons classé ces sites en fonction du type de substrat et de la fréquence d'utilisation. Une analyse de régression linéaire a été appliquée entre le niveau de la rivière et le nombre de sites de marquage trouvés. La plupart des sites positifs ont un substrat rocheux, ensuite sableux. Un peu plus de la moitié des sites de marquage n'étaient utilisés qu'occasionnellement et peu de sites étaient associés à une activité élevée. L'abondance du substrat rocheux, lorsque le niveau de la rivière est bas, est probablement responsable de la fréquence élevée d'indices de présence de loutre. Nous suggérons que des études sur le marquage de *Lontra longicaudis* dans une plaine inondable soient effectuées pendant les périodes d'étiage de la rivière afin de faciliter la détection d'indices de présence de la loutre. Nous tenons à souligner que les estimations de densité et de préférence d'habitat ne peuvent pas être basées uniquement sur les sites de marquage, car ce comportement et sa détection sont sujet à des variations dues à de nombreux facteurs, en ce compris la variation du niveau de la rivière.

RESUMEN

DETECCIÓN DEL MARCADO POR NUTRIAS NEOTROPICALES (*Lontra longicaudis*), INFLUENCIADA POR EL NIVEL DE LAS AGUAS FLUVIALES EN UNA PLANICIE DE INUNDACIÓN

El objetivo de este estudio fue caracterizar el hábitat utilizado por la Nutria Neotropical en una sección de la planicie de inundación y examinar la influencia del nivel del río en la detección de sus sitios de marcado, los que están formados esencialmente por marcas de olor y/o mucosidad anal. A lo largo de un año, inspeccionamos una sección de 6 km sobre la margen izquierda del Río Paraná, buscando signos de marcado. Esos sitios fueron clasificados en cuanto al tipo de sustrato y la frecuencia de uso. Aplicamos un análisis de regresión lineal, entre el nivel del río y el número de sitios de marcado encontrados. La mayoría de los sitios positivos tienen sustrato rocoso, seguido por arenoso. Un poco más de la mitad de los sitios de marcado fueron usados sólo ocasionalmente, y pocos estuvieron asociados con alta actividad. La abundancia de sustrato rocoso cuando el río está bajo, es probablemente la responsable de la alta frecuencia de signos de nutria detectada. Sugerimos que los estudios de marcado de *Lontra longicaudis* en planicies de inundación deberían llevarse a cabo en períodos de bajo nivel de los ríos, para facilitar el hallazgo de signos. Enfatizamos que las estimaciones de densidad y de preferencia de hábitat no pueden basarse solamente en los sitios de marcado, porque tanto este comportamiento como su detección están sujetos a variaciones debidas a muchos factores, incluyendo la oscilación en el nivel de los ríos.

RESUMO

INFLUÊNCIA DO NÍVEL DO RIO NA DETECÇÃO DE MARCAÇÕES DE LONTRA NEOTROPICAL (*Lontra longicaudis*) EM UMA PLANÍCIE DE INUNDAÇÃO

O objetivo desse estudo foi caracterizar o habitat utilizado pela Lontra Neotropical em um trecho de planície de inundação e avaliar a influência do nível do rio na detecção de locais de marcação, que são essencialmente demarcados por sinais odoríferos. Ao longo de um ano, um trecho de 6km na margem esquerda do rio Paraná foi vistoriado à procura de pegadas, fezes e muco anal. Esses locais foram caracterizados pelo tipo de substrato e frequência de uso. Além disso, foi aplicada uma análise de regressão linear entre o nível do rio e o número de marcações encontradas. A maioria dos locais encontrados apresentou substrato rochoso, seguido por areia. Pouco mais da metade dos locais de marcação foram ocasionais e poucos foram associados à elevada atividade animal. A elevada presença de substrato rochoso nesse local quando o rio está baixo provavelmente é responsável pela elevada frequência de sinais de marcação encontrada. Sugere-se que estudos com marcação de *Lontra longicaudis* em planície de inundação devem ser realizados em períodos com baixo nível do rio para facilitar o encontro de sinais de marcação. Enfatizamos que estimativas de densidade e de preferência de habitat não podem ser baseados em locais de marcação, porque este comportamento é sujeito a variações devido a vários fatores, como a oscilação do nível do rio.

R E P O R T

GOOD NEWS FROM THE SOUTH: FILLING THE GAP BETWEEN TWO OTTER POPULATIONS IN ITALY

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Abstract: Following a severe decline in Italy in the second half of the last century, the Eurasian otter (*Lutra lutra*) has been confined in the southern part of the peninsula with two isolated nuclei. Similar to other European populations, a slow recovery of the two disjointed populations started in the 90s. Filling the range gap was set as a main objective of the national action plan released in 2011. To assess the achievement of this target we ran a systematic survey in 2017 in the gap area, searching for otter signs in two river basins and two lakes in the Tyrrhenian (Campania) and Adriatic (Puglia) portions of the gap area. Otters were detected along most of the hydrographic network surveyed in the Tyrrhenian side, and only in few sites in the Adriatic side. Results confirmed the gap filling between the two sub ranges, and highlighted the need for a habitat survey in the Adriatic water courses. Our results have implications for the long-term survival of the small and endangered otter population in Italy.

Keywords: *Lutra lutra*, Volturno river, Candelaro river, recovery.

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INTRODUCTION

The Eurasian otter (*Lutra lutra*) is one of the most threatened mammals in Italy, listed as Endangered in the IUCN Red List of Italian vertebrates (Rondinini et al. 2013). Once widespread in the whole peninsula (Giglioli, 1880; Cavazza, 1911; Ghigi, 1911; Bonelli and Moltoni, 1929), the otter started to decrease in the 1970s. The first national survey undertaken in 1971-1973 showed that the species was still widespread, but decreasing and showing a fragmented distribution in northern regions (Cagnolaro et al., 1975). Later investigations based on interviews with forestry service and hunting associations didn't show any improvement of the otter status (Spagnesi and Cagnolaro, 1981; Pavan and Mazzoldi, 1983). The first direct field surveys run in the late 70s revealed that the otter was decreasing at an alarming rate (Wayre, 1976; Macdonald and Mason, 1983).

This situation led to a more accurate national systematic survey run between 1984 and 1985, coordinated by the WWF and sponsored by the Italian Ministry of Environment (Cassola, 1986). The survey returned an even more dramatic picture: the species was extinct in northern Italy, extremely reduced and fragmented in central Italy, and a viable population only survived in most southern regions (Basilicata and part of Calabria, Puglia and Campania), being completely isolated from any other European population (Cassola, 1986; Beseghi and Donati, 1987).

Thereafter, the use of standard survey techniques (Reuther et al., 2000) became more frequent and independent investigations detected the disappearance of all residual nuclei in central Italy (Prigioni et al., 1989; Reggiani et al., 1995, 2001; Mattei et al., 2001) while new occurrences were detected in some southern river basins (Reggiani and Ciucci, 1994; Agapito Ludovici et al., 1994). Systematic surveys run between 2002 and 2004 in southern Italy confirmed the presence of otters in the most southern regions, and the existence of a small isolated population in the central - southern region of Molise (Loy et al., 2004; Marcelli, 2006) (Fig. 1). To face this dramatic situation a national action plan was set up in 2011, aimed at increasing awareness, reducing threats, and supporting otter recovery (Panzacchi et al., 2011; Loy et al., 2010).

Since 2000s, otters have been recovering in many European countries, likely as a consequence of the coming into force of strict protection and banning of polychlorinated biphenyls (PCBs) by the European Union (Ruiz-Olmo et al. 2000). Evidences of range expansion were also recorded in the last ten years in both portions of the Italian range (Prigioni et al., 2005; De Castro and Loy, 2006; Marcelli and Fusillo, 2009a; Panzacchi et al., 2011; De Castro et al., 2013; Marrese et al., 2014; Balestrieri et al., 2016). Also, otters were recently recorded at the north eastern Italian border, likely following range expansion from Austria and Slovenia (Pavanello et al. 2015). However, the expansion rate of the otter in Italy seems slower compared to that observed in other European countries (Ruiz-Olmo and Delibes, 1998; Janssens et al., 2006; Crawford, 2003), and the southern sub-ranges were still disjointed in the last Habitat Directive EC/43/92 report (Loy et al., 2015; Fig. 1). These two areas are separated by about 100 km of river stretches, covering the medium part of Volturno on the Tyrrhenian side and Candelaro river basin on the Adriatic side (Fig. 2). Recent occasional findings of otter signs in this gap area (Loy et al. 2015; Scorpio et al. 2016) encouraged a new systematic survey aimed at assessing the connection of the two portions of the range, representing a main goal of the national action plan (Panzacchi et al., 2011; Loy et al., 2010).

Figure 1. Current EOO of the otter in Italy (from Loy et al. 2015).

STUDY AREA AND METHODS

The study area covers about 9 300 km^2 across the Apennine watershed (highest altitude in the area: 1 086 m) in southern Italy (Fig. 2), with streams flowing eastward to the Adriatic Sea and westward to the Tyrrhenian Sea. The Adriatic landscape is characterized by intensive agricultural lowland plains, where water bodies mainly comprise channels and lagoons. The western Tyrrhenian landscape is more heterogeneous and hilly, with rivers flowing in crops, riparian forests and woodlands (CORINE Land Cover, 2012). The average human density is 98/km^{-2} in the eastern part (63/km^{-2} excluding largest towns) and 148 km^{-2} in the western part (124/km^{-2} excluding largest towns) (data source: National Institute of Statistics, 2013).

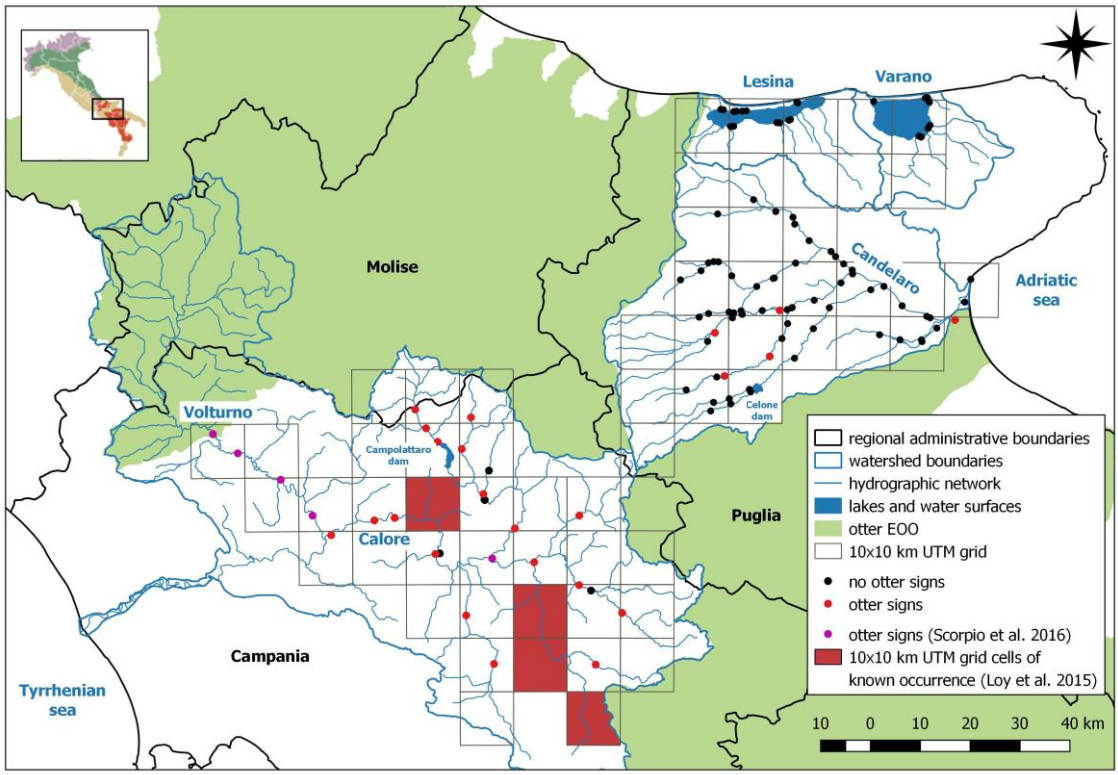

Figure 2. Study area with locations of positive and negative sites overlaid to the UTM grid.

The Volturno is a key river basin for the Italian otters (Panzacchi et al., 2011): it is one of the largest catchments of southern Italy, covering an area of 5 450 km^2 and connecting 15 different water basins (Regione Molise, 2016). Calore, the main tributary of the Volturno river, and Candelaro are the main rivers flowing respectively in the western and eastern parts of the study area (Fig. 2). Calore covers 3 058 km^2 and about 500 km of hydrographic network (river flow: 32 m^3 s^{-1}). The Calore river is known to host otters only in the upper part, and only occasional signs have been recorded in the middle stretches downstream of the city of Benevento (Loy et al., 2015; Scorpio et al., 2016). The Candelaro water basin covers an area of 2 560 km^2 and 350 km of hydrographic network (river flow: 2.5 m^3 s^{-1}). Additionally, we investigated the Lesina and Varano coastal lakes (51 km^2 and 60 km^2) respectively, where the species has not been detected since the 1990s (Cassola, 1986; Reggiani and Ciucci, 1994; Marrese and Caldarella, 2005). A total of 94 sites were surveyed in 36 Universal Transverse Mercator (UTM) squares: 19 sites in the western Tyrrhenian, and 75 in eastern Adriatic side of the Apennine watershed. Following the standard procedure recommended by Reuther et al. (2000) up to four sites were surveyed for each 10 x 10 km UTM grid cell of the study area. We didn't survey UTM squares where otter signs were found in the last three years by other studies (Loy et al., 2015;

Scorpio et al., 2016). In order to optimize the survey efforts, sites were checked preferably starting from bridges, well vegetated river banks, or pools. We avoided those sites located on headwaters, low order streams (Strahler, 1974), or on dry watercourses. Where dense reedbeds along channel banks prevented the search for marking sites, signs were only searched for under bridges. Rivers were checked for otter signs, especially spraints, along at least 600 m of one bank (Reuther et al., 2000). As soon as a reliable otter sign was found, the transect line was stopped; only when otter signs were found immediately at the beginning of the transect we checked the first 100 metres of the river in order to investigate the prevalent environmental characteristics. The survey was carried out between March and May 2017 avoiding periods of heavy rainfalls in the previous week (Fusillo et al., 2007; Imperi, 2013).

RESULTS

All squares on the western side of the study area were positive for otter presence (Fig. 2). Otter signs were found at 22 sites out of 94 (23%). However, a large difference in relative proportion of positive vs negative sites was observed in the Tyrrhenian (22 out of 27 = 81,4%) vs the Adriatic (5 out of 67 = 7,4%) side. Otters were found in all stretches of Calore River and its tributaries: Tammaro, Miscano, Ufita, Fredane, and Sabato. In 65% of sites of this area, signs were found in the first 100 m of the transect. Moreover, despite the short length of the stretches surveyed (i.e. < 100 m) on some rivers (i.e. Ienga creek, Ufita and Fredane rivers) we found high densities of marking sites (Fig. 3). Otter were also found in the Sabato River, downstream of the densely populated city of Avellino, inside an industrial area and close to a hydroelectric power station (Fig. 4).

Figure 3. One of the stretches showing high density of marking sites found in the study area.

On the Adriatic side only four sites were positive for the presence of otters, and one was doubtful (Fig. 2). All positive sites were found in the Candelaro river basin, along the Salsola and Vulgano creeks, where a latrine was found in front of a waste

water outfall in the suburbs of the city of Lucera (Fig. 4). The riverine vegetation belt of the Candelaro river was narrow (less than 10 m wide) and mainly composed of reedbeds often destroyed by cutting. However, the freshwater fauna of the lower part of the river appeared quite rich.

Figure 4. Sprainting sites in the industrial area (a) and close to a little hydroelectric power station (b) in the suburbs of Avellino (Campania), and in front of a wastewater outfall (c) in the suburbs of Lucera (Puglia).

DISCUSSION

Our results revealed that the gap area between the two portions of the otter range in southern Italy has been filled up, and the species now occurs in one continuous range from Abruzzo to Calabria and Puglia (Fig. 5). Compared with results of surveys conducted in the last decade within the Tyrrhenian side of the gap area (De Castro et al., 2013; Loy et al., 2015; Scorpio et al., 2016), all river stretches previously found to be negative are now positive. This widespread occurrence, the high density of marking sites and the occurrences in suboptimal patches around large cities suggest that on the Tyrrhenian side otters have likely reached the carrying capacity (Fretwell, 1972) of the gap area. These outcomes encourage future surveys in the neighbouring rivers in the Latium region that were recently found still avoided of otters (Giovacchini and Loy pers. obs.).

Conversely, otters are still rare in the Adriatic side of the gap area, concentrated in the Candelaro river basin and clustered in small tributaries. Interestingly, they occur in suboptimal patches and are absent from pristine riverine habitats and high water quality water courses like the San Lorenzo and Celone creeks (ARPA Puglia, 2015). These creeks run into the Celone reservoir, and during the survey period there was no water downstream of the dam. As usually dams do not prevent movements of otters and reservoirs could rather increase survival during periods of drought (Basto et al., 2011; Pedroso et al., 2007, 2014) it is rather the absence of water downstream that might have prevented otters from colonizing the pristine upstream stretches of these creeks. Signs of otter found during opportunistic searching in shallow marshes near the mouth of Candelaro river (Marrese, pers. obs.) suggest that otters arrived from the

southern Cervaro river basin, by moving through a drainage channel connecting both river basins, as other signs were previously found along this water body (Marrese, pers. obs.). As the fish community seems to be quite rich, it is possible that the otter expansion in this water basin is just starting, and future surveys could likely witness a further increase of positive signs.

Figure 5. New EOO of the otter in Italy filling the gap between the two disjointed portions.

Despite otters being sighted in the past in both Lesina and Varano lakes (Marrese and Caldarella, 2005), only a very old spraint was found on an artificial heap of rocks in the Varano lake (maybe a shag (*Phalacrocorax aristotelis*) pellet: Dell'Omo, pers. com.), and none in the Lesina lake. Although numerous fish nets and fish traps suggested good availability of feeding resources, the water quality is classified as 'Poor' for the Lesina lake, and 'Moderate' for the Varano (ARPA Puglia, 2015). The evidence suggest that the lakes could be frequented only by wandering individuals. However, survey of the lakes may have also suffered from a low detection probability, as most areas were not accessible to survey (soft muddy shores, artificial channels and private properties).

CONCLUSION

The new occurrence records collected during this study indicate that the Italian otter population has been reunified in one single continuous EOO (*sensu* IUCN, 2012). The gap filling between the two portions of the southern Italian range is likely related to improving habitat quality during the last 20 years, e.g. higher water quality, natural recovery of riverbank vegetation (Carone et al., 2014), and lower human impact on streams (Marcelli and Fusillo, 2009b). The rejoining has several implications on the conservation and management of the Eurasian otter in Italy:

i) it guarantees gene flow across the whole southern range;
ii) it promotes the metapopulation dynamics and diminishes the risk of extinction of sub populations (Christie and Knowles, 2015), especially in the small

northern portion, safeguarding the ongoing northward expansion (Panzacchi et al., 2011; Imperi, 2013).

Otters have likely reached carrying capacity in the Tyrrhenian portion of the gap area, making a further expansion northward in the near future highly probable, especially in the neighbouring Lazio region, which is still devoid of otters (Giovacchini and Loy, pers. obs.).

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RÉSUMÉ

BONNES NOUVELLES DU SUD: REMPLISSAGE DU GAP ENTRE DEUX POPULATIONS DE LOUTRE EN ITALIE

Après le déclin important de la deuxième partie du XXe siècle en Italie, la loutre (*Lutra lutra*) a été confinée dans la partie sud de la péninsule. Depuis les relevés effectués dans les années 80, la zone d'occurrence de cette espèce a subi une expansion lente mais constante, tout en maintenant deux populations disjointes. Le remplissage de ce gap est un des objectif du plan d'action nationale publié en 2011. Pour évaluer la réalisation de cet objectif nous avons réalisé une etude systématique dans la zone de connexion, à la recherche de signes dans deux bassins fluviaux et deux lacs des Pouilles et de la Campanie. Signes des loutres ont été détectées le long de la plus grande partie du réseau hydrographique étudié, ce qui confirme le comblement des lacunes entre les deux aires de répartition, qui sont maintenant reliées en une seule zone d'occurrence. Cette réalisation a des résultats pertinents sur la survie à long terme de la petite population menace de loutres italiennes.

RESUMEN

BUENAS NOTICIAS DEL SUR: LLENANDO LA BRECHA ENTRE DOS POBLACIONES DE NUTRIA EN ITALIA

Después del severo declive ocurrido durante la segunda parte del siglo 20 en Italia, la nutria (*Lutra lutra)* estaba confinada en la parte sur de la península, con dos núcleos aislados. De manera similar a otras poblaciones europeas, en los 90s comenzó una

lenta recuperación de las mismas. Llenar la brecha entre las dos subpoblaciones fue uno de los principales objetivos del plan de acción italiano lanzado en 2011. Para evaluar el logro de este objetivo, realizamos en 2017 un relevamiento sistemático en el área de conexión, en busca de señales de nutrias en dos cuencas fluviales y dos lagos de las porciones Tirrena (Campania) y Adriática (Puglia) del área de la brecha. Se detectaron nutrias a lo largo de la mayoría de la red hidrográfica estudiada en el lado Tirreno, y sólo unos pocos sitios en el lado Adriático. Los resultados confirmaron el relleno de la brecha entre las dos áreas de distribución inconexas, y resaltan la necesidad de un relevamiento de los hábitats en los cursos de agua Adriáticos. Estos resultados tienen implicancias para la supervivencia a largo plazo de la pequeña y amenazada población de nutrias en Italia.

R E P O R T

DIET OF *Lontra longicaudis* IN ESPEJO RIVER, QUINDÍO, COLOMBIA

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Abstract: We studied the diet of the Neotropical otter, *Lontra longicaudis* in the Espejo River (Department of Quindío, Colombia). This river has the highest levels of pollution within the catchment area of the La Vieja River. We visited a 5.6 km section of the river on nine occasions during the month of July 2009 and collected 131 otter scats. The fecal samples were washed, sieved, and their contents were examined. Stool samples indicated that the otter's diet in this river is mainly composed of fish comprising seven predated species. The most common prey items were *Hypostomus* sp. (31.6% of samples) and *Brycon henni* (29.22% of samples).

Keywords: anthropic disturbances, carnivore, foraging, environmental pollution

INTRODUCTION

The Neotropical otter *Lontra longicaudis* is a key predator in tropical aquatic environments, and the species occupies the highest level of the food chain (Gallo-Reynoso et al., 2008) and plays a regulatory role in the food web in aquatic systems (Waldemarin, 2004). Although there have been studies on this otter in the coffee-growing ecoregion of Colombia (Botero-Botero and Torres-Mejia, 2007; Mayor-Victoria and Botero-Botero, 2010a; Mayor-Victoria and Botero-Botero, 2010b; Restrepo and Botero-Botero, 2012), information for the Espejo River on its natural history needs to be collected.

This species is in danger of local extinction due to a series of anthropogenic factors (Botero-Botero and Torres-Mejia, 2007). Although it has been reported that the otter tolerates water pollution, the Espejo River is one of the most polluted in the basin of the La Vieja River due to discharges of industrial and urban wastewater, along with local agricultural and livestock activities (Botero-Botero and Torres-Mejía, 2007; Londoño et al., 2007). This can affect the otter due to the loss of food resources and the deterioration of riparian habitats where it finds refuge.

Here we present a description of the diet of the Neotropical otter in the Espejo River (department of Quindío, Colombia) that can serve as baseline information for the protection of the food resources of this species in the study area.

MATERIALS AND METHODS

Study Area

The Espejo River is located to the northeast of the department of Quindío, Colombia (Fig. 1). The river starts at an altitude of 1300 m at the bridge of Pantanillo (municipality of Montenegro) and flows into the La Vieja River, west of the municipality of La Tebaida. It is a tertiary class river of 40.1 km in length with a catchment area of 159 km^2 and is fed by a large number of tributaries including La Coqueta, La Blanquita, El Vadeo and Anapoima, among others.

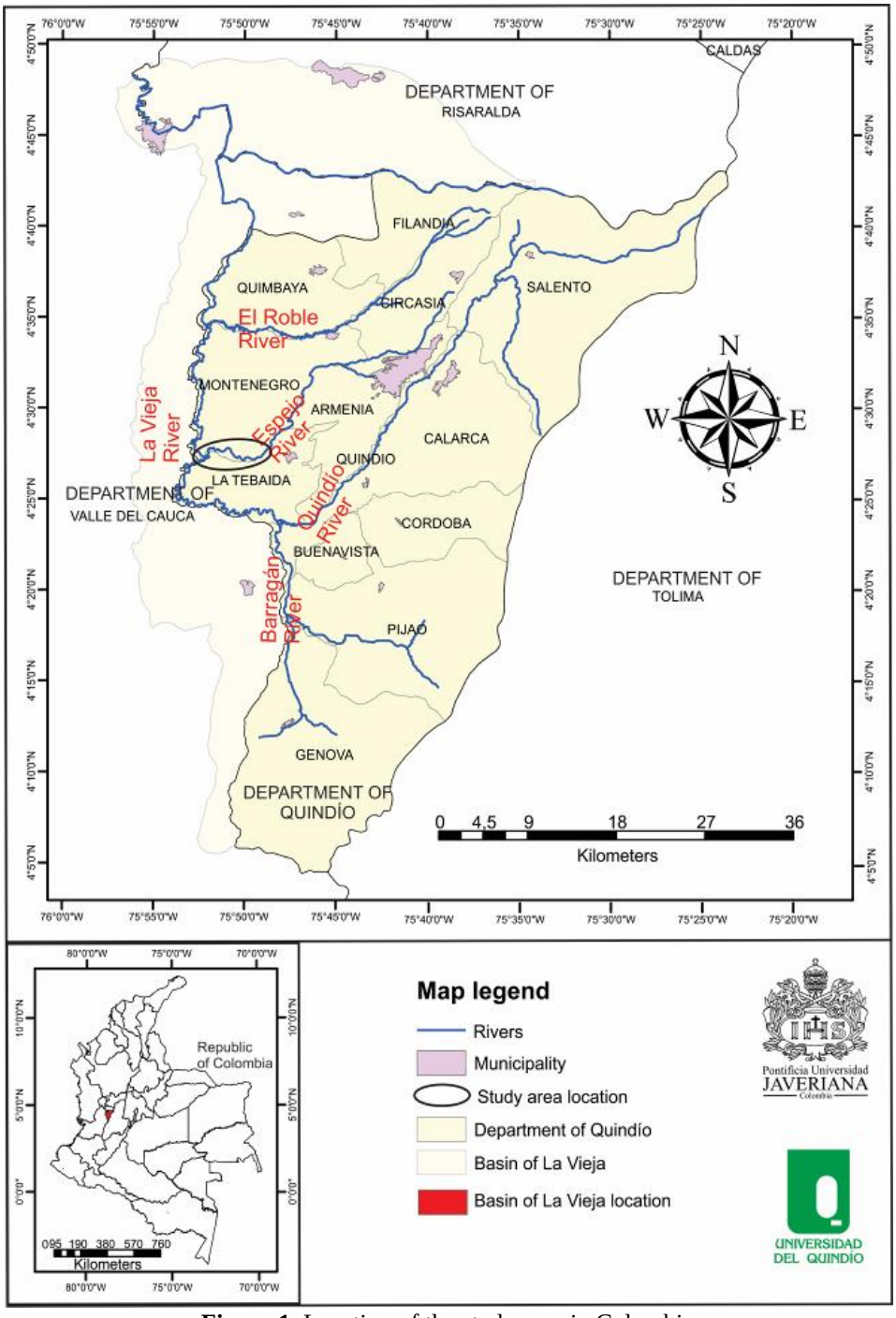

Figure 1. Location of the study area in Colombia

The river begins at the union of two streams: Hojas Anchas and Armenia. The Espejo River originally was a river of clean and crystalline waters but nowadays it contains high levels of organic contamination from wastewater from both urban and industrial sources. The pollution of the river is mainly due to the lack of enforcement and paucity of legal regulations on the quality of waters discharged into it (Londoño et al., 2007). The sector most affected by pollution is the central section, where the Armenia stream brings water from the municipality of the same name. From this point and downstream the color of the water changes, oxygen levels fall, the biochemical and chemical oxygen demand increase (BOD and COD), and turbidity levels are high (Londoño et al., 2007).

During our study, we observed that, although the river had an important degree of pollution, the riparian vegetation was well preserved. However, overall these changes represent an important decrease in the quality of the habitat and food resources for the otter.

Data Collection

During July 2009, we walked nine 5.6 km lengths along the lower section of the river. During each trip, we surveyed the area by searching for spraints (otter scats). When otter scats were located, we collected each one and stored it in a plastic zipper bag and labeled it with the following data: GPS coordinates, altitude (meters above sea level), time, date, collector's name, level of desiccation, and the number of spraints found at each point.

We froze the samples until required for processing. In the laboratory, we separated each sample and gently washed it with water and liquid soap in a 2.4-micron sieve. We dried the food items found in each sample in a convection oven (Cole Parmer® Model 05015-58) at 250 °C and separated the identifiable fragments of the diet by food categories, dividing them into fish, mammals, birds, seeds, hairs, gastropods, larvae and plant remains.

The vertebrae and scales of the different fish were identified with the help of the fish guide for the region (Mayor-Victoria 2008). The relative frequency of occurrence of each food item (FR) was calculated using the formula: FR= (n_i/n).100, where: n_i= number of fecal samples with the food item *i* and *n*= total fecal samples found (Anderson et al., 2008). We classified the items consumed by otters as constant items (FR>50%) accessory items (FR= 25-50%), or accidental items (FR< 25%), following the classification of Biffi and Iannacone (2010). We calculated the proportion of occurrence of each prey item in the samples using the formula: $PA=f_i/F$.100 where: f_i is the number of spraints in which species *i* appeared and *F* is the total number of occurrences of all prey types in all the droppings, and we calculated the total items by adding all the f_i values (Casariego-Madorell et al., 2008).

RESULTS

The Espejo River otters showed evidence of a wide spectrum of food items. Fish predation dominated both in the number of species predated (*S*=7), and the percentage of their occurrence in stool samples (*PA*=69.1). These were followed by mammals (*PA*=6.2), birds (*PA*=3.7); and finally, other items such as seeds, gastropods, invertebrate larvae, insects and hairs that were pooled and considered in a single group *(PA*=2.7*)* (Table 1).

Otters showed a clear tendency to consume fish of the family Loricariidae, especially the specie *Hypostomus niceforoi* (*FR*=31.60; *PA*=22.6, classified as a constant dietary item), and the genus *Ancistrus* (*FR*=20.40; *PA*=14.5; classified as an accessory item). Consumption of fishes in the family Characidae was found to mainly

involve medium-sized species, such as *Sabaleta* (*Brycon henni*, *FR*=29.22; *PA*=20.1; classified as a constant dietary item), and to a lesser proportion small fish such as *Astyanax* sp. (accidental prey) and *Lebiasina* sp. (accidental prey). Finally, the family Heptateridae was represented by the genus *Rhamdia* (accidental item) (Table 1).

Table 1. Relative frequency (%) of prey consumed by the Neotropical otter in the Espejo River (Colombia). We calculated the percentage value separately for each item from the total samples analyzed, because it is more than one item per sample.

Otter prey			Relative frequency (%)
Fish (98.2%)	Loricariidae	*Hypostomus niceforoi.*	31.6
		Ancistus spp.	20.4
		Chaetostoma	6.0
	Heptapteridae	*Rhamdia* sp.	10.0
	Characidae	*Brycon* sp.	29.22
		Astianax sp.	0.4
	Lebianisidae	*Lebiasina* sp.	0.4
Mammals			35,52
Birds			12.0
Others (28.70%)	Seeds		12.9
	Gastropods		5.6
	Invertebrate larvae		4.6
	Vegetation		1.9
	Insects		3.7

DISCUSSION

The diet and distribution of the Neotropical otter populations are likely related to the ecological and behavioral habits of the fish species that form a major part of their diet (Lopes et al., 2012). This underlines the need to characterize species richness and abundance of the ichthyofauna in the area of study to determine the probability of each of these species being available as potential prey for the otter. In this way, it may be possible to understand the relationship between the different ecological and biological aspects of the fish species (e.g., habits, seasonal patterns, reproduction seasons, among others), with the prey selection behavior of the otters. This topic merits future research (Lopes et al., 2012).

Although many medium-sized predators consume a wide variety of resources, they generally prefer items based on their abundance, energy search costs and consumption risks (Begon et al., 2006). The preference for an item is reflected in the percentage of its prevalence in the diet; this reflects its use more than the percentage of occurrence in the environment (Begon et al., 2006).

Otters in the Espejo River mainly consume particular types of fish, as observed in previous studies in Colombia and elsewhere in Latin America (Macias-Sánchez and Aranda, 1999; Quadros and Monteiro-Filho, 2001; Gori et al., 2003; Kasper et al., 2004; Kruuk, 2006; Rosales, 2009; Mayor-Victoria and Botero-Botero, 2010a; Restrepo and Botero-Botero, 2012). The otter population in this river had a high tendency to prey on fish of the family Loricariidae, within which the species *Hypostomus nicefori* was the most frequently consumed. In the Espejo River the only species of *Hypostomus* present is *Hypostomus nicefori*, listed as a species introduced into the basin of the La Vieja River (com. pers. D. Taphorn). If the otters consume the

prey according to their availability, it is probable that the remains found in the feces belong to this species. This suggests that the Neotropical otter acts as a biological controller of this introduced species as it is its main food source.

The fish of *Hypostomus* shelter among tree roots and rocks in the water (Garavello and Garavello, 2004), and are easy prey for the otter. The slow movement and bentophage (bottom-feeding) habits of species within this genus facilitate their capture by the otter. These habits probably also imply lower energy expenditure in the process of pursuit and capture (Quadros and Monteiro-Filho, 2001; González et al., 2004; Mayor-Victoria and Botero-Botero, 2010a). This also explains the high occurrence of species in the genera *Ancistus* and *Chaetostoma* from the family Loricariidae, in which similar findings on the selection of slowmoving prey items were reported for otters in the La Vieja River (Restrepo and Botero-Botero, 2012), and the Roble River (Mayor-Victoria and Botero-Botero, 2010a; Lopes et al., 2012). These authors consider that *L. longicudis* engages in generalist and opportunistic feeding behavior, which favors the consumption of slow-moving prey, regardless of their size.

The fish species *Brycon henni* (Characidae) also occurred in scats samples at high frequencies. Fishes of this genus are characterized by their large sizes in Andean ecosystems, with individuals that exceed 115mm in length (Zuluaga-Gomez et al., 2014) and for their abundance in this region (García-Alzate et al., 2009; Botero-Botero and Ramírez-Castro, 2011). This would likely improve their detection by otters, for which they may represent valuable food resources that provide attractive returns on the energetic investment in the pursuit and capture of this type of prey. The presence of fish items of the genus *Rhamdia* (Heptapteridae) that are small fast-moving fishes with nocturnal habits such as *Astyanax faciatus* and *Lebiasina* sp. may reflect opportunistic predation events by the otters.

The presence of *B. henni* in the diet of the otter may explain the occurrence of several of the items detected in the food category of "others" (Table 1). In fact, these fishes can consume seeds and fruits as well as insect larvae, adult insects and small gastropods (Botero-Botero and Ramírez-Castro, 2011). The presence of seeds in the otter scat can be attributed to the fact that they form part of the diet of some fish consumed by the otters, and for this reason we do not consider them part of the diet.

A number of items classified as mammalian may correspond with small rodents related with bodies of water, as indicated by the type of hair registered in stool samples. However, the reference collection that we use does not allow us to obtain more precise mammal identifications; we need to improve the hair collection of small mammals in the area.

Although present at a very low proportion, we detected the consumption of birds in scat samples and we classified this as accidental. Although the consumption of birds by the otters has already been reported in other countries (Larivière, 1999), this constitute the first evidence for the consumption of birds by the Neotropical otter in Colombia. Gallo-Reynoso et al. (2008) reported the consumption of birds in the diet of *L. longicaudis*, mostly involving aquatic avian species. Similarly, Quadros and Monteiro-Filho (2001) reported that otters ate birds associated with the otter's habitat, underlining that the neotropical otter is a species with opportunistic feeding habits.

Despite its classification as accidental, we should investigate the importance of birds in the otter diet throughout its range in Colombia. Due to the elevated pollution levels on some rivers where they live, it is possible that the relative frequency of consumption of birds could increase relative to a decrease in the preferred fish resources due to river pollution.

As Botello says, (2004) in an evaluation on the state of the Neotropical otter in the Cauca river, "Factors such as the deterioration of riparian vegetation and alteration of water quality negatively influence the density of otter populations". Because the Espejo River contains high levels of contamination from domestic, industrial and agricultural origins (Londoño et al., 2007), we believe that Neotropical otters in this river are at risk of decreasing. Thus, we propose the establishment of a monitoring program for both otters and their prey.

In comparison with other studies (that had longer sampling periods) we found a high number of spraints. This could be due to the high density of otters, or to the fact that a few otters are showing high activity (searching for food or marking territory). Our data and the sampling used in this study does not allow for an evaluation of these options, and we suggest a population analysis in later studies.

Despite being more abundant at sites with low human presence, the Neotropical otter quickly adapts to environmental changes (Larivière, 1999). Also, the behavior of Neotropical otter normally is diurnal in areas with low human access, but behavior becomes nocturnal in areas with a high degree of human disturbance (Lariviére, 1999). The otter is abundant in places with low human presence and quickly adapts to environmental changes (Larivière, 1999), the fact that the Espejo River has a significant degree of pollution and the riparian vegetation is well-preserved could favor the otter, since this vegetation could be a refuge for potential prey of the otter.

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RÉSUMÉ

LE RÉGIME ALIMENTAIRE DE *Lontra longicaudis* DANS LA RIVIÈRE ESPEJO, QUINDIO, COLOMBIE

Nous avons étudié le régime alimentaire de la loutre à longue queue, *Lontra longicaudis*, dans la rivière Espejo (département de Quindío, Colombie). Cette rivière a les plus hauts niveaux de pollution du bassin versant de la rivière La Vieja. Nous avons parcouru une section de la rivière de 5,6 km à neuf reprises au cours du mois de juillet 2009 et avons recueilli 131 épreintes. Les échantillons de matières fécales ont été lavés, tamisés et leur contenu examiné. Les échantillons d'excréments ont indiqué que le régime alimentaire de la loutre dans cette rivière est principalement composé de poissons comprenant sept espèces capturées. Les proies les plus courantes étaient *Hypostomus* sp. (31.6 % des échantillons) et *Brycon henni* (29.22 % des échantillons).

RESUMEN

DIETA DE *Lontra longicaudis* EN EL RÍO ESPEJO, QUINDÍO, COLOMBIA

Estudiamos la dieta de la nutria Netropical, *Lontra longicaudis*, en el Río Espejo (Departamento del Quindío, Colombia). Este río presenta los más altos niveles de contaminación en la Cuenca del Río la Vieja en esta región. 5.6 km del río fueron muestreados en nueve ocasiones durante el mes de Julio de 2009, donde se colectaron 131 muestras fecales de las nutrias. Las muestras fueron lavadas, tamizadas y analizadas. La dieta de la nutria en el río Espejo se compone principalmente de siete especies de peces depredadas. Las presas más comunes fueron *Hypostomus* sp. (31% del total de muestras) y *Brycon henni* (29% del total de muestras).

S H O R T N O T E

NEW LOCATION FOR THE EURASIAN OTTER *Lutra lutra* IN THE CATCHMENTS OF THE WESTERN RIF MOUNTAINS OF MOROCCO

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Abstract: The Eurasian Otter *Lutra lutra* has experienced a resurgence in Europe attributed to pollution control policies particularly organochlorine pesticides and polychlorinated biphenyls (PCBs). However, little is known about the species' presence in North Africa. Here, we report the first direct observations of otters in two major rivers in the western Rif Mountains of North Morocco. We made opportunistic observations of otters while surveying and monitoring Barbary Macaques *Macaca sylvanus*, which inhabit steep river canyons in this area of their distribution. We observed three individual otters in two different rivers confirming the species' presence in the western Rif. We intend to continue surveying for otter presence and to set camera traps in river canyons when circumstances allow.

Key words: Eurasian otter, *Lutra lutra*, Morocco, Rif Mountains

INTRODUCTION

The Eurasian Otter *Lutra lutra* has Near Threatened status on the IUCN Red List. The species is making a strong recovery in many parts of Europe but its status in Morocco and the rest of its African range is far from clear (Delibes et al., 2012). A survey was conducted in the watersheds of the Middle and High Atlas in 1983 and repeated in 2011 (MacDonald and Mason, 1983; Delibes et al., 2012). The 2011 survey found results similar to those of 1983 with the caveat that the species might be declining on the lowland plains (Delibes et al., 2012). Neither of these surveys investigated the catchments of the western Rif Mountains in the north of Morocco. Here we present what is, to the best of our knowledge, the first documented observation of otters in the Western Rif Mountains.

STUDY SITES

Our study site where we survey and monitor the Endangered Barbary macaque *Macaca sylvanus* includes the mountainous areas of Bouhachem mixed oak forest, Talessemtane National Park (NP) and its surroundings and the canyons connecting Talessemtane NP to the calcareous massif running south east from Tétouan (Fig. 1). The carnivore species in these areas are not well studied. Local people do not fish for

subsistence; they frequent the river canyons only if preparing and cultivating the more accessible areas for cannabis cultivation, so may be unaware of otter presence.

We employ local ecological knowledge to ascertain presence of macaques in what is often steep inhospitable terrain and we then verify the reports by surveying the sites named by participants and recording sight or sign of macaques. Since 2015, we have been working in and around Talessemtane NP and began visiting the steep narrow canyons surrounding the park where local people alerted us to the presence of Barbary Macaques. The macaques feed on the dense riparian vegetation such as that described by MacDonald and Mason (1984) which forms impenetrable thickets along and above the rivers which have water all year round. When we can access the canyon floors, we also check for signs of otter presence such as spraints and tracks.

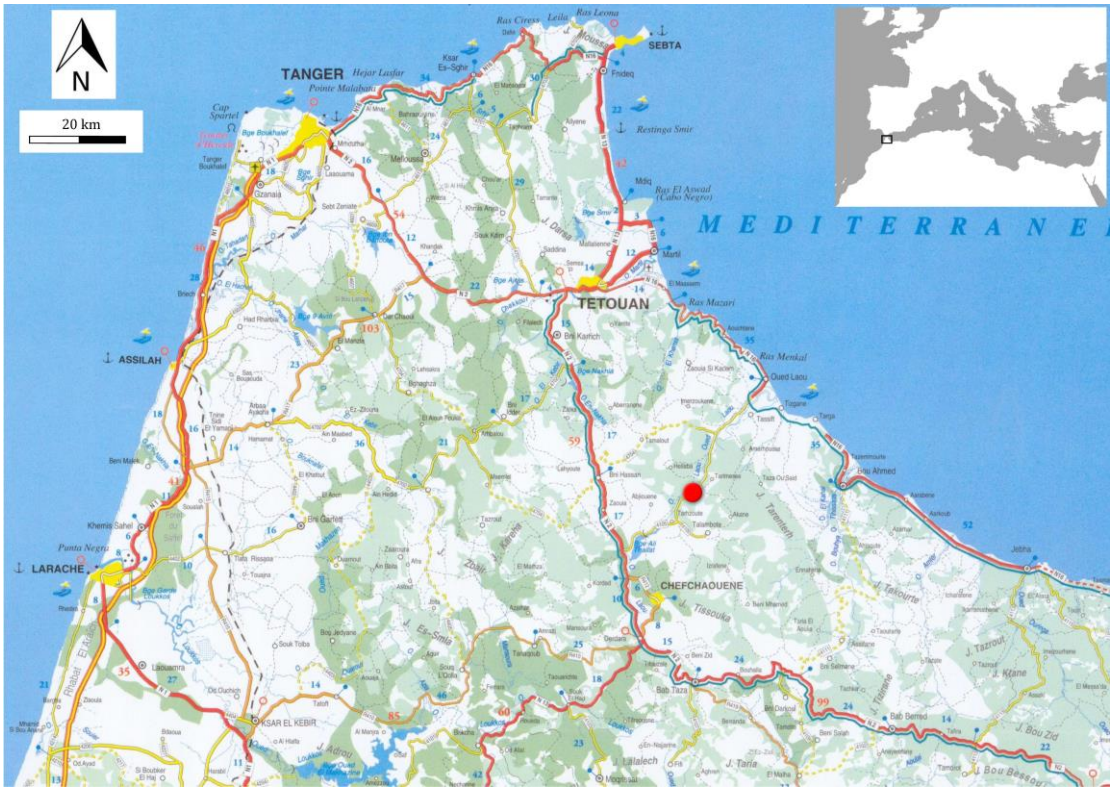

Figure 1. Location of study area in north Morocco (the red dot denotes the location of the April 2018 observation).

RESULTS

We failed to find any signs of otters in river canyons. However, in August, 2013, AEH observed a single otter on rocks above Oued el Ferda, a tributary of the Oued (= River) Lao. The site is included in Talessemtane NP. The otter was moving quickly and soon disappeared into undergrowth. In April 2018, we were looking for a group of macaques, which frequented that particular part of the canyon of Oued Lao (see Fig. 1). The canyon has little vegetation on its banks at that point (Fig. 2). AEH spotted an otter swimming slowly down river and SW then spotted another some 10 meters behind it. We followed the animals with binoculars as they swam downstream (see Fig. 3). At the point we observed the otters the canyon floor is ~100 m above sea level. Given the time of year it is possible that this was a male and female.

DISCUSSION

MacDonald and Mason (1984) pointed out that the otter's distribution in Morocco is clearly limited by lack of water. Oued Lao and its tributaries have water

all year round and are currently suitable habitat for otters. Given the remoteness of the area, PCBs and other chemicals may not cause major contamination of the watercourses. Our observations of the species provide confirmation of its presence in these catchments and an increase in the species' known Moroccan range.

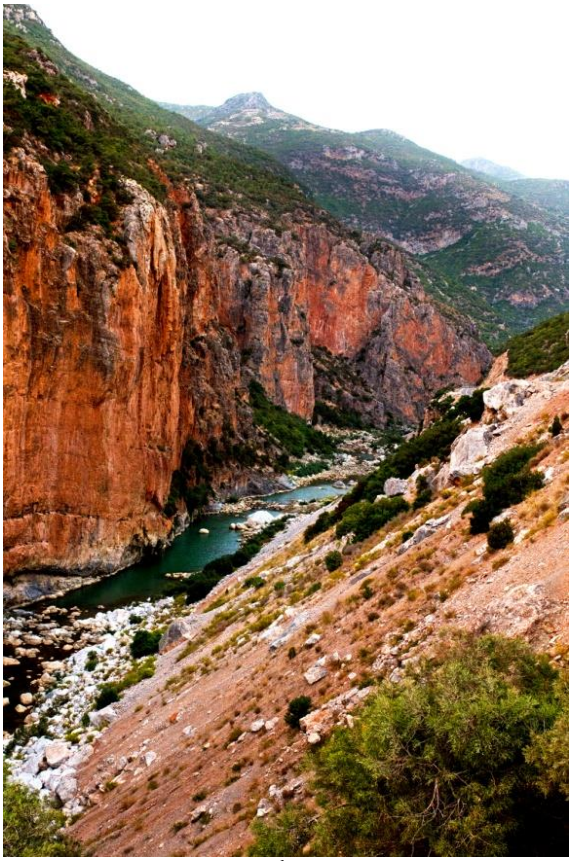

Figure 2. Canyon where 2nd otter observation took place

Figure 3. One of the otters swimming downriver.

We have found no suggestion of conflict between people and otters due to the lack of dependence on river fish by villagers. However, a major threat comes from disturbance from tourist activities, particularly in spring, when hundreds of people crowd into some of the more accessible river canyons. Village dogs kill other

carnivores such as the African Wolf (*Canis lupus lupaster)*, Common Genet (*Genetta genetta)* and Red Fox (*Vulpes vulpes*) in these areas, so may present a threat to otters. We have recently observed accelerated clearance of vegetation from steep canyon sides for the planting of cannabis and we believe this to be a serious threat to both otters and Barbary Macaques in the canyons.

We are now beginning to focus on other river systems in our study areas. Our inability to find otter sign may be related to the non-systematic way we are searching which we will endeavour to rectify. Additionally, we hope that, with the use of camera traps, we will be able to provide more information on the presence of otters in this area of the Rif and possibly beyond.

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RÉSUMÉ

NOUVEAU SITE POUR LA LOUTRE EURASIENNE, Lutra lutra, DANS LES BASSINS VERSANTS DES MONTAGNES DU RIF OCCIDENTAL AU MAROC

La loutre eurasienne, *Lutra lutra*, a connu une renaissance en Europe, en raison des politiques de contrôle de la pollution, en particulier des pesticides organochlorés et des polychlorobiphényles (PCBs). Cependant, on sait peu de chose sur la présence de l'espèce en Afrique du Nord. Nous rapportons ici les premières observations directes de loutres dans deux importantes rivières des montagnes du Rif occidental au nord du Maroc. Nous avons effectué des observations providentielles de loutres alors que nous observions et faisions un suivi des Macaques Barbary, *Macaca sylvanus*, qui habitent des canyons de rivières abruptes dans cette zone de leur aire de répartition. Nous avons observé trois loutres sur deux rivières différentes, confirmant la présence de l'espèce dans le Rif occidental. Nous avons l'intention de continuer le suivi de la présence de loutres et d'installer des pièges photographiques dans les canyons des rivières lorsque les circonstances le permettent.

RESUMEN

NUEVA LOCALIDAD PARA LA NUTRIA EURASIÁTICA *Lutra lutra* EN LAS NACIENTES DE CUENCA EN LAS MONTAÑAS DE LOS RIF OCCIDENTALES, MARRUECOS

La Nutria Eurasiática *Lutra lutra* ha experimentado un resurgimiento en Europa, atribuido a las políticas de control de la contaminación, particularmente de los pesticidas organoclorados y los bifenilos policlorados (PCBs). Sin embargo, se sabe poco acerca de la presencia de la especie en el Norte de Africa. Aquí, informamos las primeras observaciones directas de nutrias en dos grandes ríos en las Montañas Rif

occidentales del norte de Marruecos. Realizamos observaciones oportunísticas de nutrias mientras prospectábamos y monitoreábamos Macacos de Berbería *Macaca sylvanus*, que habita en cañadones profundos y abruptos en esta parte de su distribución. Observamos trres nutrias en dos ríos diferentes, confirmando la presencia de la especie en el Rif occidental. Tenemos la intención de continuar prospectando la presencia de nutrias, e instalar cámaras-trampa en los cañadones, cuando las circunstancias lo permitan.

تعرف القضاعة الأوروبية أو القضاعة الأوراسية انتعاشًا في أوروبا يرجع إلى سياسات مكافحة التلوث خاصة المبيدات الحشرية « الكلورية والبيفينيل متعدد الكلور (PCBs)» . ومع ذلك ، لا يُعرف الكثير عن وجود هذا النوع من الثدييات في شمال إفريقيا.

هنا بالمغرب ، مكّنت الملاحظات المباشرة الأولى من إحصاء ثعالب الماء في اثنين من الأنهار الرئيسية في جبال الريف الغربية في شمال المغرب. قمنا بملاحظات ثعالب الماء أثناء مسح ورصد قرد ة زعطوط *Macaca sylvanus* Barbary Macaques، اللتي تعيش في الأخاديد النهرية شديدة الانحدار في هذه المنطقة. لاحظنا ثلاثة ثعالب فردية في نهرين مختلفين يؤكدان وجود هذا الصنف في الريف الغربي. ونحن نعتزم متابعة المسح و تنصيب الكاميرات في الأخاديد النهرية عندما تسمح الظروف بذلك.

OSG MEMBER NEWS

Since the last issue, we have welcomed 6 new members to the OSG: you can read more about them on the Members-Only pages.

Ricardo Correa, Chile: I have studied Marine Otters (*Lontra felina*) along the coast of Chile for many years and work to persuade the authorities to take their protection seriously. I am currently working with them to develop a mitigation protocol for significant anthropogenic pressures on the coastal region affecting otters.

Sagar Dahal, Nepal: I am a conservationist in Nepal, currently surveying rangers in the Protected Area about the presence (or absence) and threats to otters in their working areas. I am preparing outreach material about all 13 species for use in Nepal. I am President of the Small Mammals Conservation and Research Foundation.

Sugandhi Gadadhur and Raghuneth Belur, India: We are a husband and wife team of certified naturalists and documentary filmmakers. For the last two years, we have been following Smooth-coated otters in India's only Otter Conservation Reserve along the River Tungabhadra, traveling across the river trying to understand the challenges that otters face. We regularly interact with the local fishermen and forest officials on how Otters survive here and what is needed to help conserve them. Over the next few years, we plan to document the Smooth-coated Otters in the Tungabhadra and hope to make a film about these otters, their behaviour and the challenges they face, like poaching, dynamite fishing, sand mining and hostile fishermen.

Taylor Gowin, USA: I am a student studying biology, and I hope to join a research team and study otters as my primary focus with other aquatic mammals as a secondary focus. Otters are my passion and I hope to be able to gain experience with them as soon as I can.

Alexandra Kahler, USA and India: Currently resident in Washington State, USA, I have done field research on African clawless otters in Malawi with Katrina Fernandez, and now intend to study smooth coated otters in Goa using environmental DNA. I also developed and moderate the Global Otter Community facebook page along with Carol Bennetto, Katrina Fernandez and Nicole Duplaix.