NOTE FROM THE EDITOR

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Dear Friends, Colleagues and Otter Enthusiasts!

I had promised that we will try to work on the backlog of manuscripts. So finally we just have closed the last issue of 2017 and open now issue 35/1 as the first issue of 2018. In fact we have at this moment already 21 manuscripts in different stages from being completely finished to just sent out to the reviewers. I can promise that interesting things are soon online. I hope you all will keep coming back to our website and see what new manuscripts went online. As previously announced f authors that need a statement that their manuscript has been accepted for internal reasons please contact me and I will provide the necessary documentation.

I would like to repeat that we are searching for pictures as if possible I prefer to have a separate picture for the title page and not take one from the articles. Therefore it would be of real great support if some of you could provide us photos, as we need good resolution pictures for the title page.

Merci villmols to Lesley for endurance with the Bulletin. She puts a lot of energy into this voluntary work and without Lesley there would be no Bulletin.

R E P O R T

NOTES ON POPULATION STATUS AND FEEDING BEHAVIOUR OF ASIAN SMALL-CLAWED OTTER (*Aonyx cinereus*) IN THE SUNDARBANS MANGROVE FOREST OF BANGLADESH

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Abstract: Very little information is available on population status, distribution and ecology of Asian Small-clawed Otter, *Aonyx cinereus* in Bangladesh. By surveying approximately 351 km of water courses in the Bangladesh Sundarbans, 53 individuals of this otter were recorded in 13 groups, with a mean group size of 4.08± SE 1.13. Mean encounter rate of combined sighting, footprint, and spraint was 0.06/km of rivers surveyed, with higher abundance along the eastern regions of the Sundarbans. Otters were found predominantly feeding on mudskippers (*Periophthalmus* sp.) on the exposed river mudflats, particularly during ebb tide. The chemical pollution in watercourses by several recent cargo incidents within the Bangladesh Sundarbans might have adversely affected otter populations. Systematic otter surveys are needed for a rigorous population assessment to guide conservation effort, and to monitor ecosystem health of the Sundarbans.

Keywords: *Aonyx cinereus*, mudskippers, otter-fishing, sign encounter rate.

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INTRODUCTION

Otters have received relatively little attention for field-based research in many of the range states across Asia, despite several species of otters occurring in the region (Foster-Turley, 1992). As a result, scientific information on Asian wild otters has remained largely non-existent (Nawab and Gautam, 2008). Bangladesh is known to support three species of otters, namely the Eurasian otter *Lutra lutra*, the Smooth-coated otter *Lutragale perspicillata* and the Asian Small-clawed otter *Aonyx cinereus*. Unfortunately, they all are endangered in the country (IUCN Bangladesh, 2016), and have been included in the Bangladesh Wildlife (Protection & Security) Act, 2012 for their protection in the wild (MoEF, 2012). Because otters are among the top predators in the wetland ecosystem, they can serve as an important indicator species in monitoring ecosystem health where they occur (Erlinge, 1972). However, very little information is available on these species, except some sighting records in Bangladesh.

Otters are elusive and versatile in adapting to a wide variety of habitats ranging from marine to freshwater wetlands (IUCN, 1992). Bangladesh lies in the largest delta of the world, the Bengal Basin, formed by the three mighty rivers systems of the Ganges, Brahmaputra, and Meghna. The Bengal Basin is a vast lowland, therefore, almost half of the country's land surface can be considered as wetlands (Khan, 1993; Hughes et al., 1994). These enormous wetland habitats support a significant assemblage of wild animals, and possibly foster some unknown otter populations.

Previously, the Smooth-coated and Eurasian otters were reported from wetland habitats dispersed across northeast and southeast regions of the country while the Asian Small-clawed Otter was reported from the mangrove forests of the Bangladesh Sundarbans in the southwest (IUCN Bangladesh, 2016). Two previous studies investigated traditional otter-fishing and captive breeding of Smooth-coated Otters in Bangladesh (Feeroz et al., 2011a, b) yet no studies were undertaken on Aonyx cinereus otters in this enormous mangrove habitat. An opportunistic study was therefore conducted on population status and feeding behaviour of the Asian Small-clawed Otter in the Bangladesh Sundarbans.

STUDY AREA AND METHODS

The Sundarbans is the largest single block of tidal halophytic mangrove forest in the world, with a total area of 10,000 km^2, shared between Bangladesh and India. Bangladesh contains 6,017 km^2 of the Sundarbans, of which 1,874 km^2 are wetlands consisting of large rivers, small creeks and canals. Within the Bangladesh Sundarbans, three isolated forest areas have been delineated as wildlife sanctuaries for higher protection wildlife species and their habitat. These wildlife sanctuaries have been declared a UNESCO World Heritage Site in 1997 (Iftekhar and Islam, 2004). The Bangladesh Sundarbans is also a Ramsar site of wetlands of international importance.

During an extensive field survey for a tiger (*Panthera tigris*) study in the Bangladesh Sundarbans led by this author, opportunistic data were collected on direct sighting and signs (e.g., foot prints and sign of spraint) of Asian Small-clawed Otter between November 2014 and March 2015. We surveyed four sample areas: the East Wildlife Sanctuary (383 km^2) and West Wildlife Sanctuary (715 km^2), Satkhira block (342 km^2) and Chandpai block (554 km^2) (Fig. 1). From these sample areas, we surveyed 30 river segments, with 50 m to 800 m wide for reliable spotting of otters or their signs (e.g., footprints or spraint) of occurrence. Water-based vessel such as traditional country boat and relatively smaller engine-driven boat were used during the survey.

Five survey teams were employed, each with four members – one data recorder, two observers to spot on the either side of river and one member for guiding the boat. We recorded geographic coordinates of sighting, number of individuals, footprints, and spraint of otters, using handled Garmin *GPSMAP 64*. These data were then imported within Geographic Information System (GIS) using ArcGIS 10.3 to deduce spatial occurrence of otters in the Sundarbans.

RESULTS AND DISCUSSION

We managed to survey 351 km of water courses across four sample areas of the Bangladesh Sundarbans, with 97 km in Satkhira block, 78 km in West WS, 101 km in East WS, and 75 km in Chandpai block. We recorded 53 individual otters in 13 locations, alongside signs of footprints and spraints (Fig. 1; Fig. 2A). Mean group size of otters was estimated as 4.08±SE 1.13 (range = 1-12, n=13). Mean encounter rate of sighting and signs (footprint and spraint) was 0.06/km, with higher in the East WS areas (0.09/km) and lower in the Satkhira block (0.02). Mean encounter rate of direct sighting was 0.03/km, translating into approximately one individual otter in every 30 km of rivers surveyed. Because of the inherent design of the tiger study, this result should be considered preliminary and an underestimate of the otter population in the Sundarbans. The sample area-wise estimates suggest higher abundance of otters across the eastern part of the Sundarbans of Bangladesh (Fig. 1).

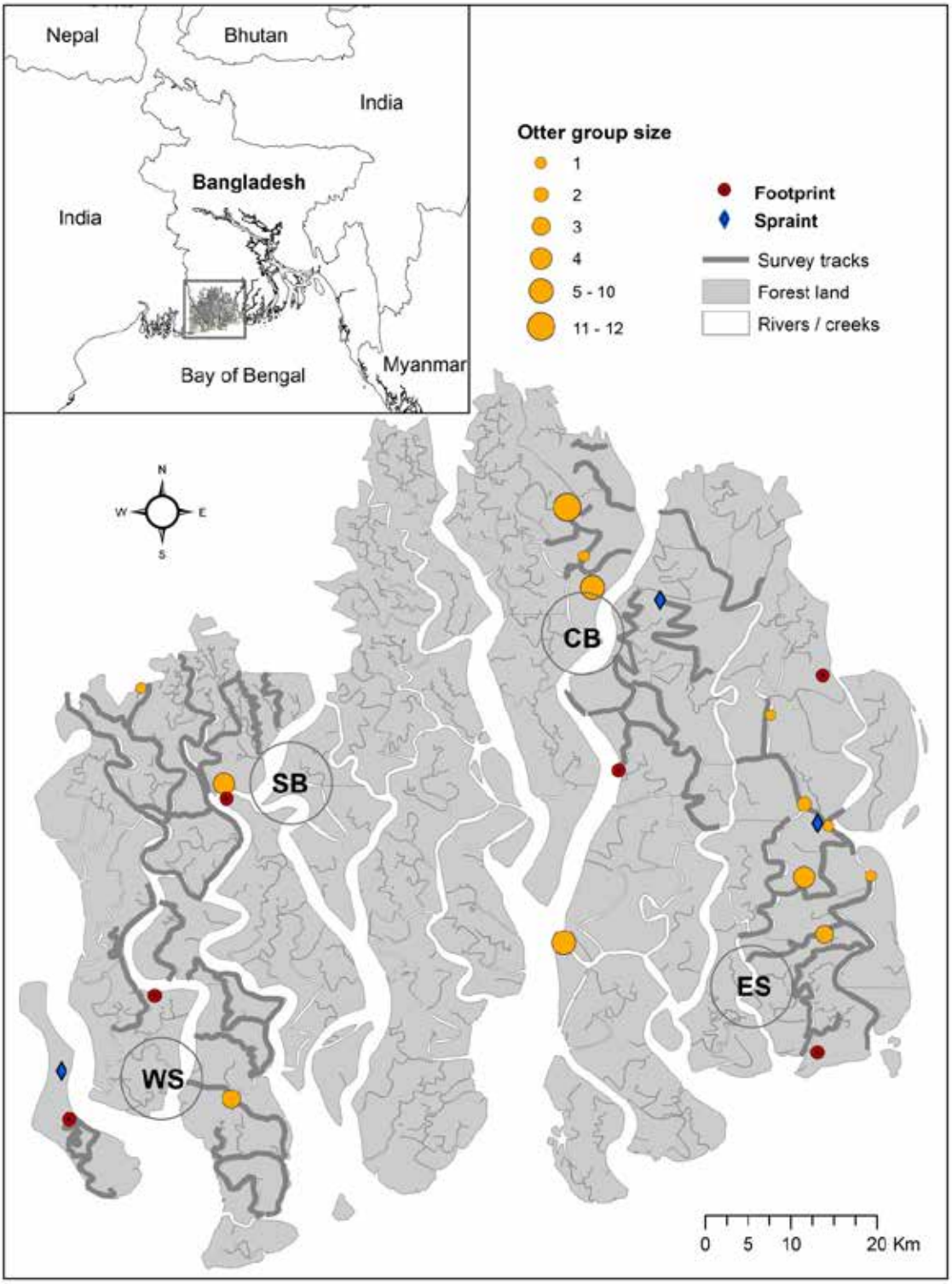

Figure 1. The Sundarbans Reserve Forest of Bangladesh showing river segments surveyed, and locations of sighting, footprint and spraint of Asian Small-clawed Otter. Several data locations outside of the survey tracks were collected opportunistically. The sample areas were indicated as SB = Satkhira block, WS = West wildlife sanctuary, CB = Chandpai block, and ES = East wildlife sanctuary.

Previously the Asian Small-clawed Otter and Smooth-coated Otter had been reported from the Indian part of the Sundarbans (Mallick, 2011), but recently only the former has been seen (Majpekar and Prabu, 2014). While in the Bangladesh Sundarbans, we recorded only the Asian Small-clawed Otter. Of note, we observed traditional fishing with Smooth-coated Otter by local fishermen in the Bangladesh Sundarbans (Fig. 2D).

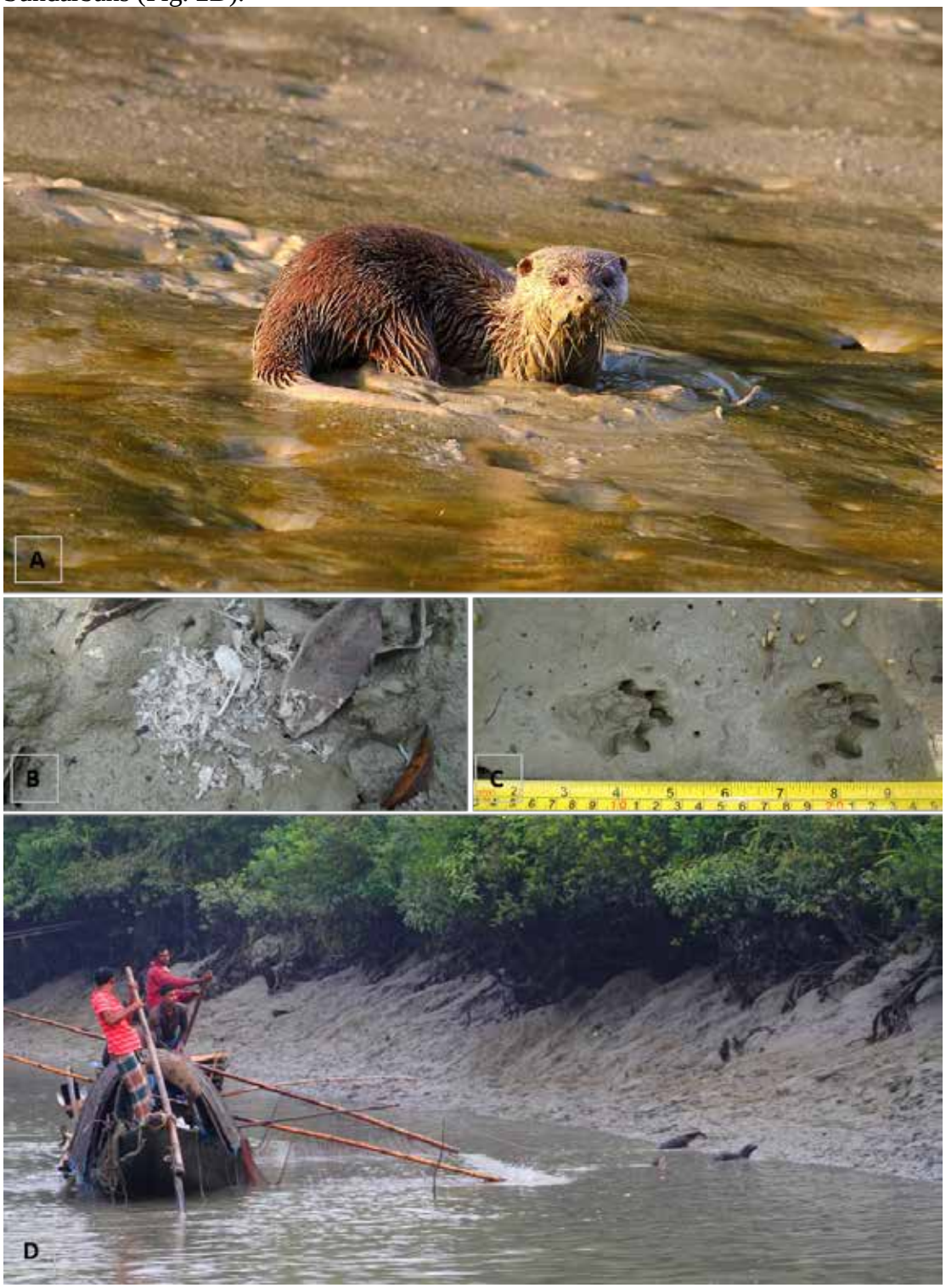

Figure 2. Otters in the Bangladesh Sundarbans: (A) Asian Small-clawed Otter searching for mudskippers on exposed mudflats; (B) Fish bones and spines in otter spraint; (C) Otter footprints; (D) Fishing with Smooth-coated Otter by local fishermen.

We observed two groups of otters for several hours in two different locations in the southeastern part of the Sundarbans during morning (0915–1040 h) and evening hours (1505–1755 h). As soon as they saw us, the otters quickly disappeared from their foraging ground of exposed mudflats into the nearby forests, but after a while they came out, and started to excavate the burrows of mudskippers, *Periophthalmus* sp. (amphibious fish of the family Gobiidae) with their forelimbs. During ebb tide, mudskippers usually take shelter in their tunnel-like burrows, which are abundant across the river banks in the Sundarbans. Observations suggest that otters have developed good strategy to catch them by inserting the forearm through one end of the burrow so that mudskippers are flushed out with the water through the other opening. Otters instantly grasped the gobiids, and then started a new session in next burrow (Fig. 3). It has been found that otters came out of shelter to feed when water drained out during ebb tides, providing extensive mudflats with lots of opportunities for feeding on mudskippers.

Analysis of spraint samples (n=3) showed that two samples exclusively contained fish bones and spines (Fig. 2B) while the third one contained a mixture of crab and fish remains. However, larger sample sizes may provide more robust diet profile for otters. Previous studies reported a range of species eaten by the Asian Small-clawed otters elsewhere, including mainly crabs (Foster-Turley, 1992); fish, snakes, amphibians and snails (Maslanka and Crissey, 1998; Kanchanasaka, 2004); and frogs, small birds and octopus (Heap et al., 2008). This study suggests that the major prey organism of this otter species is the mudskippers in the Sundarbans.

Otters are threatened with different degrees of endangerment due to a range of threats in the wild (IUCN, 2016). In the Bangladesh Sundarbans, chemical pollution of watercourses may possibly be the most critical threat to otters. For instances, cargo vessels carrying furnace oil (350,000 litres), chemical fertilizer containing potash (300 tonnes), and coal (1,235 tonnes) capsized in the Shela river in the eastern part of Sundarbans over the last two years. Pervasive pollution through these disasters might have serious consequences on otter populations, particularly in the areas where higher number of otters observed. Otter hunting is common for their skin in trade and other parts for food and traditional medicine in many communities across Asia (Nguyen et al., 2002; Hon et al., 2010). However, skin trade and medicinal use of otter parts is probably rare in Bangladesh but may not be impossible in areas where tiger and their prey poaching were identified as major threat (Aziz et al., 2013).

Habitat destruction, disturbance and occasional drowning in fish traps were also reported elsewhere (Kanchanasaka, 2004; Hon et al., 2010). Habitat destruction and disturbance is minimal for otters in the Sundarbans but trapping by entanglement in fishing gear might occur, due to widespread gear fishing in the watercourses of this mangrove forest.

CONCLUSION

This survey result is preliminary but probably indicates the presence of a large population of the Asian Small-clawed Otters in the Sundarbans. Our observations suggest that the Sundarbans mangrove forest is a stronghold for Asian Small-clawed Otter for their long-term survival. However, there is a growing body of evidence that salinity in the Sundarbans waters is rising due to s significant decline of freshwater flow from the upstream rivers which will undoubtedly affect otter populations alongside the general biodiversity of the Sundarbans (Gopal and Chauhan, 2006). Being one of the top predators in the Sundarbans aquatic ecosystem, otters can be an important candidate species for monitoring ecosystem health. Therefore, robust

population assessment of otters is strongly recommended for guiding their future conservation effort and for monitoring ecosystem health of the Sundarbans.

Figure 3. Asian Small-clawed Otter hunting mudskippers: inserting forearms through burrow while mudskipper is being flushed out (top), mudskipper flushed out on the air (middle), and finally eating the catch (bottom).

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RÉSUMÉ

NOTES SUR LE STATUT DE LA POPULATION ET LE COMPORTEMENT D'ALIMENTATION DE LA LOUTRE CENDRÉE (*Aonyx cinereus*) EN FORÊT DE MANGROVE DU SUNDARBANS AU BANGLADESH

Il existe très peu d'informations sur le statut, la distribution de la population et l'écologie de la loutre cendrée, Aonyx cinereus, au Bangladesh. Grâce à un suivi d'environ 351 km de cours d'eau du Sundarbans au Bangladesh, 53 individus ont été répertoriés dans 13 groupes, avec une taille moyenne par groupe de 4,08 +/- SE 1,13. Le taux moyen de découverte d'indices de présence qui combine l'observation d'individus, de traces de pas et d'épreintes était de 0,06/km de rivière inventoriée, avec une densité très élevée dans les régions Est du Sundarbans. Les loutres se nourrissaient préférentiellement de périophtalmes (Periophtalmus sp.) sur les berges boueuses, tout particulièrement à marée basse. La pollution chimique récente des cours d'eau par des bateaux cargos dans la région du Sundarbans au Bangladesh peut avoir affecté de manière négative les populations de loutre. Un suivi systématique des loutres est nécessaire afin de permettre une évaluation rigoureuse de la population pour orienter l'effort de conservation et suivre l'état de santé de l'écosystème du Sundarbans.

RESUMEN

NOTAS SOBRE EL ESTADO POBLACIONAL Y EL COMPORTAMIENTO DE ALIMENTACIÓN DE LA NUTRIA DE UÑAS PEQUEÑAS ASIÁTICA (*Aonyx cinereus*) EN EL MANGLAR DE SUNDARBANS, BANGLADESH

Hay muy poca información disponible sobre el estado poblacional, la distribución y la ecología de la Nutria de Uñas Pequeñas Asiática, *Aonyx cinereus*, en Bangladesh. Relevando aproximadamente 351 km de cursos de agua en los Sundarbans de Bangladesh, registramos 53 individuos en 13 grupos, con un tamaño medio de grupo de 4.08 ± SE 1.13. La tasa media de encuentro (combinando avistajes, huellas y fecas) fue de 0.06/km de ríos relevados, con más abundancia a lo largo de las regiones orientales de los Sundarbans. Encontramos a las nutrias predominantemente alimentándose de “peces del fango” (*Periophthalmus* sp.) en los planos barrosos expuestos, particularmente durante la bajamar. La contaminación química en los cursos de agua a partir de varios incidentes recientes de cargueros en los Sundarbans de Bangladesh, han afectado en forma adversa a las poblaciones de nutria. Se necesitan relevamientos sistemáticos de nutrias para tener una evaluación poblacional rigurosa, que pueda guiar los esfuerzos de conservación, y para monitorear la salud ecosistémica de los Sundarbans.

A R T I C L E

FEEDING ECOLOGY AND SPRAINT DEPOSITION SITES OF THE NEOTROPICAL OTTER (*Lontra longicaudis*) AT CAVERNAS DO PERUAÇU NATIONAL PARK, BRAZIL

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Abstract: Knowledge on the feeding ecology and habitat use of a species is of essential value for effective conservation. We describe the diet and spraints deposition sites for the Neotropical otter (*Lontra longicaudis*) at Cavernas do Peruaçu National Park, in south eastern Brazil. We collected spraints and recorded characteristics of the deposition sites from 2007–2010. We described otter diet as the number of faeces in which a given taxon was found and the frequency of occurrence of each taxon. We collected 57 spraints and identified 92 food items from nine different taxa, all from animal origin. Fish was the most frequent taxon, found in 98.3% of our samples, followed by arthropods (22.8%) and mammals (10.5%). We recorded 112 spraint deposition sites, most of them located in caves (80%) and <10 m from the water (93.4%). In our study area the Neotropical otter relies heavily on fish, and we believe that the behaviour of some fish species makes them more vulnerable to predation. Habitat use by otters has important management implications for the national park, as caves are the main tourist attraction and some tourist tracks are located next to the river. Although a well-implemented management action might seem enough to avoid negative impacts of tourism, we believe that monitoring the Neotropical otter population in our study area is of major conservation concern to evaluate the impacts of this activity.

Keywords: Mustelidae, *Lontra longicaudis*, feeding ecology, habitat use, faeces, latrine

Citation: Pinho, FF de, Ferreira, GB and Barata, IM (2018). Feeding Ecology and Spraint Deposition Sites of the Neotropical Otter (*Lontra longicaudis*) at Cavernas do Peruaçu National Park, Brazil. *IUCN Otter Spec. Group Bull*. **35** (1): 11 - 21

INTRODUCTION

Investigations of Neotropical carnivore feeding ecology are often based on the analyses of faeces (e.g. Garla et al., 2001; Rodrigues, 2002; Novack et al., 2005; Zuercher et al., 2005; Moreno et al., 2006; Massara et al., 2012; Valenzuela et al., 2013; De Angelo et al., 2013; Elbroch and Wittmer, 2013), which can be collected in

the species' natural habitat. Faecal collection is considered a non-invasive method that does not harm or stress the animal, and allows the acquisition of valuable data (Perini et al., 2009). This method is ideal for our target species (*Lontra longicaudis*) because its conspicuous spraints are easily distinguished from other sympatric carnivore species and are usually placed in latrines (Quintela et al., 2011).

The Neotropical otter (*Lontra longicaudis*) is a carnivorous mammal from the Mustelidae family and is distributed throughout Latin America, from Mexico to Uruguay (Cheida et al., 2011). Neotropical otters are generally diurnal (Parera, 1993) and solitary animals, but can be found in pairs when mating and raising their offspring (Larivière, 1999). The species is well adapted for swimming with a strong tale and fully webbed toes (Cheida et al., 2011), and for these reasons feeds primarily on aquatic animals.

The species is classified as Near Threatened by the IUCN (under criteria A3CD) and its population is thought to be declining (Rheingantz and Trinca, 2015). There is little information available on species' ecology in natural environments and to the best of our knowledge this is the first ecological research on Neotropical otters in the Cerrado-Caatinga ecotone (two major ecosystems in Brazil). In this paper, we describe the diet of *Lontra longicaudis* and the sites of faeces deposition in Cavernas do Peruaçu National Park, south eastern Brazil.

STUDY AREA

Cavernas do Peruaçu National Park (CPNP), located at Minas Gerais state, south eastern Brazil, encompasses 568 km^2 in a transitional area between two major Brazilian ecosystems, the Cerrado and the Caatinga (Fig. 1). Caatinga is a vegetation mosaic constituted of thorn scrub and tropical seasonal dry forests associated with a semi-arid climate, while the Cerrado is a savannah-like ecosystem formed by several vegetation types varying from open grasslands to dense forests.

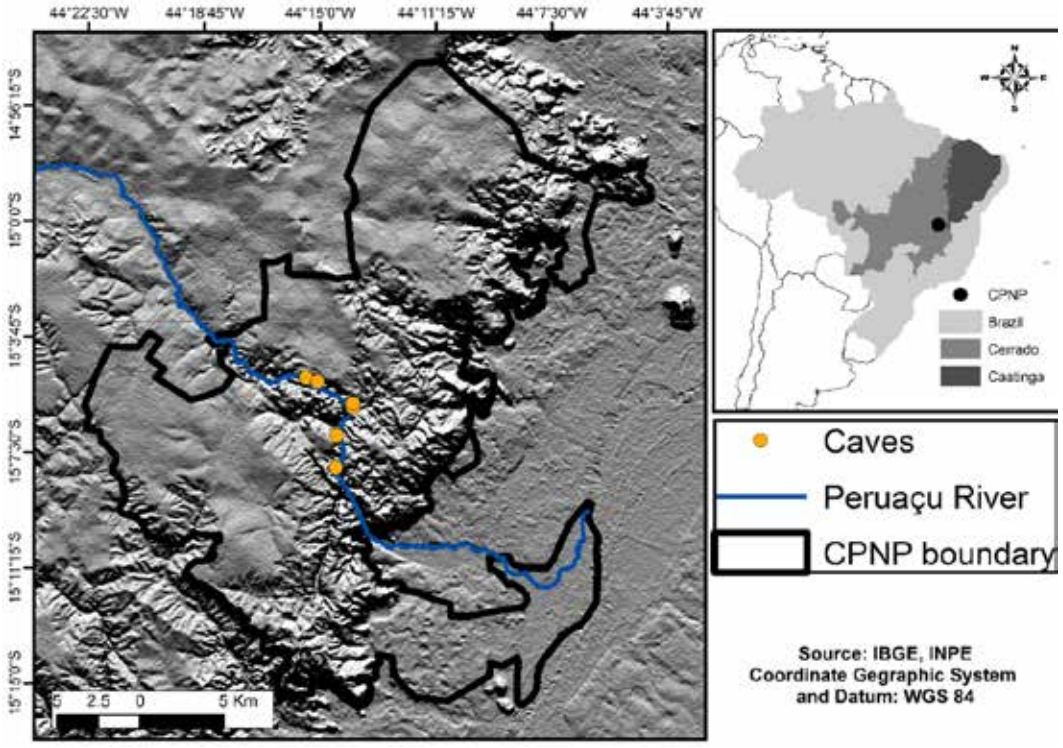

Figure 1. Location of study area at southeastern Brazil, showing the boundaries of Cavernas do Peruaçu National Park and occurrence of caves along the Peruaçu River.

The Peruaçu River is the main watercourse in CPNP and runs through a karst area forming a large and deep valley with several caves. In this valley, the river goes across four large caves ranging from 180 m to 4.740 m in extension. Few other small and shallow creeks are present at CPNP, but none of them are likely to support otter populations.

The Peruaçu River valley is mainly represented by riparian and seasonal dry forest - the latter being found further away from the river, especially on the valley slopes. Although selective logging has occurred in some remote areas in the past, most of the valley remained as natural habitats because the topography has discouraged land clearing even prior to the creation of the protected area in 1998.

The annual mean temperature at our study area is 25.2°C and the mean annual rainfall is 805 mm – with some years recording annual rainfall lower than 600 mm, which is classified as semi-arid climate (Geoclock, 2005).

METHODS

Data Collection

We collected Neotropical otter spraints opportunistically between May 2007 and April 2008 while conducting a camera trap survey for large mammals in CPNP. We also did a systematic sampling from 2009 to 2010, when three field trips were conducted at the same areas surveyed in previous years. To collect spraints we walked a continuous track of approximately 10 km along the Peruaçu River searching for potential deposition sites at the river bed and its margin (usually up to 30 m from the river). The area surveyed along the Peruaçu River encompasses most of its extension within the national park (WGS84 -15.1163, -44.2413) and we spent three days in each field trip to cover the entire area. We collected and stored all spraints in individual plastic bags which were labelled with identification and date.

For each spraint deposition site (including those where there were signs of deposition, but no intact spraint) we recorded habitat type (forest or cave) and substrate type (log, sand, rock, or forest floor). Additionally, for spraints found inside caves we also recorded the perpendicular distance from the river. We did not take this measurement in forested habitats because we assumed detection probability would decrease sharply as the distance from the river and vegetation density increased, biasing our data.

We often found the spraints in a naturally dried state, but when needed we used an oven-drying method in the laboratory. We examined all food items under a stereomicroscope and we sorted them into distinct classes: scales, teeth, jaws, hair, bones and carapaces. We used a reference collection and Hildebrand (1995) to identify broad taxonomic groups: Mollusca, Arthropoda, Pisces, Reptilia, Amphibia, Aves and Mammalia. With the help of a specialist and a reference collection from the São Francisco River basin, fishes were further classified into order and, in some cases, identified into genus level.

Data Analysis

Diet composition was described as the number of spraints in which a given taxon was found and also as the frequency of occurrence, dividing the number of total occurrences of each taxon by the total number of spraints collected.

We used Levin's index (Krebs, 1998) as a measure of niche breadth, which ranges from zero to one. According to Krebs (1998), values closer to zero indicate that few items are consumed very often and most items are seldom consumed, while

values closer to one represent larger niche breadth where items are more homogenously consumed. The index is given by the formulae:

$$BA = \frac{\frac{1}{\sum pi^2} - 1}{n - 1}$$

where "BA" is the standardized Levin's index, *n* is the number of food categories, and *pi* is the frequency of each food category (Krebs, 1998).

We used a rarefaction curve to evaluate the relationship between the number of spraints collected and the number of taxa identified. This relationship can be interpreted as a measure of sampling completeness of our study, indicating how well our sampling of spraints represents the diet of *L. longicaudis* at CPNP. For this analysis we used EstimateS 9.1 (Colwell, 2009) software adjusted for 200 randomizations without replacement.

For both the accumulation curve and Levin's index, fishes were classified only to order, because not all samples of this group could be identified to lower taxonomic levels.

RESULTS

Diet of *Lontra longicaudis* at CPNP

We collected 57 spraints from *L. longicaudis* and identified 92 food items from nine different taxa, all from animal origin. The average number of taxon identified per spraint was 1.72 (± 0.82). Fish was the taxon most frequently found in the samples, recorded in 56 spraints we analyzed. Arthropods were found in approximately 25% of the samples, while other vertebrates were evident in only 10% or less of the spraints (Table 1).

Fish belonged to three orders, with Characiformes (60%, of which 30/34 were genus *Hoplias*) and Siluriformes (44%) being most frequently found; (Table 1). Niche breadth as calculated by the Levins' index was 0.1 and the taxa accumulation curve tended to stabilization (Fig. 2).

Table 1. Occurrence and frequency of occurrence of taxa identified in the spraints of *Lontra longicaudis* at Cavernas do Peruaçu National Park, Minas Gerais, south eastern Brazil.

Taxon	Occurrence **(n=57)**	Frequency of occurrence (%)
Pisces	56	98.2
Characiforme	34	59.7
Characidae		
Salminus sp.	4	7.0
Erithrinidae		
Hoplias sp.	30	52.6
Siluriforme	25	43.9
Perciforme		
Cichlidae	4	7.0
unidentified fish	6	10.5
Amphibia	1	1.8
Reptilia	4	7.0
Aves	4	7.0

Mammalia	6	10.5
Mollusca	1	1.8
Arthropoda	13	22.8

Spraint Deposition Sites

We recorded 112 deposition sites of *L. longicaudis* next to the Peruaçu River. Caves were largely used by the species as deposition sites with 78.6% of the spraints found in this environment (Fig. 3A). Sand was the substrate most frequently used for deposition, followed by rock and forest floor (Fig. 3B). Most spraints recorded in caves were less than 10 m away from the Peruaçu River (93.4%), with only one sample found further than 50 m from the river (Fig. 3C).

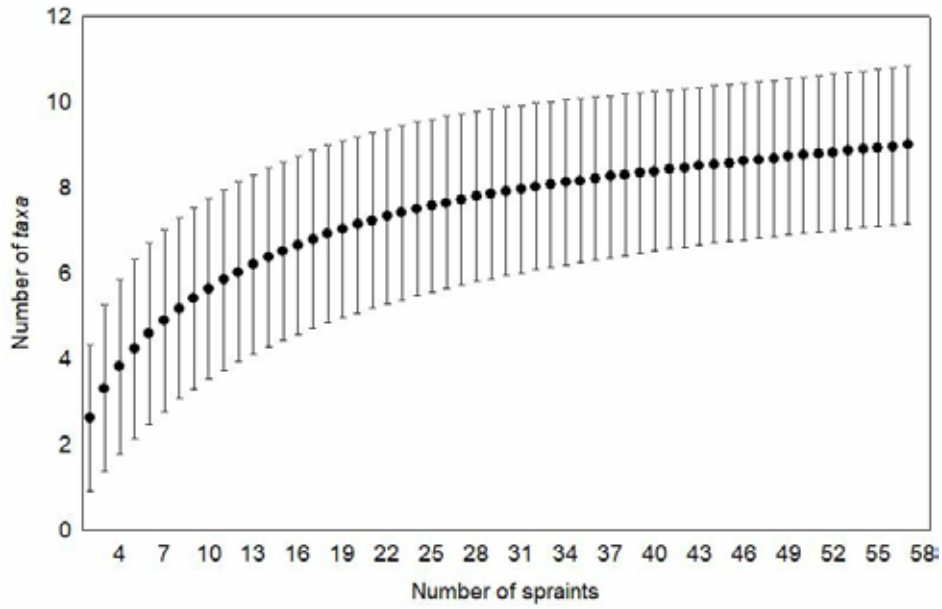

Figure 2. Accumulation curve of taxa identified in relation to the number of *Lontra longicaudis* spraints collected at Cavernas do Peruaçu National Park, Minas Gerais, south eastern Brazil.

DISCUSSION

Diet of *Lontra longicaudis* at CPNP

Our accumulation curve indicates that most taxa consumed by *L. longicaudis* at CPNP were recorded in our samples, which makes our results representative to characterize the Neotropical otter diet in the study area. The prevalence of fish in the diet of *L. longicaudis* has been previously observed in several studies in different parts of South America (Pardini, 1998; Colares and Waldemarim, 2000; Brandt, 2004; Kasper et al., 2008; Quintela et al., 2008; Chemes et al., 2010). Only one of our samples did not include fish – as an animal well adapted to aquatic life it is expected that most of the Neotropical otter's prey are aquatic. The same pattern has been observed in the diet of another Neotropical mustelid highly adapted to water, the giant otter (*Pteronura brasiliensis*) (Rosas et al., 1999; Carter et al., 1999; Cabral et al., 2010).

At CPNP, Characiforme was the most frequent order of fish represented in the diet of *L. longicaudis*, differing from previous studies (Pardini, 1998; Colares and Waldemarim, 2000; Brandt, 2004; Kasper et al., 2008; Quintela et al., 2008; Chemes et al., 2010). Despite the fact that Brandt (2004) recorded Siluriformes as the most frequent fish item in the diet of *L. longicaudis* in the Pampa at south Brazil, the

frequency of Characiformes was similar to what we observed at the Peruaçu River. Although Neotropical otters can show preferences for some prey items (Pardini, 1998), the composition and structure of the fish community in a given location may have a strong influence on the species' diet. Thus the differences in the frequency of occurrence of fish orders found in our study are probably a consequence of the differences in the fish community in each study area, which are affected by biotic and abiotic features of the particular river basin.

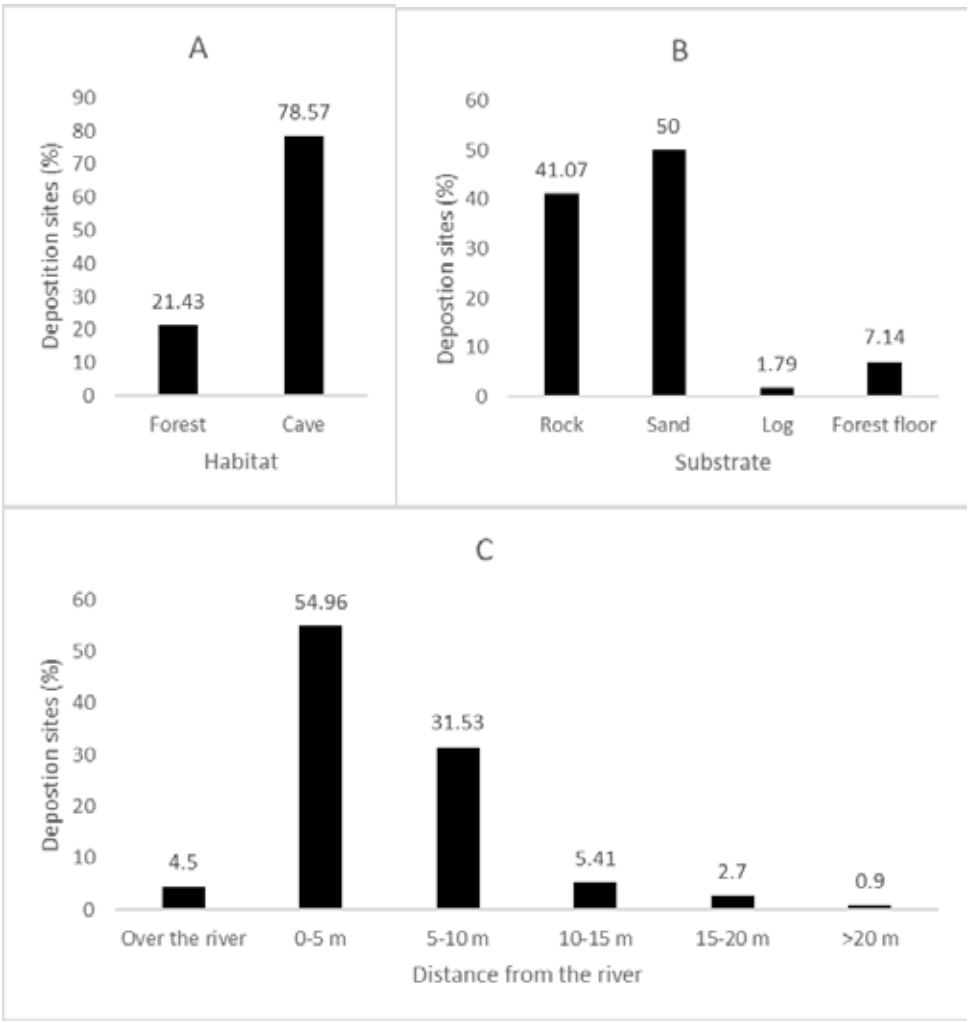

Figure 3. Characteristics of *Lontra longicaudis* spraint deposition sites by: A) Habitat type; B) Substrate type; C) Distance from Peruaçu River.

The genus *Hoplias*is represented in the Peruaçu River by *traíras* (*H. malabaricus*) and *trairões (H. lacerdae*) (Geoclock, 2005), and the high frequency of this food item in the diet of *L. longicaudis* might be related to the behaviour of these fishes. *Hoplias* spp. are ambush predators that do not move much in the water (Trajano et al., 2009), and this behaviour might make them vulnerable to be captured by Neotropical otters. Similarly, Pardini (1998) observed that *L. longicaudis* preferred to feed on prey showing lower escape capability. Moreover, Trajano et al. (2009) reported that *Hoplia* spp. can live in caves with little light, a habitat type that was frequently used by the Neotropical otter at CPNP.

Fish species from the Characiformes and Siluriformes orders are all native to Peruaçu River, but there is at least one species in the family Cichlidae (order Perciforme) that is exotic to the Peruaçu watershed (Geoclock, 2005). Since the latter

family was not identified to genus level we cannot confirm that exotic fish is not part of the Neotropical otter diet at CPNP. However, it is clear that most of *L. longicaudis* diet in the study area is composed of native fish species.

As observed by Brandt (2004) and Quintela et al. (2008) in the Pampas and by Pardini (1998) in the Atlantic Forest, arthropods were the second most frequent taxon recorded in otter spraints at CPNP. Arthropods, especially crustaceans, are found more frequently than fish in the diet of some otter species (such as the southern river otter *Lontra provocax*, the marine otter *Lontra felina* and Asian small-clawed otter *Aonyx cinerea*) and represent the largest proportion of biomass consumed by these species (Ostfeld et al., 1989; Reyes et al., 2007; Biffi and Iannacone, 2010; Hon et al., 2010).

Although mammals have been recorded in *L. longicaudis* diet in other studies, it was never reported with a frequency of occurrence greater than 5% (Pardini, 1998; Colares and Waldemarim, 2000; Brandt, 2004; Quintela et al., 2008; Kasper, 2008) - at CPNP mammals represented 10% of items consumed. Despite arthropods occurring more frequently than mammals in the Neotropical otter's diet at our study area, mammals are likely to represent a greater biomass in the species' diet, as all arthropods identified in the spraints had small body size.

Other vertebrate classes (Amphibia, Reptilia and Aves) were recorded in the spraints collected at CPNP, similar to Pardini (1998) and Quintela et al. (2008). Reptiles were not recorded in *L. longicaudis* diet by Kasper et al. (2008), Brandt (2004) and Colares and Waldemarim (2000), while amphibians were not recorded in the last two studies. None the less these items (especially amphibians) were not frequently observed in the diet of *L. longicaudis* in our study area. As in the present study, molluscs were recorded in the Neotropical otter's diet at the Pampas (Colares and Waldemarim, 2000; Brandt, 2004; Quintela, 2008) and in the Atlantic Forest (Kasper et al., 2008); however, Mollusca was one of the rarest item consumed, representing a small proportion of food items frequency.

Even though *L. longicaudis* preyed upon all vertebrate classes and some invertebrates at CPNP, Levin's index indicates a narrow niche breadth, reflecting the high frequency of a few taxa in the diet. Moreover, the presence of the genus *Hoplias* in half of the spraints collected may even suggest feeding habits of a specialist species. Rheingantz et al. (2012) found that Neotropical otter's diet is more influenced by its specialist feeding behaviour than by the availability of prey. These findings agree with observations that *L. longicaudis* (Pardini, 1998) as well as other otter species (Van der Zee, 1981; Wise et al., 1981; Kruuk and Moorhouse, 1990) have preference for some prey species or groups.

When investigating otter diet through the collection of spraints, pseudo replication may be an issue because the collection of several samples from few individuals might occur (Quinn and Keough, 2002). We cannot assess the degree of pseudo replication in our data, but we believe that spraints from different individuals were sampled due to the fact that surveys were conducted for a relatively long period (starting in 2007 and finishing in 2010) and approximately 10 km of the Peruaçu River was surveyed. There is no information in the literature about home range size of *Lontra longicaudis*, but some studies report a density ranging from 0.5 to 2.76 individuals/linear kilometre (Larivière 1990; Kruuk 2006; Carvalho-Junior 1990, 2007 - although these estimates are from other ecosystems). Furthermore, because our survey area encompasses most of the Peruaçu River extension at CPNP, we believe our results are representative of the otter population within the national park.

Spraint deposition sites

Some environmental features of the caves at CPNP, especially a sparse (or sometimes, the lack of) vegetation, make it easier to find spraints on these sites, which could potentially lead to a positive bias relative to forest. On the other hand, riparian forests cover a much larger area than caves, and our survey effort (in time and distance walked) was higher in forests when compared to caves. Because we did not control for confounding factors such as detection probability and habitat availability we cannot infer habitat preference. However, the large number of spraints found in caves indicates they are regularly used by Neotropical otters in the study area. The high proportion of spraints found in caves also explains the prevalence of sand and rock substrates for deposition as they are commonly found in this habitat. The presence of *Lontra longicaudis* in caves was reported in three other regions in Brazil (Dessen et al., 1980; Trajano and Gnaspini-Netto, 1991; Gnaspini and Trajano, 1994), but has not been previously reported for the Peruaçu River. As noted by Pardini and Trajano (1999) in the Betari River at south eastern Brazil, the use of caves by the Neotropical otter in the Peruaçu River is not restricted to the photic zone - spraints were also found in the aphotic zone of caves, where there is no natural light.

Being morphologically adapted to life in the water and feeding mainly on fish it seems natural that most Neotropical otter's spraints were found near the Peruaçu River (<10 m from the water). A similar pattern was recorded for Eurasian otter (*Lutra lutra*) (Kruuk, 1995) with most spraint deposition sites located next to the river bank. The fact that sites close to the Peruaçu River and caves are frequently used by the species has some management implications for the national park, as these caves are a major tourist attraction in the protected area and some of the tourist tracks are located next to the river. CPNP opened for visitors in 2015 and since then, due to management efforts, a well-organized tourist activity is being conducted in the park: some caves and areas by the Peruaçu River are off-limits for tourists, the number of visitors per day is kept low and the management team is closely monitoring the visits. These actions may be enough to avoid negative impacts from tourist visitation on the Neotropical otter population in the Peruaçu River and should continue in effect. However, it would be important to monitor any negative responses from the species in the following years, since the frequency and number of visitors tends to increase as local tourism sector develops.

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RÉSUMÉ : ECOLOGIE DE L'ALIMENTATION ET SITES DE MARQUAGE D'ÉPREINTES CHEZ LA LOUTRE À LONGUE QUEUE (*Lontra longicaudis*) DANS LES GROTTES DU PARC NATIONAL DE PERUAÇU AU BRÉSIL

La connaissance de l'écologie de l'alimentation et de l'utilisation de l'habitat par une espèce sont essentielles pour une protection efficace. Nous décrivons dans cet article l'alimentation et les sites de marquage d'épreintes chez la loutre à longue queue (Lontra longicaudis) dans les grottes de Peruaçu du parc national au sud est du Brésil. Pour ce faire, nous avons prélevé des épreintes et noté les caractéristiques des sites de marquage entre 2007 et 2010. Nous avons décrit l'alimentation de la loutre ainsi que le nombre d'épreintes dans lesquelles un taxon donné a été trouvé ainsi que la fréquence d'occurence de chaque taxon. Nous avons prélevé 57 épreintes et identifié 92 types d'aliments provenant de 9 taxons différents, tous d'origine animale. Le poisson, taxon le plus fréquent, a été trouvé dans 98,3 % de nos échantillons, suivi par les arthropodes (22,8 %) et les mammifères (10,5 %). Nous avons répertorié 112 sites de marquage d'épreintes, la plupart étant situés dans des grottes (80 %) et à moins de 10 m de l'eau (93,4 %). Dans notre aire d'étude, la loutre à longue queue est fortement dépendante de la présence de poisson, et nous estimons que le comportement de certaines espèces de poissons la rend plus vulnérable à la prédation. L' utilisation des habitats par les loutres a des implications importantes sur la gestion du parc national, notamment les grottes,

qui sont l'attraction touristique principale, et la présence de touristes à proximité du cours d'eau. Cependant, un plan de gestion bien adapté devrait être suffisant pour éviter l'impact négatif du tourisme. Nous pensons qu'un suivi de la population de loutre à longue queue dans notre aire d'étude est un élément important de sa protection afin d'évaluer les impacts de cette activité.

RESUMEN: ECOLOGÍA ALIMENTARIA Y SITIOS DE DEPOSICIÓN DE FECAS DE LA NUTRIA NEOTROPICAL (*Lontra longicaudis*) EN EL PARQUE NACIONAL "CAVERNAS DE Peruaçu", BRASIL

El conocimiento de la ecología alimentaria y el uso del hábitat de una especie es de valor esencial para la conservación efectiva. Describimos la dieta y los sitios de deposición de fecas para la nutria neotropical (*Lontra longicaudis*) en el Parque Nacional Cavernas de Peruaçu, sudeste de Brasil. Colectamos fecas y registramos las características de los sitios de deposición en el período 2007-2010. Describimos la dieta de la nutria como el número de fecas en las que se encontró un taxón dado, y la frecuencia de ocurrencia de cada taxón. Colectamos 57 fecas e identificamos 92 items alimentarios de nueve taxa diferentes, todos de origen animal. El taxón más frecuente fueron los peces, encontrados en 98.3% de nuetras muestras, seguidos por los artrópodos (22.8%) y los mamíferos (10.5%). Registramos 112 sitios de deposición de fecas, la mayoría ubicados en cuevas (80%) y <10 m del agua (93.4%). En nuestra área de estudio la nutria Neotropical se sustenta altamente en base a los peces, y creemos que el comportamiento de algunas especies de peces las hace más vulnerables a la predación. Aunque una acción de manejo bien implementada podría parecer suficiente para evitar los impactos negativos del turismo, creemos que es de importancia primordial de conservación monitorear la población de nutria Neotropical en nuestra área de estudio, para evaluar los impactos de esta actividad.

RESUMO: ECOLOGIA ALIMENTAR E SÍTIOS DE DEPOSIÇÃO DE FEZES DE LONTRAS NEOTROPICAIS (*Lontra longicaudis*) NO PARQUE NACIOANAL CAVERNAS DO PERUAÇU, BRASIL

Conhecer a ecologia alimentar e o uso do habitat pelas espécies é de essencial importância para ações efetivas de conservação. Neste trabalho descrevemos a dieta e os sítios de deposição de fezes da lontra neotropical (*Lontra longicaudis*) no Parque Nacional Cavernas do Peruaçu, sudeste do Brasil. Coletamos as fezes e registramos as características dos sítios de deposição entre 2007 e 2010. Descrevemos a dieta como o número de fezes em que cada taxon foi encontrado e a frequência de ocorrência de cada taxon. Coletamos 57 fezes e identificamos 92 itens alimentares de nove taxa diferentes, todos de origem animal. Peixes foi o taxon mais frequente, encontrado em 98.3% das nossas amostras, seguido por artrópodes (22.8%) e mamíferos (10.5%). Registramos 112 sítios de deposição de fezes, a maioria localizados em cavernas (80%) e <10 m de cursos d'água (93.4%). Em nossa área de estudo a lontra neotropical depende muito dos peixes e é provável que o comportamento de algumas espécies de peixes os tornam mais vulneráveis à predação. O uso do habitat pelas lontras tem importantes implicações para o manejo do parque nacional, já que as cavernas são as principais atrações turísticas e algumas trilhas turísticas estão localizadas próximas ao rio. Embora a implantação do turismo no parque nacional esteja sendo feita de forma bem planejada e as medidas adotadas pareçam suficientes para evitar impactos negativos dos visitantes sobre a biodiversidade, acreditamos que o monitoramento da população de lontras neotropicais em nossa área de estudo é de grande interesse para avaliar potenciais impactos futuros dessa atividade.

R E P O R T

A NATIONAL SURVEY OF THE EURASIAN OTTER (*Lutra lutra* L., 1758) IN MONGOLIA

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ABSTRACT: A survey for otters across Mongolia was conducted in 2012 to document the status and distribution range of the Eurasian otter (*Lutra lutra* Linnaeus, 1758), and to propose the scientific basis for government policies to protect the species. We report results from the first survey of otter since the late 1980s (Stubbe et al., 1989), with new records emerged after 2012. The species is very rarely reported in the country, but in addition to an actual sighting of this species, the survey team observed a limited number of otter sign, including tracks, scat, ice diving holes, snow diving marks, snow wallows, territorial marks, and prey remains at widely distributed sites. We recommend a set of strategies to expand conservation for the Eurasian otter in Mongolia.

Key words: Eurasian otter, *Lutra lutra*, Mongolia, Khalkh-Numrug Rivers, Tengis-Shishged Rivers, Onon-Balj Rivers

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INTRODUCTION

The Eurasian otter (*Lutra lutra* Linnaeus, 1758) has been classified as a very rare species in the Mongolian Red Book since 1987 (Shagdarsuren et al., 1987; Shiirevdamba et al., 1997, 2013), and hunting of otters has been forbidden by Mongolian law since 1930. Currently, it is protected as a Very Rare species under part 7.1 of the 2012 Mongolian Law on Fauna. Eurasian otters are listed on Appendix 1 of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1973) and classified globally as Near Threatened on the IUCN Red List, although Asian populations are declining rapidly due to human pressures. Despite efforts to protect otters in Mongolia, the species is thought to be extremely rare with a limited range. Information on otters in Mongolia is scanty, leading to the regional evaluation of this species as "data deficient" by the IUCN, with an estimated 12% of the species' range in Mongolia occurring within protected areas (Clark et al., 2006).

The earliest scientific report on Mongolian otters comes from Bannikov (1954), who reported a direct observation of an otter at the mouth of Khalkh Gol ('Gol' is the Mongolian word for river) in the easternmost corner of Mongolia. He suggested that they were rare in the Onon, Eroo, and Minj Rivers, while noting that otters have been reported at the mouths of the Zavkhan River and the Khunguin River from Khangai Mountains, and the Shishged River and the Tengis River in Hövsgöl Province. He also speculated that in the Altai Mountains, only the Bulgan River might have otters (Bannikov, 1954).

In 1968-1972, Tsagaan, a researcher at the Natural History Museum of Mongolia, initiated a campaign to study Mongolian otters, and reported his results in a series of scientific and popular publications (Tsagaan, 1975, 1977, 1981). Tsagaan surveyed widely in Mongolia for otters and collected a specimen from the mouth of Shishged River (now in the exhibit of the Natural History Museum in Mongolia) and captured a young otter from the Khalkh Gol. In his earlier report, Tsagaan (1975) effectively dismissed the otter occurrence in Bulgan River south of Altai Mountains, while confirming the low numbers of otters in the Khalkh River, Shishged River and isolated small parts of Delgermurun watershed. In the same paper (Tsagaan, 1975), he reported that there was an informal record that two otters from the Erchis River to the Khukh Togoo and Sagsai River of Altai Soum of Bayan-Ulgii Province were killed by locals. Based on this, it seems that Tsagaan (1975) could not confirm otter occurrence in the Mongol Altai with hard evidence.

Tsagaan estimated a population of 50±10 otters in the Shishged River in the Darkhad Basin, 20±5 animals in the Khalkh Gol, and another 10±5 animals in areas (~ 200 sq km) surrounding Lake Dayan of Bayan-Ulgii Province in western Mongolia, in the Mongol Altai Mountains (Tsagaan, 1981). Overall, the otter range in Mongolia was estimated to be about 2000 sq km, with a total population size, in 1981, of 80±20 animals (Tsagaan, 1981).

Researchers from the Institute of Biology, Mongolian Academy of Sciences, studied and mapped the distribution of mustelids, including otters, and collected information about distribution and habits of otters, covering Khentii Mountains from 1966 to 1970, the Khalkh, Numrug and Degee Rivers in 1976 and the western side of Altai Mountains in 1979 (Stubbe et al., 1989). They documented otters in small rivers in the Yenisei Basin in the north, the Khalkh Gol Basin in eastern Mongolia, as well as headwaters of the Khovd River in the Mongolian Altai, a result of combination of field work and compilation of information on otters in Mongolia collected since 1930s (Stubbe et al., 1989).

There have been several more recent reports. Roy Dennis of the Scottish Ornithologists' Club reported sighting an otter 30 km downstream of Bulgan Soum of Bayan-Ulgii province in September, 1991. Researchers also reported on the distribution of otters in the Khalkh and Numrug Rivers in eastern Mongolia and the Shishged and Tengis Rivers in the north (Samjaa et al., 1998). In their field work, the researchers located and mapped 8 locations for otter sign along the Khalkh and Numrug Rivers in the east and 5 locations in Darkhad Basin, while collecting information on winter habits of otters (Samjaa et al., 1998). In May 2004, an otter was killed by a domestic dog on the Khuitnii Gol in Darkhan-Uul Province in northern Mongolia (Tsendjav, 2005). All these reports have been summarized by Shar and Samiya (2011), in addition to their report on their field work of 2007 focusing on some lakes and rivers in Mongol Altai region. More recently, a skin was located in 2013 near the Tes River, in western Mongolia, and a live otter was sighted in the same river in 2013 (pers. comm., Ts. Dansran), suggesting a Tes River population.

These findings, along with faunistic and conservation literature that alluded to otter status (Dulamtseren, 1970; Sokolov and Orlov, 1980; Mallon, 1985; Shagdarsuren et al., 1987; Shiirevdamba et al., 1997, 2013; Clark et al., 2006) basically define our knowledge of Eurasian otters in Mongolia. This survey updates our knowledge of the status and distribution range of the Eurasian otter and serves as the scientific basis for government policies to protect this globally threatened species in Mongolia.

STUDY AREA

Based on the reported occurrences and published distribution records, we divided Mongolia into five geographical regions for the purpose of this otter survey.

(*a*) *Numrug Strictly Protected Area in Khalkh Gol Soum of Dornod Province in eastern Mongolia*: The Numrug River downstream of Three-River Delta (Gurvan Goliin Belchir), around the area called the German Bay, along the Khyasaat and Degee Rivers, along the Khalkh River, near the Border Patrol Outpost at Ers Mountain, near the Kheree Mountain, and the Bay of Yeren Baatar downstream from Khalkh Gol Soum.

(*b*) *Tengis and Shishged Rivers in Ulaan-Uul Soum of Hövsgöl Province in northern Mongolia*: The delta of Shishged and Tengis Rivers.

(*c*) *Onon and Balj Rivers in northeastern Mongolia*: The Onon, Balj and Khyarkhan Rivers in Onon-Balj National Park.

(*d*) *Khuitnii Gol area in Darkhan-Uul Province in northern Mongolia*: Areas along the Khuitnii Gol.

(*e*) *Lake Dayan Basin in Mongol Altai in western Mongolia*: This region was not surveyed in 2012, because it had recently been surveyed and reported Shar & Samiya (2011), which we simply incorporated that data in our analysis.

Altogether, we surveyed 10 rivers in 2012 where otters had been reported, in addition to published results of 2007 survey (Shar and Samiya, 2011), which included reports for five rivers and several small lakes in Lake Dayan Basin in western Mongolia.

SURVEY METHODS

Field surveys were done in November and December of 2012 by four teams of researchers, each headed by an experienced zoologist. The winter season was chosen so that it was relatively easy to document signs of presence of this secretive species. Experience was important because in northern Mongolia there is another species of mustelids, the American mink (*Neovison vison* Schreber, 1977), some signs of which (including the scat and tracks) may be difficult to distinguish from those of the otter to a non-trained person.

The field survey followed Rukovskii (1986) methodology for indirect signs, which in this case included scat, tracks, ice holes, and prey remains, to document otter presence. We walked continuously along the length of rivers on ice, with walking distances varying from half a kilometer up to five kilometers, searching for typical sign of otters, specifically focusing on areas with tall vegetation, roots and hollow trees near river stretches that may have unfrozen pools.

We recorded otter scat (fresh and old), tracks (fresh and old), ice holes, traces of snow diving, rolling or wallowing places in the snow, and apparent prey remains. All recorded signs were photographed, and mapped using GPS coordinates, which were used to develop a digital distribution map.

RESULTS

As a result of these surveys, otter presence was documented by indirect sign at fifty sites (‘site’ is defined as the location of an otter sign). Detailed information of these records is summarized in Table 1. Results from the current survey were used to develop a GIS-based map, at the scale of 1:500,000, of otter distribution in Mongolia (Fig. 1).

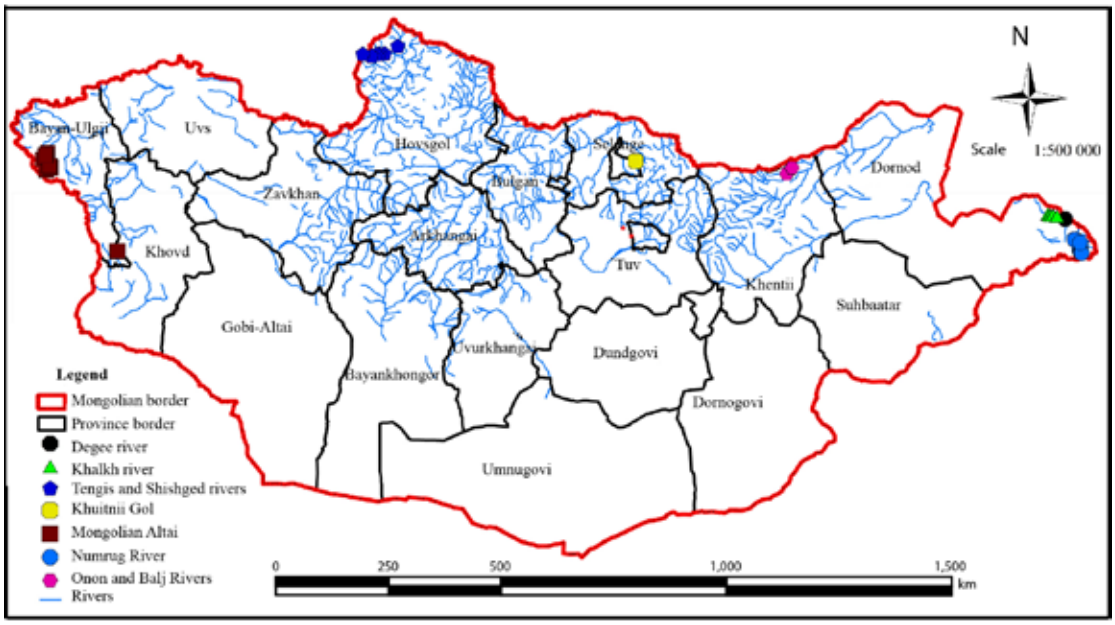

Figure 1. Locations of indirect sign observed in survey for otters in Mongolia. Each symbol represents one observation of otter sign (n = 50).

Eastern Mongolia

Of the rivers surveyed, Numrug River yielded the largest number of sign (Table 1) and resulted in actual sighting of one adult otter (Figure 3). We found otter sign at 13 sites, including 8 fresh tracks and 5 old tracks, 4 fresh scat, 2 fresh traces of wallowing in snow, 3 ice holes used by otters for feeding, 2 fresh and one old traces of snow diving, and 1 fresh pile of prey remains. Fresh otter sign was present downstream from the Three-River Delta (Gurvan Goliin Belchir Rivers), and near and downstream from the Numrug Border Patrol Outpost. A local citizen observed an otter near an area called Sumberiin zuun tokhoi, upstream from Khalkh Gol Soum (M. Sharkhuu, pers. comm. November, 2012), near where the survey identified fresh otter scat.

In addition, one fresh set of tracks and one fresh scat, together with what appears to be an ice hole and wallow were found on the Degee River, a tributary to Khalkh River. The survey in the Khalkh River in eastern Mongolia resulted in 16 sites of otter sign, including 3 fresh tracks, 11 old tracks, and 2 fresh scat. Additionally, two holes in the ice were found with otter tracks between them (Fig 2). There is also an anecdotal report that an otter was killed by a dog in 2009 at the Bay of Yeren Baatar, 10 km downstream from Khalkh Gol Soum.

Northern Mongolia

At the delta of Shishged and Tengis Rivers in northern Mongolia, our team found 4 fresh otter tracks, and 2 old tracks, together with a fresh scat, an ice hole, and a wallow (Table 1). This is an area that had been reported by locals to be inhabited by the otters, although sign was relatively scarce. At Khuitnii Gol in north central Mongolia, where there was the latest record (Tsendjav 2005), our team did not find any sign, although we found a fresh carcass of an otter along the river. In northeastern Mongolia at the Onon-Balj River Basin, our team found 2 fresh tracks and 2 fresh scat, along with one fresh ice hole and one wallow mark.

Western Mongolia

Our previous work (Shar and Samiya, 2011) documented two dead animals and sightings at 4 locations in Lake Dayan Basin in western Mongolia.

Table 1. Otter sign detected during the survey, fresh and old: tracks, scat, ice holes, trace of snow diving, snow wallow, and prey remains (n = 50); live and dead otters.

Tracks		Scat		Ice Holes		Snow Diving		Snow Wallows		Prey remains	
Fresh	Old	Fresh	Old	Fresh	Old	Fresh	Old	Fresh	Old	Fresh	Old
EASTERN MONGOLIA											
Numrug River: 13 sites: one live otter											
8	5	4	-	3	-	2	1	2	-	1	-
Degee River: 1 site											
1	-	1	-	1	-	-	-	1	-	-	-
Khalkh River: 16 sites											
3	11	2	-	2	-	-	-	-	-	-	-
NORTHERN MONGOLIA											
Tengis and Shishged River: 6 sites											
4	2	1	-	1	-	-	-	1	-	-	-
Khuitnii Gol: 1 site; skin remains from one otter											
Onon and Balj Rivers: 5 sites											
2	-	2	-	1	-	-	-	2	-	-	-
WESTERN MONGOLIA											
Lake Dayan Basin: 8 sites; two otter carcasses											
-	1	-	1	-	-	-	-	-	-	-	1

Figure 2. Otter tracks between two ice holes, Numrug River, November 29, 2012.

DISCUSSION

Otter sign was found at 50 sites in Mongolia in this survey: 16 sites on the Khalkh River, 13 sites on the Numrug River and one site in the delta of the Degee River and the Khalkh River in Eastern Mongolia; 5 sites on the Onon and Balj Rivers, 6 sites on Shishged and Tengis Rivers, one site on the Khuitnii Gol in Northern Mongolia; and 8 sites in the Lake Dayan Basin in the Mongol Altai Mountain in Western Mongolia. Our survey suggests that eastern Mongolian rivers, namely the Numrug and Khalkh Rivers, have the most abundant otter population, although within the region, the Khalkh River appears to have a smaller otter population than the Numrug River area, which in fact yielded the only actual sighting of an otter during the survey (Figure 3). The Khalkh River could potentially support more otters but for a well-developed road network and higher levels of disturbance from domestic animals.

In northern Mongolia, informal interviews with local residents of the Shishged and Tengis River Basins suggest that otters currently inhabit a 40-km stretch of the Shishged River, downstream from Khadan Khyasaa to the border, as well as the main tributaries of the Shishged River, such as Byaran, Jamsai, Bus and Tengis Rivers. The distributional range of otters seems not to have changed significantly since the 1995-1996 winter survey (Samjaa et al., 1998). The exception seems to be that otter distribution below the delta of Tengis and Shishged Rivers has shrunk towards the border with the Russian Federation.

In western Mongolia, otters have probably inhabited Lake Dayan and its basin in Mongol Altai Mountains at least since 1970. The Local History Museum in Bayan-Ulgii Province has a taxidermy specimen of an otter collected in 1975 by Erikbay Ansabai of Sagsai Soum of Bayan-Ulgii Province. In recent years, however, habitat and prey resources of otters have been shrinking in this area due to increased human and domestic animal populations. Based on the finding of two dead otters from the River Arkhalag and west side of Lake Dayan, two otter sightings in the Songinot River, and other anecdotal information, we conclude that there are still otter populations in the Lake Dayan Basin. The Yamaat and Songinot Rivers merge and flow across the border between the People's Republic of China and Mongolia, and otters may cross into Mongolia from China along these rivers, but thus far, traces of otters are rare on the Mongolian portions of these rivers. Research on *L. lutra* in the rivers of the enormous areas of southern Siberia, or northern and eastern China which border on Mongolia, however, has been insufficient to characterize the status of the species in those regions (Conroy et al., 1998). Of the rivers surveyed in Mongolia, the most suitable habitat appears to be found along the Songinot, Yamaat and Tumbaa Rivers. The remains of dead otters from Arkhalag River and Chuluut Nuur on the west side of Lake Dayan suggests that these water bodies are inhabited by otters. These otters may seasonally follow the fish spawning run upstream in the spring, and downstream in the fall.

Except for some lakes in the western part of the country, our survey suggests that otters are mostly found in Mongolia in rivers that cross international political boundaries. This could represent a potential threat to otter populations if they are not managed across boundaries in coordination with the responsible agencies.

Figure 3. Otter observed at the Numrug River in Eastern Mongolia, November 28, 2012

MANAGEMENT RECOMMENDATIONS

1. Approaches must be developed to stop the poaching of otters in Mongolia. Local communities should be involved through agreements that recompense local families for information about poachers, while at the same time protecting informant identity. Economic incentives are badly needed to bring otter poachers to justice.
2. In the cases of dead otters that we examined, the cause of death was always a dog attack. We recommend that local rangers and environmental officers prohibit families with dogs to reside in areas of otter distribution during the times of high vulnerability, including the mating and pupping seasons.
3. We recommend creating programs that increase the involvement of local communities in protecting otter habitats, that raise public awareness about legal consequences of poaching endangered otters, and that provide educational workshops and materials.
4. We recommend that local government agencies develop agreements with anglers and fishing tour companies that specifically prohibit illegal activities, such as disturbing or poaching otters.
5. Otters are more visible and vulnerable when rivers are frozen. Winter ice-fishing should be prohibited on rivers with otter populations, especially where there is little open water available.
6. A wildlife ecology monitoring station should be established in an area of otter habitation, for example, the Numrug River stretch in the Numrug Strictly Protected Area. Such a monitoring station could rely for protection on existing infrastructure of the Numrug Border Patrol Outpost. Based on the results from consistent monitoring, strategic plans for otter conservation could be developed.
7. The establishment of the Ulaan Taiga Protected Area in Hövsgöl Province may present a favorable opportunity for long-term monitoring studies of fresh water bodies of Darkhad Basin and the high mountain ecosystems of Baruun Taiga (Western Taiga) and Zuun Taiga (Eastern Taiga). In particular, if the Ulaan Taiga Protected Area Administration, with support from the Ministry of Environment and Green Development, initiates studies of biological diversity in

the border areas of Shishged River, Ulaan Taiga and the Bus River Basin in collaboration with its partners in the Russian Federation, Mongolian research organizations are prepared to support such cooperation.

8. The biodiversity of Darkhad Basin is relatively less-studied compared to other areas in Mongolia, even while it has high conservation value in its unique ecosystems. The headwaters of Delgermurun, which becomes the Selenge River, and the headwaters of Shishged River, a major tributary of Little Yenisei River, are in this basin. It was disheartening to learn from reindeer people that they believe the climate here is drying, and drinking water resources becoming less available. Such claims by local people appear to be well-grounded, judging from our own informal observation in the area. The main reasons of the drying trend are claimed to be decreased snowfall during winter and colder summers with decreased rainfall. The Nature Reserve of Tengis-Shishged Rivers and the Ulaan Taiga Strictly Protected Area were established as a result of a project implemented in the Altai-Sayan Ecoregion. Now it is important to strengthen the capacity of Ulaan Taiga Protected Area Administration and to support the activities of this protected area by conducting detailed studies on biological diversity of the region and establishing a network of monitoring studies.

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RÉSUMÉ

SUIVI NATIONAL DE LA LOUTRE EURASIENNE (*Lutra lutra* L., 1758) EN MONGOLIE

Un suivi des loutres a été réalisé à travers la Mongolie en 2012 afin d'évaluer le statut et la distribution de la loutre eurasienne (*Lutra lutra* Linnaeus, 1758) et de proposer une base scientifique à des règles de gouvernance destinées à protéger l'espèce. Nous avons rapporté les résultats du premier suivi de loutre qui date des années 1980 (Stubbe et al, 1989) ainsi que des nouvelles données postérieures à 2012. L'espèce est très peu signalée dans la pays, et dans le cadre de son observation actuelle, l'équipe du suivi a observé un nombre limité d'indices de présence comprenant des traces de pas, des épreintes, des orifices de plongée dans la glace, des traces de plongée et de ressui dans la neige, des marques territoriales et des restes de proie sur des sites largement dispersés. Nous recommandons un ensemble de stratégies pour étendre la protection de la loutre eurasienne en Mongolie.

RESUMEN

RELEVAMIENTO NACIONAL DE LA NUTRIA EURASIÁTICA (*Lutra lutra* L., 1758) EN MONGOLIA

Condujimos un relevamiento de nutrias en todo Mongolia, en 2012, para documentar el status y distribución de la nutria eurasiática (*Lutra lutra* Linnaeus, 1758), y para proponer bases científicas para políticas gubernamentales de protección de la especie. Informamos los resultados del primer relevamiento de nutrias que se hace desde fines de 1980s (Stubbe et al., 1989), con nuevos registros que han aparecido después de 2012. La especie es muy raramente informada en el país, pero en adición a un avistaje concreto de la especie, el equipo de relevamiento observó un número limitado de signos, incluyendo huellas, fecas, agujeros de buceo en el hielo, marcas de buceo en la nieve, revolcaderos en la nieve, marcas territoriales, y restos de presas, en sitios ampliamente distribuidos. Recomendamos un conjunto de estrategias para expandir la conservación de la nutria eurasiática en Mongolia.

R E P O R T

PHOTOGRAPHIC DOCUMENTATION AND DISTRIBUTION OF SMOOTH-COATED OTTER (*Lutrogale perspicillata*) (GEOFFROY 1826) IN SURAT, GUJARAT

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Abstract: A group of Smooth-coated otter (*Lutrogale perspicillata* GEOFFROY 1826) was sighted at Gavier lake of Nature Club Surat. This group of otter was documented by Nature Club Surat with the help of camera traps. Nature Club Surat has also identified five other sites where indirect signs of otters were found. In March 2014 otters were sighted for the first time in Gavier Lake but no photographic evidences were found at that time. (http://timesofindia.indiatimes.com/city/surat/Endangered-otters-back-in-Gavier-lake/articleshowprint/31931076.cms?null). According to presently available data and information of Gujarat State Forest Department, smooth-coated otters are only found in Narmada River system and surrounding water sources such as wetlands, lakes, canals and streams.

Keyword: Smooth-coated otter, Aquatic Mammal, Surat, Gujarat.

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INTRODUCTION

Smooth-coated otter (*Lutrogale perspicillata*) is listed as vulnerable in the IUCN Red List (http://www.iucnredlist.org/details/12427). The species is protected under Schedule II of Wildlife Protection Act, 1972 of India. It is listed in appendix II of CITES (CITES 2014). Smooth-coated otter are widely distributed in Southeast Asia but very little information is available on the status of Smooth-coated otter populations in Gujarat state as well as India, although there seems to have been a rapid decline due to loss of habitat and intensive poaching (Hussain et al., 2008). Being the apex predator in their ecosystem, they are well adapted to semi-aquatic life and majorly thrive in areas where fresh water is plentiful, including wetlands, rivers,

lakes and mangrove forests. Smooth-coated otters are among the least studied animals in India. There is very less information available on their distribution in Gujarat. Smooth-coated otters are part of illegal trade for their skin and bone, and there is high demand of their body parts in illegal market (http://www.otterspecialistgroup.org/Library/Colloquium_10/Presentations/10-10-16-20_Alarming_Trade_Paul_Yoxon.pdf).

Surat city is unique in availability of water sources as it is well connected by canal networks, wetlands, ponds, lakes, and the Tapi River along with the adjacent coast of Gulf of Khambhat provides mangrove habitat in which otters could survive. These areas provide otters with a range of food choices including fish, crustaceans, small birds and mammals, water snakes and amphibians.

Surat is mainly covered by agricultural landscape. This agricultural landscape is well connected by irrigational canals which are likely the main waterways for smooth-coated otters to commute from one water body to another. Smooth-coated otters were observed for the first time in Gavier Lake (Fig. 1) of Nature Club Surat which is situated near Surat airport. It is waterbody rich in biodiversity. Nature Club Surat has planted more than 1500 native trees which attracts birds and butterfly. Gavier Lake is home of more than 50 native bird species which are nesting at Gavier lake and around 150 species of migratory birds are recorded during winter season. In November 2015 the Nature Club Surat team sighted otters once again in Gavier Lake and decided to document them by camera trapping. Camera traps were installed in Gavier Lake and on the first day itself the camera trap recorded a group of five smooth-coated otters. Later camera trapping was continued for more than a month for documentation and good photographs.

Figure 1. Camera trap locations for documenting otters at Gavier Lake

METHODOLOGY

Camera trapping and sign surveys were the main methods employed. Two infrared camera traps of Cuddeback model C2 were used and installed in various

locations of the Gavier Lake (Fig.1). Every three days camera trap were checked and data collected. This process was repeated for six weeks during the peak of the activity season (2nd week of October, 2015 to the 1st week of January, 2016). Smooth-coated otters were identified by comparing images and video footages with field guides and published literature (Menon, V. 2014**)**. Moreover we also compared the images and video footages with the live specimens of smooth coated otters housed at Surat city zoo. We also surveyed other water bodies of Surat outskirts such as lakes, wetland, canals and mangroves areas to search for indirect signs of otters such as tracks and spraints.

RESULTS

On the first day after setting a camera trap recorded a group of five smooth-coated otters (Fig. 2). Later camera trapping was continued for more than a month for documentation and photographs and videos were collected.

Figure 2. Smooth-coated otters documented by camera trap at Gavier Lake during November 2015

Figure 3. Smooth-coated otter photographed by Dr. Nilay Desai at Tena lake while bird watching in November 2011

Figure 4. Spraints of smooth-coated otter found at Gavier Lake in November 2015

Surveyed other water bodies of Surat outskirts of Surat such as lakes, wetland, canals and mangroves areas revealed evidences of smooth-coated otters at seven sites (Tab.1).

Table 1. Sites were Smooth-coated otters indirect signs were found in Surat outskirts:

Sr. No.	Sight Name	GPS Coordinates	Direct Sighting/Indirect Signs	Season during Sighting & Survey period
1	Gavier Lake	21º07'38.5" N 72º44'02.3" E	Direct Sighting & Indirect Signs (Tracks & Spraints)	Winter (Seven weeks)
2	Lake near Olpad village	21º19'29.9" N 72º44'33.1" E	Indirect Signs (Spraints)	Winter (Two Weeks)
3	Barbodhan Lake	21º13'12.4" N 72º42'11.7" E	Indirect Signs (Tracks & Spraints)	Winter (Two Weeks)
4	Mindhola River	21º5'32.7" N 72º5'34.8" E	Indirect Signs (Tracks & Spraints)	Monsoon (One Week)
5	Kukni village canal	21º14'49.7" N 72º43'20.0" E	Direct Sighting & Indirect Signs (Spraints)	Winter (Two Weeks)
6	Hazira mangroves	21º6'0.5" N 72º41'7.6" E	Indirect Signs (Spraints)	Summer (Three Weeks)
7	Tena Lake		Direct Sighting (by Dr. Nilay Desai) Indirect Signs (Spraint & Tracks) (Fig. 3)	Winter (Two Weeks)

DISCUSSION

Smooth-coated otters are adapted to live near human populations and migrate through the canal network. It was observed that otters are not habituated to human presence. Being nocturnal, most activity is observed at night in the field areas. They are also found crossing roads in certain areas. We have found fish bones, small particle of turtle shell, and feathers in their spraints (Fig. 4). We have found them most active during winter, visiting various ponds in search of food. During summer and monsoon, they are mostly seen near estuarine areas by local people.

In the Surat district and other surrounding villages, smooth-coated otters are mainly sighted near aquaculture farms such as the prawn farm. They are observed feeding on prawns and fishes at the farm. The farm owner suffer financial loss as otters destroyed their prawn cultivation, and sometimes the farm owner tries to kill otters (no evidence available, just information shared by local people). Pollution is also a threat to them. The fishing community also needs to be aware of their presence and importance. Being sensitive towards the environmental changes, smooth-coated otters are suitable indicators for the health of wetland ecosystems (Nawab, 2009). They are the topmost predator in this freshwater ecosystem. Conservation measures are required for smooth-coated otters and their habitat. Local people and fishermen will be targeted for education and outreach programs in order to build locally driven conservation actions. This will ensure the self-sustained conservation of the species in the area, encompassing micro and macro habitat protection. Monitoring and documentation of current population will help to make a future conservation plan.

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RÉSUMÉ

REPORTAGE PHOTOGRAPHIQUE ET DISTRIBUTION DE LA LOUTRE À PELAGE LISSE (*Lutrogale perspicillata*) (GEOFFROY, 1826) DANS LE SURAT, ÉTAT DE GUJARAT

Un groupe de loutres à pelage lisse (*Lutrogale perspicillata* Geoffroy, 1826) a été observé au lac Gavier du Club Nature de Surat. Ce groupe a été étudié par le Club Nature Surat à l'aide de pièges photographiques. Le Club Nature de Surat a également identifié d'autres sites où des indices de présence indirects de loutres ont été trouvés. En mars 2014, des loutres ont été observées pour la première fois au Lac Gavier, mais aucune photo probante n'a été prise à cette occasion. (http://timesofindia.indiatimes.com/city/surat/Endangered-otters-back-in-Gavier-lake/articleshowprint/31931076.cms?null). Selon les données disponibles actuellement et les informations du Département de la Forêt de l'Etat de Gujarat, les loutres à pelage lisse sont uniquement présentes dans le réseau hydrographique de la rivière Narmada et à proximité des ressources en eau telles que zones humides, lacs, canaux et ruisseaux.

RESUMEN

DOCUMENTACIÓN FOTOGRÁFICA Y DISTRIBUCIÓN DE LA NUTRIA LISA (*Lutrogale perspicillata*) (GEOFFROY 1826) EN SURAT, GUJARAT

Un grupo de nutria lisa (*Lutrogalle perspicillata* GEOFFROY 1826) fue avistado en el lago Gavier (en el Club de Naturaleza Surat). Este grupo de nutrias fue documentado por el Club de Naturaleza Surat con la ayuda de cámaras-trampa. En este club fueron también identificados otros cinco sitios en los cuales se encontraron signos de nutria. En Marzo de 2014 fueron vistas nutrias por primera vez en el Lago Gavier, pero en ese momento no se encontraron evidencias fotográficas (http://timesofindia.indiatimes.com/city/surat/Endangered-otters-back-in-Gavier-lake/articleshowprint/31931076.cms?null). De acuerdo a los datos disponibles actualmente y a la información del Departamento Estatal de Bosques de Gujarat, las nutrias lisas se encuentran solamente en el sistema del Río Narmada y ambientes acuáticos vecinos, como humedales, lagos, canales y arroyos.

R E P O R T

THE RECOVERY OF A COASTAL EURASIAN OTTER (*Lutra lutra*) POPULATION IN THE GALICIAN ATLANTIC ISLANDS MARITIME-TERRESTRIAL NATIONAL PARK

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Abstract: In Galicia (NW of the Iberian Peninsula) there is an important population of coastal Eurasian otters (*Lutra lutra*), some of which are present on islands. This study analyses the recent historical evolution of the species distribution along the Galician Atlantic Islands Maritime-Terrestrial National Park. National surveys of years 1984, 1994 and 2005, other local surveys conducted between 2000 and 2017, some publications and other technical reports have been used for this purpose. Also, between 2010 and 2017, the number of otters inhabiting each island and their relative age were estimated using camera traps. According to the information collected, otters may have disappeared or become very scarce in the last third of the 20th century. However, from the beginning of the 21st century, their populations began to recover, occupying today all the islands and the closest coasts. It has been confirmed otter breeding in all islands between 2010 and 2017. The average size of the observed litters was 1.89 cubs. There does not seem to be a well-defined breeding season pattern. For each of the islands, a minimum population of 4 otters was recorded.

Keywords: *Lutra lutra*, island population, distribution, breeding, Galicia, NW Iberian Peninsula

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INTRODUCTION

The Eurasian otter (*Lutra lutra* L.) occupies some coastal areas of northern and western Europe, mainly in Great Britain, Norway, France, Portugal and Spain (Macdonald and Mason 1994; Trindade et al., 1998; Romero, 2008). In these coastal areas, it is also present in islands, as is the case with some archipelagos of Scotland (Kruuk, 2006), Norway (Heggberget and Christensen, 1994), French Brittany (Lafontaine, 2001) and Denmark (Elmeros et al., 2006). In the Iberian Peninsula, the only population of otters living on islands is probably the one find in Galicia (NW Spain) (Ruiz-Olmo and Delibes, 1998). On its coasts, there are a large number of

islets and islands, many of which are inhabited or visited sporadically by otters (Romero et al., 2008).

The small islands or archipelago of Sálvora, Ons and Cíes are among the largest in Galicia, and are now included in the Galician Atlantic Islands Maritime-Terrestrial National Park. They are located within the coastal areas with the highest human density in Galicia, currently experiencing an industrial growth. Otter populations in this coastal area declined or even disappeared by the end of the 20th century. This study describes the recent recovery of otter populations in these islands and closest coasts from data obtained from various surveys and bibliographical references. In addition, information about the breeding of the species is provided based on data collected by using remote cameras.

METHODS

Study area

The study area includes three small archipelagos located at the entrance of Rías (sea inlets) Baixas (coastal region of the SW of Galicia, NW Spain), belonging to the Galician Atlantic Islands Maritime-Terrestrial National Park (PNMTIAG) (Figure 1). From north to south the archipelagos included are Sálvora, Ons and Cíes (this last includes the islands of Monteagudo, Faro and San Martiño), located respectively at the entrance of the Rías of Arousa, Pontevedra and Vigo. Each of them is formed by one or three main islands and numerous islets. The length of the main islands varies between 2.5 km and 5 km, and its surface area between 152 ha and 416 ha. The information used here refers exclusively to the main islands of each archipelago (Figure 1).

Review of information

The main source of information to analyse the evolution of otter occurrence in the islands and closest coasts was the national surveys conducted in 1984 (Delibes, 1990), 1992 (Munilla et al., 1998) and 2004 (Romero, 2008). In addition, data collected between 2000 and 2017 (direct observations of otters and dead specimens), as well as information from local surveys (own data) conducted in the islands also between 2000 and 2017, were used. For the 20th century, data from books on biology and ecology of local natural spaces, technical reports, and even literature books, were also taken into account (Table 1).

Camera traps

Camera trapping were carried out between 2010 and 2017. Two models of cameras were used: Scoutguard SG550 and Moultrie M-990i. In Ons island a short photo-trapping campaigns were carried out using one or two cameras, only in 2011 and 2012. In the other islands, camera trapping has been more continuous over the years, although the effort (no. cameras/day) was very uneven (Table 2).

Each photograph or video, called event, was individualized according to date and location. An independent event was considered as a set of photographs or videos made at intervals of more than 60 minutes (Wagnon and Serfass, 2016). Four age classes were defined, depending on the relative size of the individuals observed together in the same scene or event (photograph or video). The sizes or classes considered were based, with some modifications, on the definitions used by Ruiz-Olmo et al. (2002):

- Very small cubs. Individuals equal to or less than 1/2 adult length. It includes cubs of approximately 2-3 months (Figure 2).

- Small cubs. Individuals smaller than an adult, but larger than 1/2 adult lenght. It includes cubs from more than 2-3 months to 6 months old (Figure 3).
- Large cubs. Similar size and difficulty to distinguish from an adult. More than six months. Within this category, were classified those otters observed in group (two or more individuals) that exhibited markedly restless behaviour, with frequent games, and apparent dependence or attention on another individual (assumed as an adult/mother) (Figure 4).
- Adult or probably adult. Large size. Within this category are otters of comparatively larger size, and those apparently large when detected alone in an event.

The size of the litters detected in the different events was estimated excluding individuals who clearly had a larger size (adults) or attending to their behaviour as explained above.

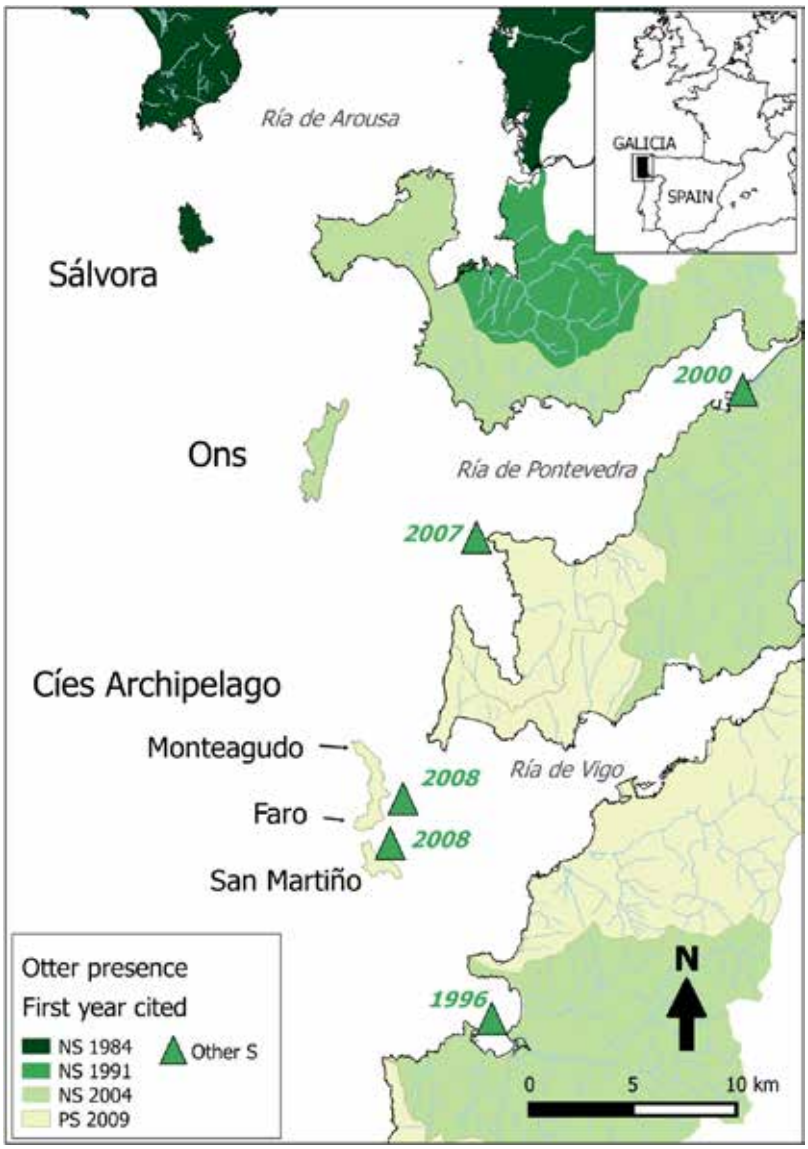

Figure 1. Evolution of the otter presence in the PNMTIAG islands and in the coastal basins of Rías Baixas region (SW of Galicia). Authors' contributions from different sources: NS, National otter surveys of 1984 (Delibes, 1990), 1991 (Munilla et al., 1998), 2004 (Romero, 2008); PS, own data of otter surveys conducted from 2009 in the PNMTIAG; Other S, own data of otter surveys carried out from 2000.

RESULTS AND DISCUSSION

Presence and recovery of the otter along the Galician coast

The information collected suggests that the otter must have been present historically on coasts and islands of the Rías Baixas. There are place names (toponyms) that refer to the existence of otters in the islands of Monteagudo ("Furna das lontras": means "cave of otters") and in Sálvora ("As Lontreiras": means "place frequented by otters"). Toponyms very similar to these can also be found at various points along the continental coast of the Rías Baixas (Romero 2006). Although no data are available, it is likely that the presence of otters on the coast and islands has been constant until the last third of the 20th century. Until the mid-twentieth century otters were hunted on the continental coast, and systematically captured on the island of Ons to sell its skin. Until the 1960s, there were still otters in some small coastal basins of the Vigo and Pontevedra Rías (Blas-Aritio, 1970).

However, during the first field surveys conducted in 1984 (Delibes, 1990), the presence of otters could be confirmed only in some of the northern coastal basins of the study area (Figure 1). According to the following field surveys performed in 1991 (Munilla et al., 1998) and 2004 (Romero, 2008), otter signs of presence (spraints, foot-prints) were detected in the southernmost coastal basins. The occurrence of dead otters and the detection of signs of presence between 2006 and 2009 (Own data) confirmed the presence of the species throughout this coastal zone during these years (Figure 1). Probably, the species was progressively scarce from the 1960s until disappearing, or at least becoming very scarce, in the 80s. From then on, their populations would recover, until they occupied the entire area of present study.

Presence and recolonization of the PNMTIAG islands

There are references to the presence of otters in the PNMTIAG islands during much of the study period (Table 1). Some publications and technical reports mention the existence of otters in the southern islands (Ons and Cíes) during the 1980s and 1990s (Table 1). Some of these references, however, are somewhat ambiguous, since they refer to data from third parties without specifying a particular date, whether it was a sighting or a footprint or a spraint. However, field surveys conducted between 1999 and 2002, despite being very intensive, did not detect the presence of the species in these islands. This suggests that during the first half of the study period (1984-2006), although the otter could be occasionally present in the southernmost islands (Cíes), it probably did not have a settled population and their presence must have been sporadic. In light of the results of the otter surveys carried out, the real recolonization of the islands occurred in 2008 (Figure 1).

The presence of the otter in the islands seems to be a consequence of their occurrence on the nearest coast. On the northernmost island (Sálvora), its presence was detected throughout the study period, as in the closest coastal basins (Table 1 and Figure 1). The same is true of the rest of the islands, where the appearance of the otter is practically simultaneous with its appearance on the nearest coasts (Figure 1).

The colonization of the islands is more likely to be done from the nearest coasts, distant between 3.7 km and 2.5 km in a straight line, than from Sálvora, which is between 9.5 km and over 20 km. Although records of displacement of otters on the coast of more than 30 km have been referred, the most common movements are of a few kilometres between some coastal locations or very close islands (Kruuk and Moorhouse, 1991).

The recolonization of the SW coast of Galicia and the nearby Atlantic islands could be framed within the general context of recovery of the Iberian otter populations, as in most of Europe during recent decades (Prigioni et al., 2007; Weinberger et al., 2016). In Galicia the causes of such recovery are not known. Apart from the possible effects of pollution on the decline of their populations (Macdonald and Mason, 1994), hunting and direct persecution may have had some influence, as in the recent past in certain areas of Great Britain and Spain (Strachan and Jefferies, 1996; Delibes, 1990). It is noteworthy that in Spain in 1963, otter hunting was prohibited by law, which could have had a direct effect on the later recovery of otter populations in the Rías Baixas region.

Table 1. Information on the presence of otter in the islands from 1984 (0, No signs of otter during survey; 1, Indirect reference; 2, footprints; 3, spraints; 4, unspecified data; Sings (spraints or footprints) are highlighted in green. The numbers in parentheses indicate the following bibliographical references (A), Delibes (1990), (B) Callejo (1986), (C), Fernández de la Cigoña (1991), (D), Munilla et al., (1998), (E) Chouza and Cid (1995), (F) Tragsatec (1999), (G) Romero (2006), (H) Romero (2008), (I to T) Romero (Own data). Highlight in green data from footprints or spraints.

Island	A 1984	B 1986	C 1991	D 1991	E 1995	F 1999	G 2000	H 2004	I&J 2006	K 2007	L 2008	M 2009	N 2010	O 2012	P 2013	Q 2014	R 2015	S 2016	T 2017
Sálvora	-	-	2	-	-	1	2/3	-	-	2/3	-	2/3	2/3	2/3	2/3	2/3	2/3	2/3	2/3
Ons	-	0	1	-	-	1	0	-	1	-	-	2/3	2/3	2/3	2/3	2/3	2/3	2/3	-
Monteagudo	1	1	1	-	4	2	0	-	-	-	-	0	2/3	2/3	2/3	2/3	2/3	2/3	2/3
Faro	1	1	1	-	4	1	0	-	-	-	2	0	2/3	2/3	2/3	2/3	2/3	2/3	2/3
San Martiño	1	1	1	-	4	1	0	-	-	-	2	0	2/3	2/3	2/3	2/3	2/3	2/3	2/3

Otter breeding in the islands (2010 to 2017)

During the study period it was possible to confirm otter reproduction in all the islands of the PNMTIAG (Table 2). Small-sized offspring were only found in 2010 on the northernmost island (Sálvora) and in 2011 on the central island (Ons) (Figure 2). In the events recorded later, several groups with otters of different size and behaviour (small or large cubs) were observed (Figures 3, 4 and 5). Data collected during the study period suggest that the species breed almost uninterrupted between 2010 and 2017 on the island of Sálvora (Table 2). It also probably breeds in Faro and Monteagudo islands, since footprints of three specimens walking together were detected between 2014 and 2016.

Table 2. Year and camera traps otter surveys (ni, number of nights with camera traps; ca, number of cameras; Gray quadrate, otter group detected).

	2010		2011		2012		2013		2014		2015		2016		2017	
Island	ni	ca	ni	ca	ni	ca	ni	ca	ni	ca	ni	ca	ni	ca	ni	ca
San Martiño	0	0	3	5	4	9	48	4	47	3	77	5,3	34	4	27	3
Faro/Monteagudo	0	0	0	0	0	0	56	11	3	2	53	10	92	2,1	28	2
Ons	0	0	13	1	5	1	0	0	0	0	0	0	0	0	0	0
Sálvora	35	9	14	10	0	0	30	12	99	7,3	40	4	42	8	9	4

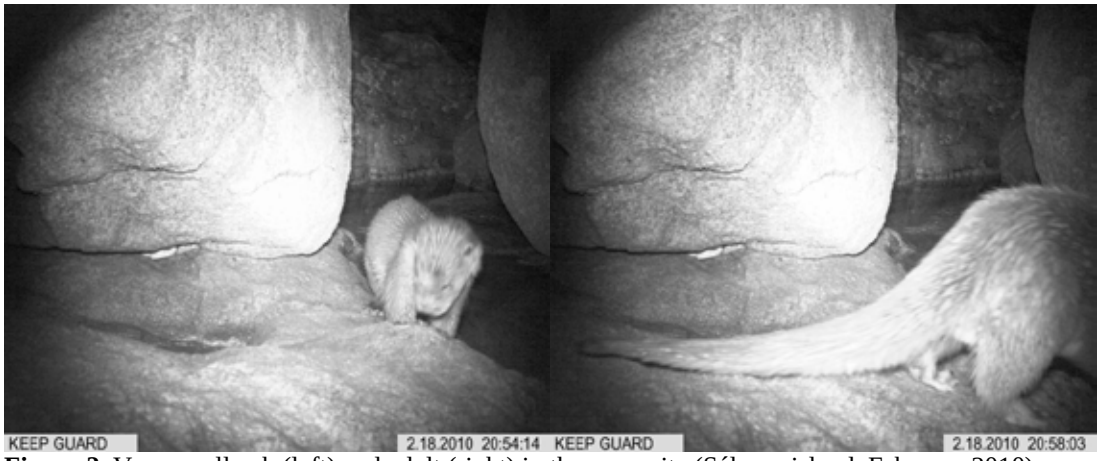

Figure 2. Very small cub (left) and adult (right) in the same site (Sálvora island, February 2010).

Figure 3. Small cub (left) and adult (right) in the same site (Monteagudo island, Cíes, April 2016).

Figure 4. Video detail with a group of 3 otters, 2 large cubs and 1 adult (San Martiño island, Cíes, April 2017).

Figure 5. Video detail with a group of 4 otters, 2 small cubs and 2 adults (San Martiño island, Cíes, March 2015).

Of a total of 217 events in which otters were detected, 83.4% corresponded to single individuals classified almost all of them as adults, while the remaining 16.6% corresponded to groups of 2 to 4 individuals. The group that accumulated a greater number of events was formed by 3 otters (Figure 4), followed by the groups formed by 2 and 4 otters respectively (Figure 5). By counting only the events with several individuals (n = 35), the mean size of these groups was 2.6 individuals (± 0.608 sd.; n = 35). The mean litter size was estimated at 1.77 individuals (± 0.426 sd.; n = 35). It should be noted, however, that most of the events recorded may correspond to the same litters observed repeatedly. Assuming that all the events of each year belong to the same litter, and counting only the maximum number of cubs detected in each of them, the average litter size for the total of the islands would be 1.89 ± 0.33 (sd., n = 9) (Table 3).

Table 3. Litter size estimated from 2010 to 2017.

Island	Year	No. Cubs
Monteagudo	2013	2
Monteagudo	2017	2
San Martiño	2014	2
San Martiño	2017	2
Sálvora	2010	1
Sálvora	2013	2
Sálvora	2014	2
Sálvora	2015	2
Ons	2011	2
Mean		*1,89*

In other coastal localities of Europe the sizes of otter litters are very similar to those estimated here. In Portugal, Beja (1996) obtained an average of 1.73 cubs for a total of 11 litters. On the coasts of Norway, Heggberget and Christensen (1994) find

an average of 2.0 cubs, while in Shetland the average is 1.86 cubs for 102 litters (Kruuk et al., 1991).

Individuals belonging to the very small cubs class (<1/2 of adult size) were detected in February (Sálvora Island) and March (Island of Ons). Assuming an age of between 2 and 3 months, it means that they could be born between November and January. Individuals belonging to the other two size classes considered (small cubs and large cubs) could be observed throughout the year (Table 4). For this reason, although these data may be compatible with births during the winter or spring, nor it could be confirmed. It is possible that the otter does not have a specific breeding period in the islands, as in other coastal areas of Europe (Heggberget and Christensen, 1994; Beja, 1996; Kruuk, 2006). Although it would be necessary more detailed information in order to confirm this.

It was possible to confirm the simultaneous existence of an isolated individual and a family group in the islands of Monteagudo, Faro and Sálvora. In addition, a group of 4 otters were located on the island of San Martiño. In the absence of more information, this number of individuals (n = 4) could constitute the minimum size of the otter population in each of the 5 main islands of PNMTIAG. However the Cíes Islands are very close to each other, so the same group of otters could occupy more than one island.

Table 4. Number of events by month and relative size of otters detected by trap cameras.

Size	January	February	March	April	May	June	July	August	September	October	November	December
Very small cubs		1	1									
Small cubs		2	2	2		1				2		
Large cubs			3	5				3				3
Adult or probably adult		1	4	4								3

CONSERVATION

The existence of otter groups in all the islands included in PNMTIAG increases the value of this natural space. Therefore, its conservation should be a primary objective in the management of the National Park. However, the islands that comprise it are located on coasts with a dense and growing human population, which could hamper the future of their otter populations. The entire coastal area of the Rías Baixas supports growing industrialization and a considerable increase in tourism. Due to the small size of island otter populations, they are likely to depend on the nearest continental populations to survive. For this reason, the management measures applied to the species should include the entire coast of the Rías Baixas. It is paradoxical that the coastal otter populations of a national park such as PNMTIAG depend on the otter populations living on the most heavily populated and probably more degraded coasts of Galicia.

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RÉSUMÉ

LE RETABLISSEMENT DES POPULATIONS COTIERES DE LA LOUTRE EURASIENNE (*Lutra Lutra*) DANS LE PARC NATIONAL DES ÎLES ATLANTIQUES DE GALICE

En Galice (Nord-ouest de la péninsule Ibérique), il existe une importante population de loutres côtières dont certaines sont présentes sur les îles. Cette étude analyse la récente évolution historique de la distribution de cette espèce sur les îles appartenant au Parc National des Iles Atlantiques Galiciennes et sur la côte continentale la plus proche. L'utilisation des données d'enquêtes nationales menées en 1984, 1994 et 2005, des données provenant d'autres enquêtes locales menées entre 2000 et 2017, de diverses publications de vulgarisation et d'autres documents techniques ont permis l'élaboration cette étude. De plus, durant les années 2016 et 2017, une estimation de la population de loutres et de leur âge relatif a été réalisée grâce à l'utilisation d'appareils photos automatiques. Selon les informations recueillies, la loutre aurait pu avoir disparu de la zone d'étude, ou y devenir très rare dans le dernier tiers du XXe siècle. Dès le début du XXIe siècle, les populations commencent à se récupérer jusqu'à occuper actuellement l'ensemble de la zone d'étude. La reproduction de la loutre a été constatée sur toutes les îles entre les années 2010 et 2017. Le nombre moyen des portées est de 1,89 petits et il ne semble pas avoir une période de reproduction bien définie. Sur chacune des îles, il pourrait avoir un minimum de 4 individus.

RESUMEN

LA RECUPERACIÓN DE LAS POBLACIONES COSTERAS DE NUTRIA EUROASIÁTICA (*Lutra lutra*) EN EL PARQUE NACIONAL MARÍTIMO TERRESTRE DE LAS ISLAS ATLÁNTICAS DE GALICIA

En Galicia (NW de la Península Ibérica) existe una importante población de nutrias costeras, algunas de las cuales están presentes en islas. En este estudio se analiza la evolución histórica reciente de la distribución de la especie en las islas pertenecientes al Parque Nacional Marítimo Terrestre de las Islas Atlánticas de Galicia y costa continental más cercana. Se han utilizado para ello los datos de los sondeos nacionales realizados en los años 1984, 1994 y 2005, datos de otros sondeos locales realizados entre los años 2000 y 2017, y diversas publicaciones de divulgación y documentos técnicos. Además, se llevaron a cabo campañas de fototrampeo entre 2010 y 2017 para saber el número de nutrias que habitaban cada isla, así como su edad relativa. Según la información recopilada, la nutria pudo haber desaparecido, o hacerse muy escasa, en el último tercio del siglo XX. A partir de comienzos del siglo XXI sus poblaciones comienzan a recuperarse, ocupando en la actualidad la totalidad de la zona de estudio. Se ha podido constatar la reproducción de la nutria en todas las islas entre los años 2010 y 2017. El tamaño medio de las camadas es de 1,89 cachorros. No parece que exista una época de reproducción bien definida. En cada una de las islas podría haber un mínimo de 4 nutrias.

R E P O R T

FIRST RECORD OF EURASIAN OTTER *Lutra lutra* IN THE ANAMALAI HILLS, SOUTHERN WESTERN GHATS, INDIA

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Abstract: There have been historic records of Eurasian otters from the Western Ghats biodiversity hotspot, but no evidence in the intervening seven decades. This had led to some doubt regarding the veracity of earlier records or attributed them to mislabelling of specimens. However, with the recent discovery of a roadkill of a Eurasian otter and following confirmation of identity of species from both photographs and molecular analysis, the occurrence of the species in the Anamalai hills of southern Western Ghats is confirmed. In this note, we present data from this first photographic and molecular evidence of the Eurasian otter from the southern Western Ghats. Morphometric measurements recorded helped identify the species and tissue sample analyzed showed 97–100% identity with *Lutra lutra* sequences available in the GenBank database. Records based on sightings or signs without photographic or molecular evidence should be treated with caution given the difficulty in identifying otters in field.

Keywords: Plantations, roadkill, molecular genetics, otter distribution

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South Asia is home to three species of otters namely Smooth-coated otter *Lutrogale perspicillata*, Eurasian otter *Lutra lutra*, and Oriental small-clawed otter *Aonyx cinereus* (Hussain, 1999). In the Western Ghats mountain range along the west coast of southern India, there have been a number of recent sighting records and observations of smooth-coated and small-clawed otters but no record, validated by photographs or genetic studies, of the Eurasian otter. Eurasian otters have been historically reported from the hills of Coorg in Karnataka state, and the Nilgiris and Palni hills of Tamil Nadu state in the Western Ghats (Pocock, 1941; Prater 1980), but there have been no records for over seven decades in this region, validated by either photographs or genetic material. Based on specimens collected during the mammal survey of India (1911 – 1923), Pocock (1941) noted that the species occurs along the Himalaya from Kashmir to Sikkim extending into the Gangetic region, with no confirmed records in the intervening region till southern India. However, recent records of Eurasian otters have emerged from camera trap images in forests of central India (Joshi et al., 2016, Vaibhav Chaturvedi, pers comm). Additionally, there have also been recent images of Eurasian otters caught on camera traps in the trans-Himlayan region of Ladakh (Melissa Savage, pers. comm) and the Sikkim Himalayas

(Sunita Khatiwara, pers. comm). Here, we report a record of Eurasian otter found as a road-kill in 2016 in the Anamalai hills, Tamil Nadu, Western Ghats.

Smooth-coated otters have been often seen in reservoirs and large rivers, while the small-clawed otters have been observed mostly in hill streams in altitudes above 500 m. The Eurasian otter is also expected to occur in hill streams (Pocock, 1941). Surveys by Raha and Hussain (2015) in five protected areas in the southern Western Ghats assessed habitat use of all the three species largely based on spraints and tracks. They have reported only the small-clawed otter for the Anamalai and Parambikulam Tiger Reserves. The Eurasian otter is reported from Periyar Tiger Reserve based on track signs. It can be very difficult to reliably identify smooth-coated otter and Eurasian otter solely using tracks, without confirmation using camera trap pictures. A few earlier studies have wrongly identified smooth-coated otters as Eurasian otters in the coastal plains (Umapathy and Durairaj, 1995; Umapathy, 2000) thereby giving an erroneous distribution of Eurasian otters in peninsular India. Past records of Eurasian otters in the subcontinent based on indirect signs or unconfirmed sightings (Conroy et al., 1998) may need a re-look in the light of this. Although camera trapping has been extensively carried out in these regions, otters have been rarely photographed. This could be because the camera trap exercise was not designed to record otters. It is very easy for an elusive species to go undetected for decades despite being in a landscape that has seen extensive ecological research. This is a first direct evidence of the Eurasian otter in the Western Ghats in over seven decades.

In the Valparai plateau in the Anamalai hills, Tamil Nadu, otters have been sighted occasionally. Direct sightings are few and it is difficult to identify otters in field from brief sightings. There have been concerns of local extinctions of otter populations due to illegal poaching (Meena, 2002). A study carried out in the Anamalai hills between 2010 and 2011 reported most of the streams to have otter presence (Prakash et al., 2012), and a few targeted camera-trapping surveys resulted in photo-trapping only small-clawed otter (Fig. 1).

Figure 1. Asian small-clawed otter photographed by a camera-trap set along a stream in Valparai, Western Ghats in 2010. (Photo: Kalyan Varma)

The Anamalai hills in the southern Western Ghats is one of the key biodiversity hotspots in India (Kumar et al., 2004). It spans an elevation range from about 300 m to 2700 m and supports a range of vegetation types from savannah-woodlands to montane shola-grasslands. Anamalai and Parambikulam Tiger Reserves, Vazhachal and Nelliampathy reserved forests and Eravikulam and Grass Hills National Parks are protected forests spanning a large part of these hill ranges. It is the main catchment area of the rivers Sholayar-Chalakudi, Nirar, Aliyar, and Amaravathy. The hills are criss-crossed by numerous streams and rivers, both seasonal and perennial. There are also many hydel-power and irrigation projects with dams and reservoirs. Located in the Anamalai hills is the 220 km² Valparai plateau, a tea and coffee plantation dominated landscape in the mid-elevational tropical wet evergreen forest zone of the *Cullenia exarillata – Mesua ferrea – Palaquium ellipticum* forest type (Pascal 1988) adjoining the Anamalai Tiger Reserve. The landscape is peppered with over 40 rainforest fragments (Mudappa and Raman 2007; Fig. 2) and has been the focus of many research projects including Sridhar et al., 2008.

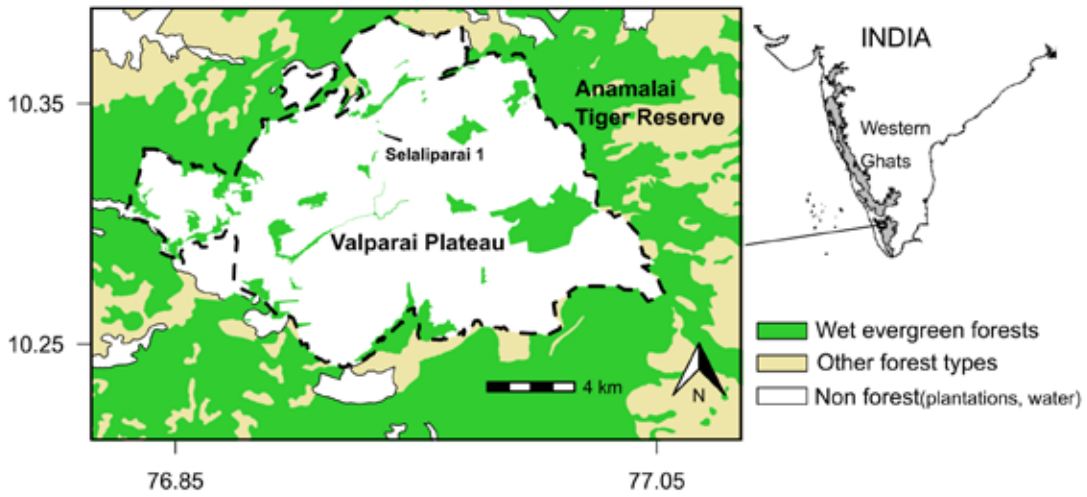

Figure 2. Map of the Valparai plateau and the surrounding protected forests.

On 25 March 2016, at about 0610 h, a fresh (blood had not coagulated) road-kill of an otter was found by KS and PP near a forest fragment, Selaliparai 1 (10.337032 N, 76.934723 E, 1075 m asl), in the Valparai Plateau. The animal was killed on the main road passing through the adjoining tea plantation, at a spot that forms the shortest distance between two swamps. The stream closest to this spot flows through the 4 ha rainforest fragment, Selaliparai 1 (Fig. 3). Photographs were taken on-site (Fig. 4, 5, 6, 7), examined by DM, and shared with experts A. Kumar, W. Duckworth and R. Timmins who confirmed its identification as an otter that was neither smooth-coated nor small-clawed otter. A small piece of tissue (tip of the tail) was collected for confirmation of species using molecular methods. Combining both the examination of the specimen, pictures and analysis of the tissue sample of the specimen, it was with a high certainty identified to be a Eurasian otter *Lutra lutra*, a first record with evidence for this region.

Description: The pelage was brown on the dorsal side and paler off-white on the ventral side. The chin up to the neck was white and there was a small patch of white on the muzzle. The zig-zag pattern of the posterior edge of the rhinarium as described

by Pocock (1941) is visible in the image (Fig. 7). It was a young male. The following morphometric measurements were taken: head-body length – 67 cm (along the dorsal contour); tail length – 37 cm; head length – 20 cm (tip of nostril to nape); neck circumference – 31 cm. The otter had long, prominent claws and 3/4ths webbing on both hind- and fore-feet (Fig. 6). The claws and webbing and the cylindrical, gradually tapering tail clearly ruled out the small-clawed otter. The shape of the head (pronounced muzzle, characteristic of Eurasian otter) and the smaller body size precluded it from being a smooth-coated otter.

Figure 3. An aerial shot of the fragment (Selaliparai 1) surrounded by tea estates and eucalyptus plantation, close to the spot of the road-kill on the Valparai plateau, Western Ghats. (Photo: Kalyan Varma)

Figure 4. Head and neck of the road kill Eurasian otter found in Anamalai hills, India.

Figure 5. The whole body of the road kill Eurasian otter found in Anamalai hills, India (tape measure in centimetres). Note the cylindrical and gradually tapering tail.

Figure 6. The claws and webbing of the road kill Eurasian otter found in Anamalai hills, India.

Figure 7. The zig-zag pattern of the rhinarium on the posterior edge.

Genetic analysis: A fresh sample (about a cm of the tail tip) was collected using sterile surgical blade and stored in ethanol. This was sent to the Laboratory for Conservation of Endangered Species (LaCONES) at the Centre for Cellular and Molecular Biology (CCMB), Hyderabad, and analysed immediately. Mitochondrial DNA is commonly used to identify sample tissues to species level (Vergara et al., 2014; Effenberger and Suchentrunk, 1999; Fernandes et al., 2008). DNA was extracted and a universal vertebrate mitochondrial cytochrome b marker (Verma and Singh, 2003) was used to identify species. Sequencing was done in triplicates in both the forward and reverse directions using ABI 3730xl. 329 bases of the cytochrome b sequence were generated from the otter sample (GenBank accession no. MF135247). This sequence showed 100-97% identity (100% coverage) with *Lutra lutra* (Eurasian otter) sequences already available in the GenBank database. The second and third closest matches were also members of Genus *Lutra* (*Lutra nippon:* 97% identity and *Lutra sumatrana*: 92% identity). Meanwhile, *Lutrogale perspicillata* showed 91-90% identity and *Aonyx cinereus* showed 89% identity to the sample sequence. Furthermore, a neighbour-joining tree, reconstructed using MEGA v5.05 with the above sequences showed that the sample was nested within the *Lutra lutra* clade (Fig. 8), confirming that the sample belonged to Eurasian otter.

This is the first photographic and molecular evidence of the Eurasian otter from the Western Ghats. Recently, the species was camera-trapped in the Satpura Tiger Reserve in Central India, a first for that region (Joshi et al., 2016). This species has been expected to occur in the southern Western Ghats, according to historic records. However, there has been no prior direct evidence for it apart from skins in museums where there is a chance of mislabelling the origin of the skin. The species is fairly widely distributed in the Himalayan region with recent camera trap records in Ladakh and Sikkim (Melissa Savage and Sunita Khatiwara, pers. comm) and the east coast of

India (Conroy et al., 1998) and also in Sri Lanka (Prater, 1980). Records of Eurasian otters without evidence in the form of photographs and DNA should be treated with caution as it is extremely difficult to reliably identify sympatric species of otters from just indirect evidence.

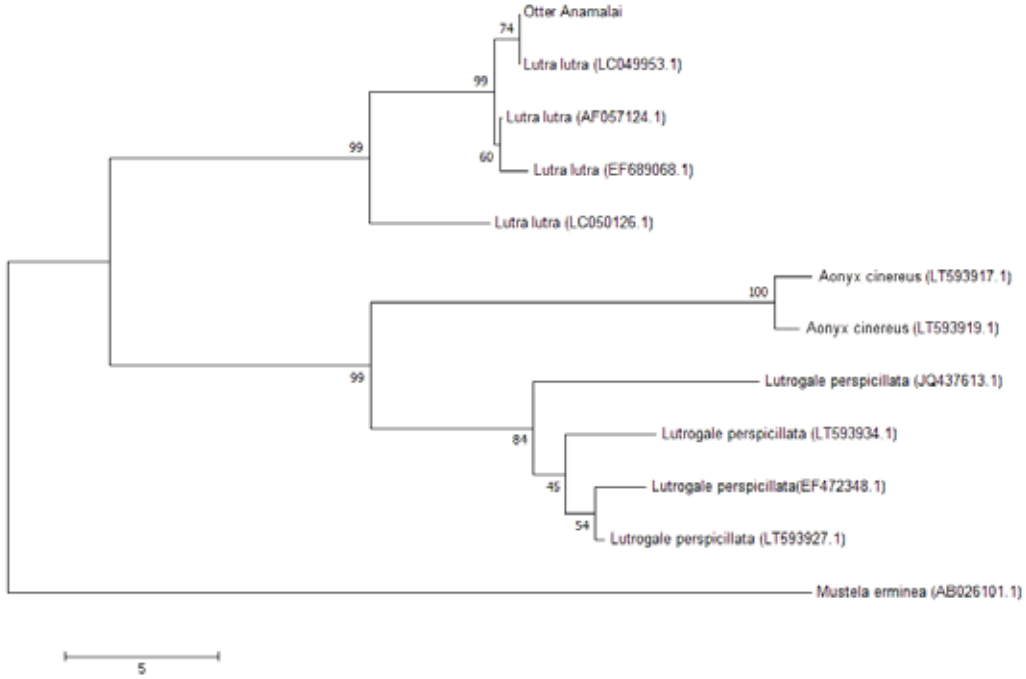

Figure 8. A neighbour-joining tree reconstructed from 329 bases of mitochondrial cytochrome b sequences of the sample (Otter_Anamalai), and *Lutra lutra*, *Lutogale perspicillata* and *Aonyx cinereus* from GenBank database (accession numbers in parentheses). The tree was rooted using the stoat *Mustela erminae* as the outgroup. The bootstrap values for each clade after 10,000 replicates are given above the branches. The evolutionary distances were computed using the number of differences method and are in the units of the number of base differences per sequence.

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RÉSUMÉ

PREMIÈRES OBSERVATIONS DE LA LOUTRE EURASIENNE, *LUTRA lutra*, DANS LES COLLINES D'ANAMALAI, DANS LES GHATS DU SUD-OUEST, EN INDE

Il existe des données historiques sur la loutre eurasienne dans le pic de biodiversité des Ghats de l'ouest, mais pas preuve durant ces 70 dernières années. Ceci a induit certains doutes concernant la fiabilité des données antérieures ou l'étiquetage erroné des individus. Cependant, depuis la découverte récente d'un accident de la route d'une loutre eurasienne et la confirmation de l'identité de l'espèce par des photos et des analyses moléculaires, la présence de l'espèce dans les collines d'Anamalia des Ghats du sud-ouest a été confirmée.

Dans cette note, nous présentons les premières données photographiques et moléculaires évidentes concernant la loutre eurasienne dans les Ghats du sud-ouest. Les mesures morphométriques enregistrées constituent une aide à l'identification de l'espèce et les échantillons de tissus analysés montrent une correspondance de 97 à 100 % avec les séquences de *Lutra lutra* disponibles dans la base de données GenBank. Les enregistrements basés sur des observations ou des indices sans preuve photographique ou moléculaire doivent être examinés avec prudence vu la difficulté d'identifier les loutres sur le terrain.

RESUMEN

PRIMER REGISTRO DE LA NUTRIA EURASIÁTICA *Lutra lutra* EN LAS COLINAS ANAMALAI, GHATS SUDOCCIDENTALES, INDIA

Ha habido registros históricos de nutria eurasiática en el hotspot de biodiversidad de los Ghats Sudoccidentales, pero no durante las siete décadas desde entonces. Esto ha llevado a tener dudas sobre la veracidad de aquellos registros anteriores, ó atribuirlos a un error en el etiquetado de especímenes. Sin embargo, con el reciente

descubrimiento de una nutria eurasiática muerta en una ruta y la subsiguiente confirmación de la identidad de la especie, tanto a partir de fotografías como de análisis molecular, la ocurrencia de esta especie en las colinas Anamalai, de los Ghats Sudoccidentales, está confirmada. En esta nota, presentamos datos de esta primera evidencia fotográfica y molecular. Las mediciones morfométricas registradas ayudan a identificar a la especie, y la muestra de tejido analizada mostró una identida de 97-100% con secuencias de *Lutra lutra* disponibles en la base de datos GenBank. Los registros basados en avistajes ó signos sin evidencia fotográfica ó molecular deberían ser tratados con precaución, dada la dificultad de identificar a las nutrias en el campo.

S H O R T N O T E

ATTACK OF OTTER ON HUMANS IN THRISSUR, KERALA, INDIA

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Abstract: Human-otter conflict is a rare phenomenon, but has been reported from North and South America, and the Indian sub-continent. This paper reports on three Smooth-Coated otter (*Lutrogale perspicillata*) attacks in Thrissur, Kerala, India, discovered during a detailed study of human-wildlife conflict which ran from April 2009 to March 2012. Focus group discussion was carried out with local people with follow-up of individual anecdotes. One fatal and two non-fatal attacks were reported; ex gratia payments to victims were sanctioned by the Kerala Forest and Wildlife Department. All attacks were by groups of otters at dawn or dusk. Two incidents were in the breeding season (August to November) and one in June 2011. The reason for the attacks appears to be territorial.

Keywords: Smooth-coated otter, human-otter conflict, Kerala, India

INTRODUCTION

Three species of otters inhabit India, and the Smooth-coated otter (*Lutrogale perspicillata*) is common in Kerala (Menon, 2014) and mainly feeds on fishes (Prater, 1965). Bite attacks of otters on humans were reported from North America (*Lontra canadensis*) (Potter et al., 2007) and South America (*Pteronura brasiliensis*) (McTurk and Spelman, 2005). Several anecdotal incidents of human-otter (*Lontra canadensis*) conflicts and rabies infection within the species were reported by Belanger et al. (2011). An attack by Smooth-coated otter at Tungabadra, India was reported by Nagulu (1992). In this paper, Smooth-coated otter (*Lutrogale perspicillata*) attacking people in Thrissur District, Kerala, India is reported. Hunting of smooth-coated otter is illegal as this species is protected by the Wildlife Protection Act of India.

STUDY AREA

Thrissur District (10°46' to 10°7' N and 75°57' to 76°55' E) is in the central part of Kerala State, India, spanning an area of about 3,032 km^2. The District has a tropical humid climate and plentiful seasonal rainfall (2500 mm to 3500 mm). The study area is comprised of 11 Forest Ranges within three Forest Divisions namely Thrissur (210.64 km^2), Chalakudy (279.71 km^2) and Vazhachal (413.94 km^2) and three

Wildlife Sanctuaries (213.44 km^2). Chalakudy, Karuvannur, Manali and Kecheri Rivers convey water to the wetlands in the District.

METHODOLOGY

Incidents of otter-bite were recorded as a part of the detailed study on human-wildlife conflict in Kerala from April 2009 to March 2012. The conflict sites were visited and the victims of attack were queried at their home. Date and time of attack and mode of attack were recorded. Focus group discussion was carried out with the local people. Twelve houses were surveyed (four houses from each area of otter attack), which were on average 143 m away from water-bodies. Details of ex-gratia claimed and provided were collected from the records of the Kerala Forest and Wildlife Department.

RESULTS

Three incidents of otter-bite (*Lutrogale perspicillata*) on humans were recorded during the period (Figure 1). One human death and one human injury were in Athirapilly Forest Range and the other injury was in Pattikkad Forest Range (Table 1). Injured persons were given an amount of Rs. 500/- each (One US Dollar = Rs. 50/-) and Rs. 100000/- was sanctioned to the deceased person's family by the Kerala Forest and Wildlife Department. Rabies vaccination was also administered to the injured persons. As the bites were unexpected, the victims could not count the number of otters in each group. Spraints were seen on the banks of river by the local people (n=12). They could not determine the sex of the Smooth-coated otter when the species was seen on the river banks.

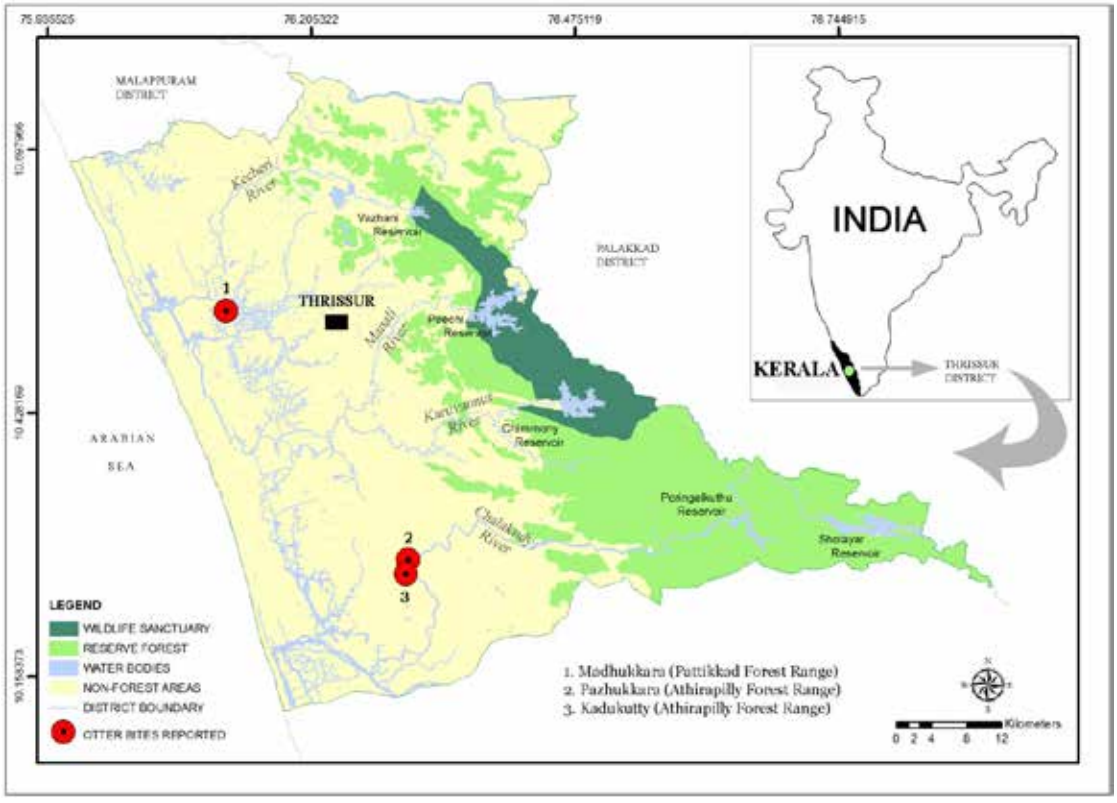

Figure 1. Locations of otter-bite on humans in Thrissur District, Kerala

Table 1. Human-otter interaction in Thrissur District, Kerala

Date (Time)	Forest Range (Forest Division)	Latitude & longitude	Age & sex of Victim	Mode of attack
02-09-2010 (08.00 hrs)	Athirapilly (Vazhachal)	10°5'47.9"N & 76°18'9.72"E	52, Male	A veteran fisherman was attacked by otters, while he was swimming in the Chalakudy River to fix a fish net across the river at Kadukutty. When he reached the middle portion of the river, otters attacked him and dragged him for 500 meters along with the flow of river. His son on the bank saw the attack, but he was helpless to attempt any rescue operation. The body was recovered by local people and the death of the person was confirmed in the hospital; the cause was reported as drowning. Otter bites were clearly visible on the victim's body.
02-06-2011 (17.00 hrs)	Pattikkad (Thrissur)	10°31'57.4"N & 76°7'7.7"E	9, Male	At Madhukkara, a boy was attacked while he was playing in the shallow water near the house. Biting was on his left leg.
14-09-2011 (17.30 hrs)	Athirapilly (Vazhachal)	10°16'40.6"N & 76°18'17.7"E	13, Male	At Pazhukkara, otters bit on both legs of the victim while he was crossing the canal along with his friends (Figure 2).

Figure 2. Smooth-coated otter attack on legs (Athirapilly Forest Range), Kerala

DISCUSSION

Attacks of smooth-coated otters on humans were recorded during dawn and dusk, and in all the incidents, the otters were in groups. Fish is the main food of this species (Prater, 1965; Anoop and Hussain, 2005) and it was reported that fish are abundant in the rivers and backwaters of the District (Kadhar, 1993). Human fatality due to attack by smooth-coated otter was reported for the first time in Kerala. A human death due to a Smooth-coated otter had been reported earlier at Tungabadra, India by Nagulu (1992). Fishermen were killed in both incidents. It is assumed that otters attacked the fisherman because their pups were trapped in the net, as happened at Tungabadra. Otters bit the legs of both boys without any apparent provocation and the signs of attack were clearly visible (Figure 2). Studies in North America pointed out that otters are very aggressive when their pups are accompanying them (Chapman and Feldhamer, 1982; Shannon, 1989; Kruuk, 2006). In the National Chambal Sanctuary, India, the breeding season of Smooth-coated otters was reported to be between August and November (Hussain, 1996). Two of these incidents were recorded in the district during the same period and the remaining incident occurred two months before the mating period (Table 1). It is therefore likely that territorial incursion by humans was the trigger for all three events.

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RÉSUMÉ

DES LOUTRES S'ATTAQUENT À L'HOMME À THRISSUR, AU KERALA, EN INDE

Les conflits entre l'homme et la loutre sont un phénomène rare. L'attaque de personnes par des loutres a été rapportée sur le continent américain ainsi que sur le sous-continent indien. L'attaque de personnes par la loutre à pelage lisse (*Lutrogale perpicillata*) a été signalée à Thrissur, au Kérala en Inde. Cette attaque a eu lieu durant une étude détaillée sur les conflits entre l'homme et la vie sauvage, d'avril 2009 à mars 2012. Un groupe de discussion a été mis en place avec l'aide de la

population locale et les détails des dédommagements aux victimes ont été rassemblés à partir des données du Département de la Foret et de la Vie sauvage du Kerala. Trois personnes ont été attaquées par des loutres à pelage lisse dont une a été blessée.
Toutes les attaques se sont produites au crépuscule et à l'aube. Un dédommagement a été immédiatement accordé aux victimes par le département de la Forêt et de la Vie sauvage du Kerala. Les loutres étaient en groupes lorsqu'elles ont attaqué des personnes. Deux incidents se sont produits durant la période de reproduction (août et novembre). Le dernier incident date de juin 2012. Des loutres à pelage lisse ont attaqué 3 personnes à Thrissur, au Kerala en Inde. La raison de ce comportement agressif est dû à leur tempérament territorial.

RESUMEN

ATAQUE DE NUTRIAS A HUMANOS EN THRISSUR, KERALA, INDIA

El conflicto humanos-nutrias es un fenómeno raro. Se han reportado nutrias atacando a humanos en los continentes Americanos y en el sub-continente Indio. Reportamos a la nutria lisa (*Lutrogale perspicillata*) atacando a personas en Thrissur, Kerala, India, lo que fue registrado durante un estudio detallado del conflicto humanos-fauna desde Abril de 2009 hasta Marzo de 2012. Se llevó a cabo una discusión de focus-group con las personas locales, y se colectaron detalles de las compensaciones a las víctimas a partir de los registros del Departamento de Bosques y Vida Silvestre de Kerala. Fueron atacadas tres personas por nutrias lisas, informándose de un caso fatal. Todos los ataques fueron durante el amanecer y el atardecer. La compensación fue inmediatamente otorgada a las víctimas por el Departamento de Bosques y Vida Silvestre de Kerala. Cuando se produjeron los ataques, las nutrias estaban en grupo. Dos incidentes ocurrieron durante la estación reproductiva (Agosto a Noviembre) y el otro en Junio de 2011. La nutria lisa atacó a tres personas en Thrissur, Kerala, India y la razón de este comportamiento agresivo es su naturaleza territorial.

S H O R T N O T E

ANVIL-USE BY *AONYX CAPENSIS*: A REBUTTAL

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Abstract: The claim that *Aonyx capensis* uses anvils to break open hard prey is rejected. It is believed that the authors who originally made the claim that the otter had used anvils to open freshwater mussels, based on signs in the field and not on direct observations, ignored the more likely possibility that the anvils had been used by the water mongoose *Atilax paludinosus*, which does employ this type of behaviour.

A number of authors, e.g. Estes (1989), Lariviere (2001), Mason and Macdonald (2009), Nowak (1999), and Sheppey and Bernard (1984) have referred to anvil using behaviour by the Cape clawless otter *Aonyx capensis*, based on the original statement by Donnelly and Grobler (1976). The observations by Donnelly and Grobler (1976) were made in Rhodes Matopos National Park (in present Zimbabwe), when after a dry spell, dam (impoundment) levels dropped and the shoreline receded about 5 m, exposing freshwater mussels embedded the mud. The authors noted that there were concentrations of mussel shells around hard objects such as rocks, logs, and even bottles and a metal pipe, and assumed that otters had used these objects as anvils to break open the mussels. One of the photographs, however, in which they show clawless otter tracks in the mud at an anvil site, also shows numerous water mongoose *Atilax paludinosus* tracks to and from the anvil (a log).

Donnelly and Grobler (1976) did not actually see otters using anvils and make no reference to their possible use by water mongooses, that do use anvils to open hard objects (Baker, 1989; Rowe-Rowe, 1978). When dealing with hard-shelled items (e g. eggs, snails, mussels) the water mongoose grasps it in its fore feet, stands on its hind legs, then throws the object downwards (Fig. 1). If it does not succeed in opening it, the mongoose takes it to the nearest hard object which it uses as an anvil.

Figure 1. A water mongoose preparing to throw an egg downwards to break it.

Anvil-use was never observed by Rowe-Rowe (1975, 1977) during 19 months of observation and feeding trials on an adult female *A. capensis*; neither in many hours of field observations in subsequent years. Hard-shelled prey is always dealt with by crushing it with its powerful molars (Rowe-Rowe, 1977; Rowe and Somers, 1998). *A. capensis* often does grasp prey in both fore feet while feeding (Fig. 2), but was never seen throwing prey downwards; almost always consuming its prey in the water. In the captive otter, if it needed to transport food to the water, it grasped it in one fore foot, and while holding it against its chest, hobbled on three legs to the water (Fig. 3).

Figure 2. *A. capensis* eating a large crab, holding it in both fore feet.

Figure 3. *A. capensis* carrying food to be consumed in the water.

Regarding the otter tracks which Donnelly and Grobler (1976) observed leading to the mussel shells, my opinion is that the otter visited the site, which was close to the water, out of curiosity. In some mammal surveys that I conducted I used scent posts (Linhart and Knowlton 1975) to attract carnivores for identification from tracks. Scent posts set beside water bodies were often visited by *A. capensis*, apparently out of curiosity.

In conclusion, I am of the opinion that *Aonyx capensis* does not indulge in anvil-using behaviour to open prey.

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RÉSUMÉ

L'UTILISATION D'UNE ENCLUME PAR LA LOUTRE À JOUES BLANCHES, *AONYX CAPENSIS*: UN DÉMENTI

L'affirmation selon laquelle *Aonyx capensis* utilise des enclumes pour casser une proie dure est fortement contestable. Il est admis que les auteurs qui avaient au départ lancé l'affirmation que la loutre avait utilisé des enclumes pour ouvrir des moules d'eau douce, basée sur des indices de terrain et non sur des observations directes, ignoraient que la possibilité la plus probable serait que les enclumes aient été utilisées par la mangouste des marais, *Atilax paludinosus,* qui a ce type de comportement.

RESUMEN

USO DE "YUNQUES" POR *Aonyx capensis:* REFUTACIÓN

La postulación de que *Aonys capensis* utiliza "yunques" para romper y abrir presas duras, es rechazada. Se cree que los autores que originalmente postularon que la nutria había usado "yunques" para abrir almejas de agua dulce, basándose en signos en terreno y no en observaciones directas, ignoraron la posibilidad más probable, de que los "yunques" hayan sido usados por la mangosta acuática *Atilax paludinosus*, que sí emplea este tipo de comportamiento.

NEW BOOK

UNDERSTANDING ANIMAL BEHAVIOUR

Rory PUTMAN

This new book tries to explain in two sections animal behaviour in an understandable way (as indicated already in the title). Rory Putman, an Emeritus Professor of Behavioural and Environmental Biology at the Manchester Metropolitan University and visiting Professor of Wildlife Welfare at the University of Utrecht wrote this book and surely does not fail in his attempt.

In two parts animal behaviour across various vertebrates is described. In the first section animal behaviour is described based on our current understanding on animal perception of their environment and how this will result in a certain behavioural response. In the second part evolutionary forces that have shaped complex behaviour as we know it are discussed. Topics include various aspects related to behaviour ranging from learning to genetics, social structure or reproductive behaviour. All this is nicely illustrated by drawings of his wife and wildlife artist Catherine Putman.

Although otters are not mentioned this book will be of interest for any interested wildlife biologist.

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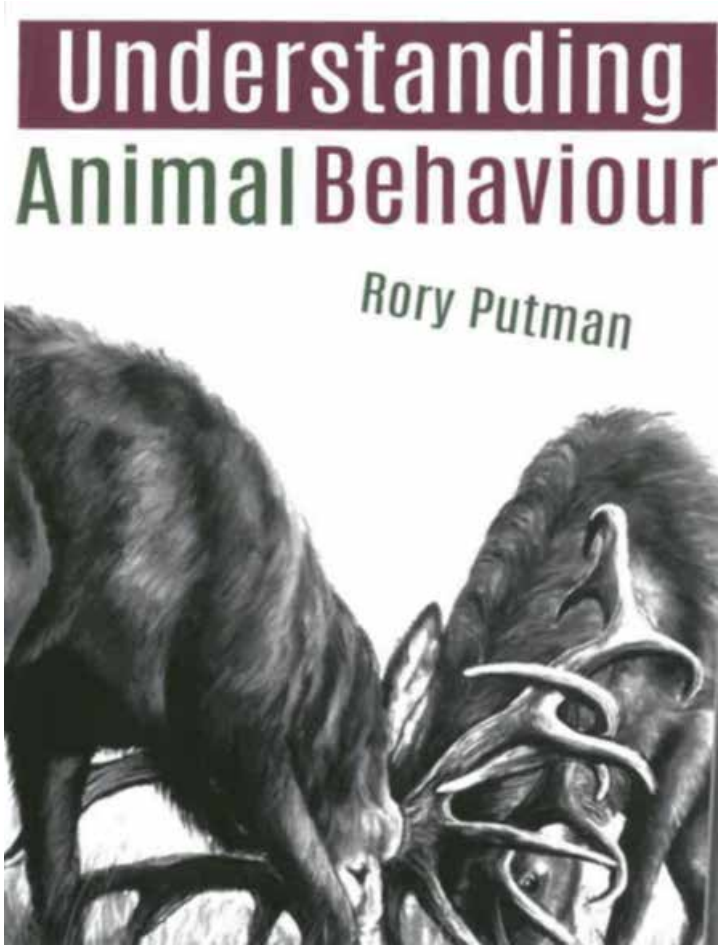

O S G M E M B E R N E W S

New Members of OSG

Since the last issue, we have welcomed 9 new members to the OSG: you can read more about them on the Members-Only pages.

Paras Acharya, Nepal: Paras M Acharya has had a lifelong career studying otters, marsh mugger, gharial crocodile and wetland conservation in Nepal.

Jeffrey Black, USA: I am a Professor at Humboldt State University that hosts a Citizen Science project that tracks river otters in northern California. I also sponsor undergraduate and MS students studying river otter ecology and behavior. http://www2.humboldt.edu/wildlife/faculty/black/research/otters.html

María Camila Latorre Cárdenas, Mexico: My main interest is to understand the relationship between the effect of human activities on the viability of the Neotropical otter populations in Mexico and Colombia. I have evaluated the effect of pollution and fishing activities on the health of populations of otters. Currently my interest is to understand the relationship between landscape configuration and genetic population patterns of otters, in order to identify priority areas for the long-term maintenance of the populations.

David Carss, UK: I am a vertebrate ecologist with a particular interest in predator-prey relationships. Much of my research has focussed on fish-eating predators and their prey. I studied otter (Lutra lutra)
ecology in north-east Scotland for many years, focussing on freshwaters: rivers, streams and lakes.
In broad terms, this research was related to otter habitat use, feeding ecology and - ultimately– to conservation.

Shannon Crowley, Canada: I began conducting research on North American river otters (Lontra canadensis) in 2006 as part of my graduate studies at the University of Northern British Columbia (UNBC). In my current position as the Ecological Monitoring Coordinator for the John Prince Research Forest (JPRF; co-managed by UNBC and Tl'azt'en Nation), I continue to conduct research on the habitat selection, status and health of populations in relation to mercury exposure, and survey methods of river otters in British Columbia, Canada. River otters are a focal species of a long-term monitoring program in the JPRF and will continue to be an emphasis of my research activities for the foreseen future

Baird Fleming, USA: I began my otter career by raising orphaned otters in Honduras at the age of 8. I spent over 8 years living with otters until embarking on my professional career which includes decades working within Zoo and rehabilitation facilities overseeing the husbandry, veterinary and exhibit needs of many species, including multiple species of otters. I am currently Director of the Albuquerque BioPark; we are about to open a North American river otter exhibit and are planning

to open a Sea Otter exhibit that will house otters from Monterey Bay's sea otter program in the next two years

Nishikant Gupta, Nepal: I have a deep-rooted interest in freshwater species, in particular the threatened Mahseer fish, and an ever-growing curiosity on avian biology, community-based conservation initiatives, recreational angling, flagship species, the role of religion in the conservation of species, and protected areas. ! am currently working as a Programme Officer for the Koshi Basin Initiative at the International Center for Integrated Mountain Development (ICIMOD) in Kathmandu, Nepal on a Rufford project assessing the population status and distribution of otters in the Indian Himalayan State of Uttarakhand.

Alessandro Ponzo, Phillippines: A vet by training, I have worked in marine conservation for the last 20 years. I am executive director of the Large Marine Vertebrates Research Institution Phillippines. Among our projects, Palawan Council for Sustainable Development has asked us to provide data to support up-listing the Palawan porpulation of Aonyx cinereus to CITES Appendix I.

Tshering Tobgay, Bhutan: I have genuine interest in learning of Otter species in Bhutan and also to help in conserving the species. Moreover, there is also a gap in status and distribution of Otter species in Bhutan. So, I am seriously looking up to build this knowledge.