

## NOTE FROM THE EDITOR

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Dear Friends, Colleagues and Otter Enthusiasts!

It is a pleasure to announce the opening of issue 26/2 after you have filled issue 26/1 with manuscripts in a very short time. Obviously the trend that started in 2008 when we also had 2 issues after three intermediate years where we had only one is still ongoing. I hope that this positive trend continues and Lesley and I will do our best to make the IUCN Otter Specialist Group Bulletin to a flourishing way to publish your results.

At this stage I can also announce that while we keep the maximum page number per issue to approximately 64 to allow printing and binding in the former way there is no need to keep to two issues a year. Let's see what the future will bring but there is a chance that we will have three issues this year.

Since this month we started also finally to populate the Special Issue 21A that will be the portal for the Proceedings of the IX<sup>th</sup> International Otter Colloquium. You may come back regularly to the issue as almost all articles have reached the state to go online soon. Thanks a lot at this stage to the reviewers that enable the publication of the proceedings in a peer-reviewed form. More about that will be found on the site for issue 21A.

For those of you who are no aware about it I have to mention that all articles are also uploaded to the Directory of Open Access Journals (<http://www.doaj.org>) on the day they go online on our website. Please visit this website to search for relevant information for your research in journals devoted to a wide range of topics.

Personally I realize that it is also only about one year until we will meet in Italy and I am really looking forward to meet many of you. Please keep an eye on the relevant websites.

.... and as always at the end..... Whoever is in doubt who is the soul of the Bulletin should see the tremendous work Lesley is doing. Thanks Lesley!

With regards,

A handwritten signature in black ink, appearing to be 'Lesley'.

## REPORT

### ABANDONED CLAY MINES: AN OPPORTUNITY FOR EURASIAN OTTERS IN NW SPAIN

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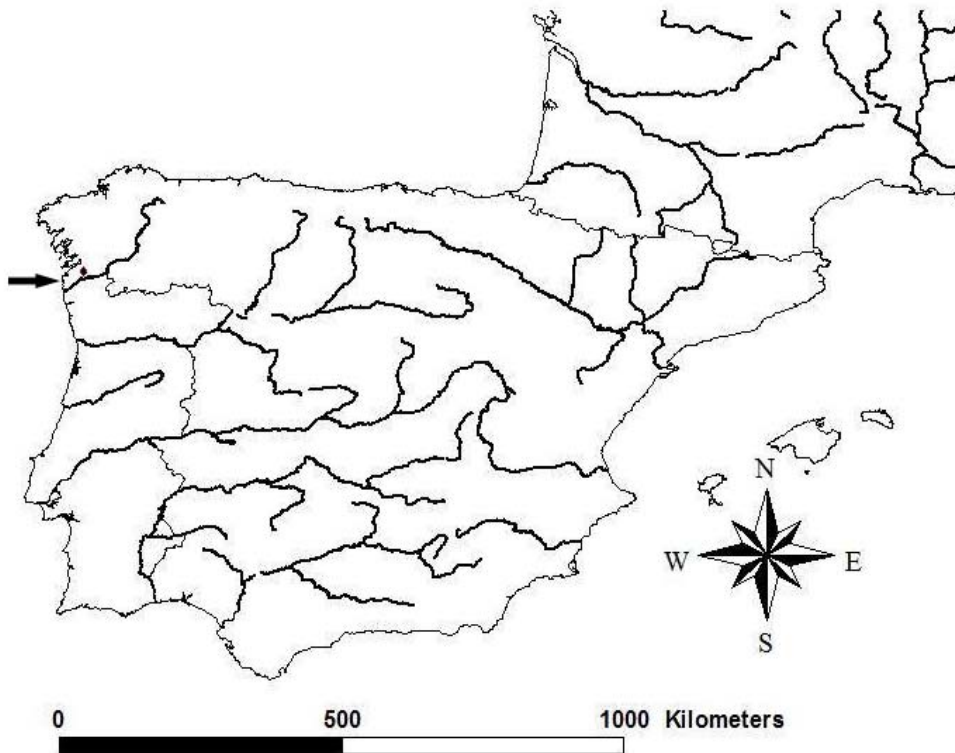
**ABSTRACT:** The Eurasian otter (*Lutra lutra*) is widely distributed in the north of the Iberian Peninsula, supposedly one of the best populations of Spain. Usually otters inhabit coastal and riverine habitats in this region, but in some cases they use man-made habitats. In the last three winters the seasonal use of old clay pits by otters has been studied in a locality from Galicia. The abundance of these artificial habitats could lead to a recolonization of Gandaras de Budiño and Ribeiras do Louro wetland, where the species disappeared in the last century.

Keywords: *Lutra lutra*, Mustelidae, clay pits, seasonal use, NW Spain.

#### INTRODUCTION

The Eurasian otter, *Lutra lutra* (Linnaeus, 1758), is widely distributed in the North of Spain (Delibes, 1990; Kruuk, 1995, 2006; Ruiz-Olmo and Delibes, 1998; Palomo et al., 2007), and after some years of population decline it seems that it is re-colonizing some areas (Nores et al., 1991; Agirre-Mendi, 1998; Ruiz-Olmo and Delibes, 1998; Lopez de Luzuriaga, 2006; Palomo et al., 2007). The species uses all available water bodies, and although they usually occur in coastal and riverine habitats in the Galicia region (Callejo Rey et al., 1979; Callejo, 1988; Delibes, 1990; Ruiz-Olmo and Delibes, 1998; Palomo et al., 2007), they also use artificial water bodies (Ayres and García, 2007).

The seasonal exploitation of resources has been studied in depth in the Mediterranean (Lizana and Pérez-Mellado, 1990; Delibes et al., 2000; Jedrzejewska et al., 2001; Clavero et al., 2003; 2004; 2005; 2006; 2007; García and Ayres, 2007; Remonti et al., 2009), but there are few studies about the feeding ecology of otters populations in the North of the Iberian Peninsula (Callejo Rey et al., 1979; Callejo, 1988). In this work seasonal use of artificial water bodies by otters during winter is reported (Figure 1).



**Figure 1.** Iberian Peninsula and study area

## MATERIAL AND METHODS

Fieldwork was carried out in a protected wetland of Northwestern Spain, Gandaras de Budiño e Ribeiras do Louro (GBRL), close to the border with Portugal. GBRL has been intensely monitored since 1998, particularly old clay pits, during a herpetological monitoring program. After the arrival of Eurasian otter in winter 2007, specific monitoring was performed throughout the following years. Clay pits are common in the study area, some of them being abandoned due to end of mining activities, and thereafter colonized by aquatic vegetation and several animals. As the Louro River is one of the most polluted rivers in Spain (Ayres and Cordero, 2004), clay pits represent an important resource for endangered species such as European pond turtle (*Emys orbicularis*), common teal (*Anas crecca*), and also provide an important breeding habitat for amphibians.

Clay pits are variable in size, from 100 m to 500 m of perimeter, and some of these water bodies are deep, more than 10 m in some cases. Some of them have been colonized by aquatic vegetation, with dense cover of *Potamogeton sp.*, and *Nymphaea alba* (Figure 2).

Monitoring of the presence of otters was carried out using secondary signs (Reuther et al., 2002), mainly spraints. The shores of the clay pits were thoroughly surveyed throughout the year, with nearly one visit per week during the last 11 years. Spraints were collected and analysed (Callejo Rey et al., 1979; Callejo, 1988; Kruuk, 1995, 2006; Jdrzejewska et al. 2001), and the biomass consumed assessed from the correction factors in Jdrzejewska and Jdrzejewski (1998). For further details see Ayres and Cordero (2004), Ayres and García (2007) and García et al., (2009).



**Figure 2.** Partially naturalized clay pit.

## RESULTS AND DISCUSSION

The presence of the otter was not detected until winter 2006-2007 (Ayres and García, 2007), and the species returned during winter 2007-2008, and 2008-2009. Intensive monitoring reveals that otters frequently used GBRL clay pits during these three winters, looking for breeding aggregations of *B. bufo*. More than two hundred predated toads were found in the last three winters. The predation pattern of toads roughly follows the “progressive skinning” described by Slater (2002). Remains of red swamp crayfish (*Procambarus clarkii*) were also found in otter spraints (n=53), as a secondary prey item between amphibian breeding peaks. Other prey items found during spraint analysis can be listed as accidental, with less than 1% in biomass.

The keystone role of amphibians in the otter diet has been argued by several authors to be related to the scarcity of fish in the environment (Lizana and Pérez-Mellado, 1990; Kruuk, 1995, 2006; Pikulik and Sidorovich, 1996; Jedrzejewska et al., 2001; Remonti et al., 2009)

It is remarkable that, even when centrarchid fish were available, that they are not consumed by otters (as shown from spraint analysis), according to the findings of Blanco-Garrido et al. (2008). This fact could be a limitation to the permanence presence of *L. lutra* in the clay pits, as prey availability becomes low after the amphibian breeding season, leading the animals to leave the site (Delibes et al., 2000; Ruiz-Olmo et al., 2007).

Riparian and helophytic vegetation provides enough refuges for shelter (an important feature for the settlement of otters; Kruuk, 1995, 2006; Beja, 1996; Liles, 2003), and this is therefore not a limiting resource, although the human activity could have an impact on the habitat use by otters.

Otters leave the clay pits in March, and results support the hypothesis that they cannot breed in the area given the absence of suitable prey resources (a key constraint to otter reproduction; Kruuk, 1995, 2006; Beja, 1996; Pikulik and Sidorovich, 1996; Ruiz-Olmo et al., 2001). They therefore have to migrate to find suitable sites for rearing their cubs.

There is an important challenge for otter conservation associated with the management of these clay pits. As clay pits are very common in the study area, with natural regeneration and protection, these artificial habitats could serve as “stepping stones” for *L. lutra* and other endangered species, avoiding the use of polluted rivers, and increasing the availability of optimal habitat.

Despite this easy possibility to increase optimal habitat for many species in the protected wetland, some clay pits have been destroyed due to a misinterpretation of the mining law. This should be forbidden, and a network of ponds should be kept to improve the habitat availability in this wetland.

However, it is important to take into account that the presence of otters in this artificial water network is seasonal and relies on the high abundance of amphibians as an easy prey, and once this kind of prey reaches a low abundance, otters go out from the pits. This fact needs to be considered when working to establish otters, and the best option is by means of habitat and prey management. Maybe, the first option could be the management of fisheries to be friendly to otters (Callejo, 1988; Kruuk, 1995, 2006; Beja, 1996; Polédnik et al., 2004), by removing as far as possible feral fish and restocking populations of autochthonous fish. This has already been done in some areas of the Iberian Peninsula (Ruiz-Olmo, 1993).

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## RESUME

### **MINES D'ARGILE ABANDONNEES : UNE OPPORTUNITE POUR LA LOUTRE DANS LE NORD-OUEST DE L'ESPAGNE**

La Loutre d'Europe (*Lutra lutra*) possède une large répartition dans le nord de la Péninsule Ibérique où elle constitue sans doute l'une des plus importantes populations d'Espagne. Habituellement, dans cette région, la Loutre occupe des habitats côtiers ou des rivières mais dans quelques cas elle utilise des milieux façonnés par l'homme. Durant les trois derniers hivers, son exploitation saisonnière d'anciennes mines d'argile a été étudiée dans une localité de Galice. L'abondance de ces habitats artificiels pourrait favoriser la recolonisation des zones humides de Gandaras de Budiño et de Ribeiras do Louro, d'où l'espèce aurait disparu au siècle dernier.

**RESUMEN**

**ABANDONO DE LAS EXPLOTACIONES MINERAS DE ARCILLA: UNA OPORTUNIDAD PARA LA NUTRIA EN EL NO DE ESPAÑA**

La nutria euroasiática esta ampliamente distribuida en el norte de la Península Ibérica, supuestamente es una de las mejores poblaciones de España. Habitualmente la nutria ocupa hábitats costeros y ribereños en esta región, pero en algunos casos usa medios antropizados. Durante los últimos tres inviernos el uso temporal de antiguas explotaciones de arcilla por la nutria ha sido estudiado en una localidad de Galicia. La abundancia de estos medios artificiales podría conducir a una recolonización del humedal Gandaras de Budiño e Ribeiras do Louro, donde la especie parecía haber desaparecido en el ultimo siglo.

## SHORT COMMUNICATION

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

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

#### INTRODUCTION

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

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

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



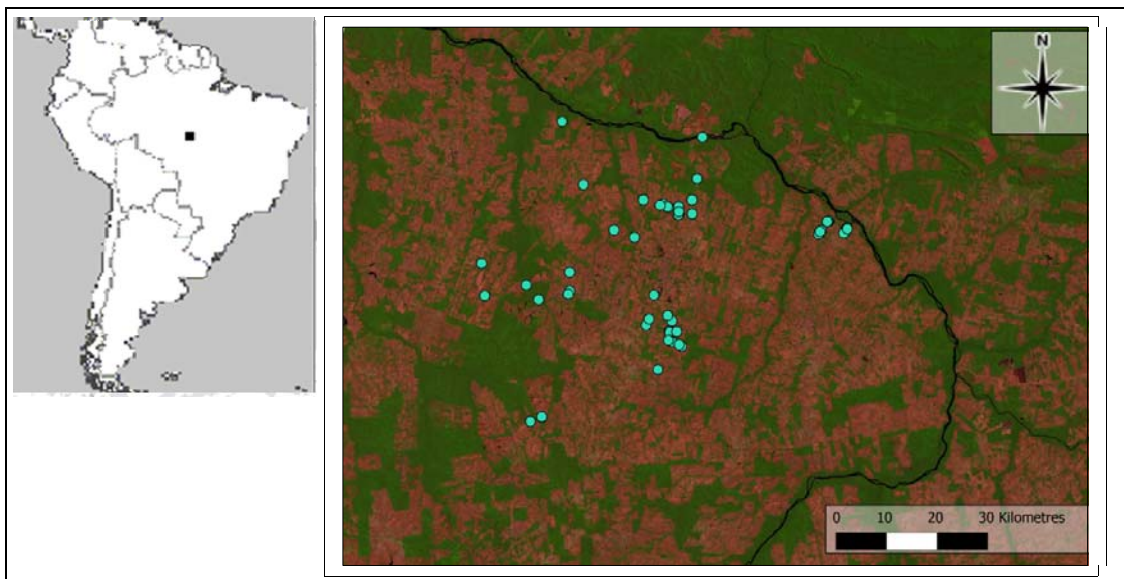
conservation organisations” (OSG, 2004). Such action may provide significant success for conservation of biodiversity, particularly in countries such as Brazil, where habitat conversion by humans is threatening a variety of aquatic systems (Agostinho et al., 2005).

Brazil governs approximately 40% of the 8,235,430km<sup>2</sup> Amazon Basin, which is recognised as one of the last strongholds for Giant Otters. However Brazil is also experiencing the world’s highest net loss of forest (FAO, 2005). During 2008 alone, it is estimated that 11,968 km<sup>2</sup> of Amazon forest were removed, with 80% (9,500 km<sup>2</sup> year<sup>-1</sup>) occurring in the 3 states of Mato Grosso, Rondônia and Pará which constitute the “Arc of deforestation” (INPE, 2009). With habitat loss / alteration predicted to lead to a 50% reduction in wild populations of Giant Otters within 20 years, there is an urgent need to understand how to conserve this species in areas dominated by anthropogenic perturbations (Duplaix et al., 2008).

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

## MATERIALS AND METHODS

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



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

Pre-elaborated interviews were carried out with either a worker (resident and living at the property for more than 1 year) or the landowner at 64 properties within a 50-kilometer radius of Alta Floresta town centre (Fig. 1). As we were interested in obtaining a representative sample of landowner/worker “types” in the region, we conducted interviews across a range of property sizes from 5 to 12 100 ha (hectares). To understand attitudes towards riparian corridors we asked the interviewees their level of agreement (strongly agree, agree, neutral, disagree, strongly disagree, and don’t know) with the following statements: 1) Riparian corridors serve no function, 2) Riparian corridors should be removed, and 3) Riparian corridors are a beautiful feature in the property. In a subset of 21 interviews, we asked interviewees to 1) list the wild animals they liked and 2) list the animals they disliked and or that caused problems.

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

## RESULTS

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

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

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

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

## CONCLUSION

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

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## **RESUME**

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

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

## **RESUMEN**

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

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

## SHORT NOTE

### ARMADILLO (CINGULATA: DASYPODIDAE) IN THE DIET OF THE NEOTROPICAL OTTER *Lontra longicaudis* IN SOUTHERN BRAZIL

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**ABSTRACT:** Claws, hairs and osteoderms of armadillo (Cingulata: Dasypodidae) were found in a scat of a neotropical otter (*Lontra longicaudis*) in an edge of a pluvial channel near a peat forest in the southern Coastal Plain of Rio Grande do Sul state, southern Brazil. Due to the absence of carrion-eating invertebrates in the sample, it is suggested that the armadillo was actively preyed upon by the otter. This is the first record of armadillo in the diet of *Lontra longicaudis*.

Key-words: claws, cingulate, food habits, osteoderms, predation, scat.

The neotropical otter *Lontra longicaudis* Olfers, 1818 is a semi-aquatic mustelid, distributed from northeastern Mexico to south of Uruguay, Paraguay and across the northern part of Argentina to Buenos Aires Province (Larivière, 1999). Investigations into the feeding habits of *L. longicaudis* indicate a predominant piscivorous-carnivorous diet (Helder-José and Andrade, 1997; Pardini, 1998; Colares and Waldemarin, 2000; Quadros and Monteiro-Filho 2001; Alarcon and Simões-Lopes, 2004; Kasper et al., 2004, 2008; Passamani and Camargo, 2005; Quintela et al., 2008). Most of these studies have also reported the occurrence of mammalian items such as rodents, didelphid marsupials and other unidentified taxa in the fecal samples. In addition, Quintela et al. (2008) identified the mephitid *Conepatus chinga* in the feeding remains of a Neotropical otter from a coastal stream in southern Brazilian restinga. Therefore, despite the low frequency, mammals are a normal constituent of the diet of *L. longicaudis*.

In this paper we report the occurrence of armadillo (Cingulata: Dasypodidae) in the diet of the neotropical otter in southern Brazil. Claws, osteoderms and hairs of armadillo (Figure 1) were identified in one scat sample collected on August 12<sup>th</sup>, 2008 in an edge of a pluvial channel near a peat forest in Rio Grande city, southern Coastal Plain of Rio Grande do Sul State (32°07'42''S – 52°09'13''W), Brazil. Vegetation in the area is mainly composed by the arboreal *Erythrina crista-galli* and the herbaceous *Scirpus giganteus*, *Eryngium pandanifolium*, *Bromelia antiacantha* and *Juncus* sp. Other items identified in the scat were scales of *Mugil platanus* (Perciformes:

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Mugilidae), an abundant marine-estuarine fish in Patos Lagoon estuary (Fischer et al., 2004). This was the only scat sample containing armadillo remains in a total of 54 collected along the pluvial channel from November 2007 to August 2008. It was not possible to identify the armadillo species in the sample. Two species (*Dasyopus novemcinctus* Linnaeus, 1758 and *D. hybridus* Desmarest, 1804) are found in and around the study area, being *D. novemcinctus* commonly trapped and recorded through footprints in the edges of pluvial channels and coastal streams. No carrion-eating invertebrates were found in the scat sample, suggesting that the otter may have captured the armadillo alive.



Figure 1. Claw and osteoderms of armadillo (Cingulata: Dasypodidae) found in *Lontra longicaudis* scat in southern Brazil. Photo: Fernando M. Quintela.

This is the first record of armadillo in the diet of *Lontra longicaudis*. Other larger-sized mammals were recorded in the diet of *L. longicaudis* in southern Brazil, such as the coypu *Myocastor coypus* (Colares and Waldemarin, 2000) and the capybara *Hydrochoerus hydrochaeris* (Colares and Waldemarin, 2000; Quintela et al., 2008). However, small rodents represent the most common mammalian item found in the majority of investigations concerning the feeding habits of the neotropical otter (e.g. Helder-José and Andrade, 1997; Pardini, 1998; Alarcon and Simões-Lopes, 2004; Kasper et al., 2004, 2008; Quintela et al., 2008). Armadillos have been recorded in the diet of other carnivore species such as crab-eating fox *Cerdocyon thous* (Rocha et al., 2004), hoary fox *Lycalopex vetulus* (Jácomo et al., 2004), maned wolf *Chrysocyon brachyurus* (Jácomo et al., 2004; Rodrigues et al., 2007; Bueno and Motta-Junior, 2009), crab-eating raccoon *Procyon cancrivorus* (Gatti et al., 2006), and even free-ranging domestic cats *Felis catus* and dogs *Canis familiaris* (Campos et al., 2007). The present account suggests *Lontra longicaudis* is a predator of cingulates in the Campos Sulinos biome, and contributes to the further understanding of the trophic ecology of the region's mammalian fauna.

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## RÉSUMÉ:

### **Le tatou (Cingulata: Dasypodidae) dans la diète de la loutre neotropical (*Lontra longicaudis*) au sud du Brésil**

Onglis, poils et osteodermes du tatou ont été trouvés dans un échantillon d'excrément de la loutre néotropical (*Lontra longicaudis*), au bord du canal pluvial proche d'une forêt paludéenne, dans la région sud de la Plaine Côtière de l'État du Rio Grande do Sul, au sud du Brésil. Le tatou a été probablement capture, puisqu'aucune carcasse d'invertébré en décomposition n'a été trouvé dans l'échantillon fécal. C'est la première fois que l'on recense des restes de tatou dans la diète de la *Lontra longicaudis*.

## **RESUMEN**

### **Armadillo (Cingulata: Dasypodidae) en la dieta de la nutria neotropical (*Lontra longicaudis*) en el sur de Brasil**

Uñas, pelos y osteodermis de armadillo (Cingulata: Dasypodidae) fueron encontrados en una muestra de heces de la nutria neotropical (*Lontra longicaudis*) en la margen de un canal pluvial cerca a una vegetación palustre en la región sur de la Planicie Costera del Estado de Rio Grande do Sul, sur de Brasil. Es probable que el armadillo depredado ha sido activamente capturado, una vez que invertebrados descompositores de armazones no fueron encontrados en la muestra fecal. Este es el primer registro de armadillo en la dieta de la *Lontra longicaudis*.

## **RESUMO**

### **Tatu (Cingulata: Dasypodidae) na dieta da lontra neotropical (*Lontra longicaudis*) no sul do Brasil**

unhas, pêlos e osteodermes de tatu (Cingulata: Dasypodidae) foram encontrados em uma amostra de fezes da lontra neotropical (*Lontra longicaudis*) na margem de um canal pluvial próximo a uma mata palustre na região sul da Planície costeira do Estado do Rio Grande do Sul, sul do Brasil. Provavelmente o tatu predado foi ativamente capturado, uma vez que invertebrados decompositores de carcaças não foram encontrados na amostra fecal. Este é o primeiro registro de tatu na dieta de *Lontra longicaudis*.



## ARTICLE

# HISTORIC AND CURRENT DISTRIBUTIONS OF RIVER OTTERS (*Lontra canadensis*) AND (*Lontra longicaudis*) IN THE RÍO GRANDE OR RÍO BRAVO DEL NORTE DRAINAGE OF COLORADO AND NEW MEXICO, USA AND OF CHIHUAHUA, MEXICO AND ADJACENT AREAS

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**ABSTRACT:** The Río Grande drainage is an important and imperiled wetland of the US/Mexican border arid lands. There is a desire to restore otter populations in this river by interested parties. In order to follow IUCN guidelines for restoration, biologists need learn more fully the situation prior to implementation of restoration management. A prerequisite for proper restoration conservation is to know the organism's taxonomy (i.e., what taxa or species and subspecies one is dealing with), distribution, and relative abundance. The historic and current distribution of the Nearctic otter (*Lontra canadensis*) and Neotropical otter (*L. longicaudis*) in the borderlands of US and Mexico are reviewed in this paper. The evidence indicates that otters were native to the Río Grande valley and has been recorded in the languages and customs of Native Americans such as the Pueblo people prior to European settlement of the area. The first Spanish documents we were able to find whereby otters were recorded, date to the middle 16<sup>th</sup> century. Otters during historical times were probably more numerous than previously thought and one of the first wildlife laws in the borderlands revolved around a moratorium on trapping the otter and beaver. Presently, populations of otters occur in 1) the Río San Pedro of Chihuahua, a tributary of the Río Conchos entering the Río Grande from the southeast, 2) the upper Río Grande near the Colorado/New Mexico border, and 3) the middle Pecos River in southeastern New Mexico entering the Río Grande from the west. These observations are corroborated by multiple observations by competent observers and in the case of the first population, otter photos and sign. These populations are centered on areas with macrohabitats characterized by a river flowing through 1) deep canyons, or 2) ancillary wetlands. Considerable more detailed survey work is needed to determine the full extent of the distribution of otters in the Río Grande drainage. A genetic study is critically needed to determine the true taxonomic affiliation of these recently discovered populations. A moratorium on translocations should be put in place for the Río Grande to conserve the native populations already existing.

**Keywords:** Nearctic, Neotropical, river otter, Río Grande, Río Bravo del Norte, Pecos River, Río Conchos, distribution, historic, current, USA, Mexico, Colorado, New Mexico, Texas, Chihuahua, Coahuila, Nuevo Leon, Tamaulipas, Spanish, Native American, Pueblo, habitat, beaver, translocation, stocking, IUCN, moratorium, genetics.

## **INTRODUCTION**

In his later years when asked by a reporter about rumors of his death, Samuel Clemens or Mark Twain was quoted as saying (Paine 1912): “Just say the report of my death has been grossly exaggerated.” The same could be said about the river otter of the Río Grande or Río Bravo del Norte except for one important distinction; Mark Twain was a well-known author of the literary world, whereas the river otter of the Río Grande is a veritably unknown animal in the scientific world.

Various authors reviewing the mammalian species of a given geopolitical area (i.e. country or state) have often neglected the otter. Granted, writing the “mammals of” type book requires much diligence to include detailed information such as the distribution for a specific geopolitical area. This is especially true of areas like the borderlands of the US and Mexico where there are extremes in altitude and climate that produce a high floral and faunal diversity. The initial thought of an otter, a semi-aquatic mammal, totally reliant on the close proximity to open water, in the midst of a desert seems to be an enigma. Wildlife biologists in the arid southwestern US and northern Mexico usually study the desert, grassland, or alpine fauna. Be that as it may, ignoring a semi-aquatic member of the native fauna of the priceless wetlands of a sun-parched region is totally irresponsible. Add to the difficulty of developing an accurate faunal list with the many languages and cultures (e.g., English, Spanish, Diné, Pueblo, etc.) in the region, plus the fact that a boundary bordering two countries (USA and Mexico) and six states (New Mexico, Texas, Chihuahua, Coahuila, Nuevo Leon, and Tamaulipas) is a river with tributaries on both sides and this is a challenging situation prone to developing errors of omission.

Mark Twain is also credited for saying “Whiskey is for drinkin’; water is for fightin’.” It surely applies to the endangered waters of the American West. The Río Grande headwaters in southern Colorado and then flows through the San Luis Valley, the Taos Plateau of New Mexico, the middle Río Grande valley of New Mexico, the Mesilla Valley, and the lower Río Grande and along the Texas/Mexican border then out to the Gulf of Mexico between the neighboring cities of Brownsville, Texas and Matamoros, Tamaulipas.

The Río Grande ranks as the longest river in Mexico, the eighth longest in the US (US Geological Survey web site), ninth longest in North America (with 52.1% in the USA and 47.9% in Mexico), and the 26<sup>th</sup> longest in the world ([http://en.wikipedia.org/wiki/List\\_of\\_rivers\\_by\\_length](http://en.wikipedia.org/wiki/List_of_rivers_by_length) visited on 3 December 2007) with 3,057 km of waterways. The Río Grande with all its drainages (e.g., Pecos River) ranks as the third largest river system in the US and measures an estimated 4,386-4,547 km long.

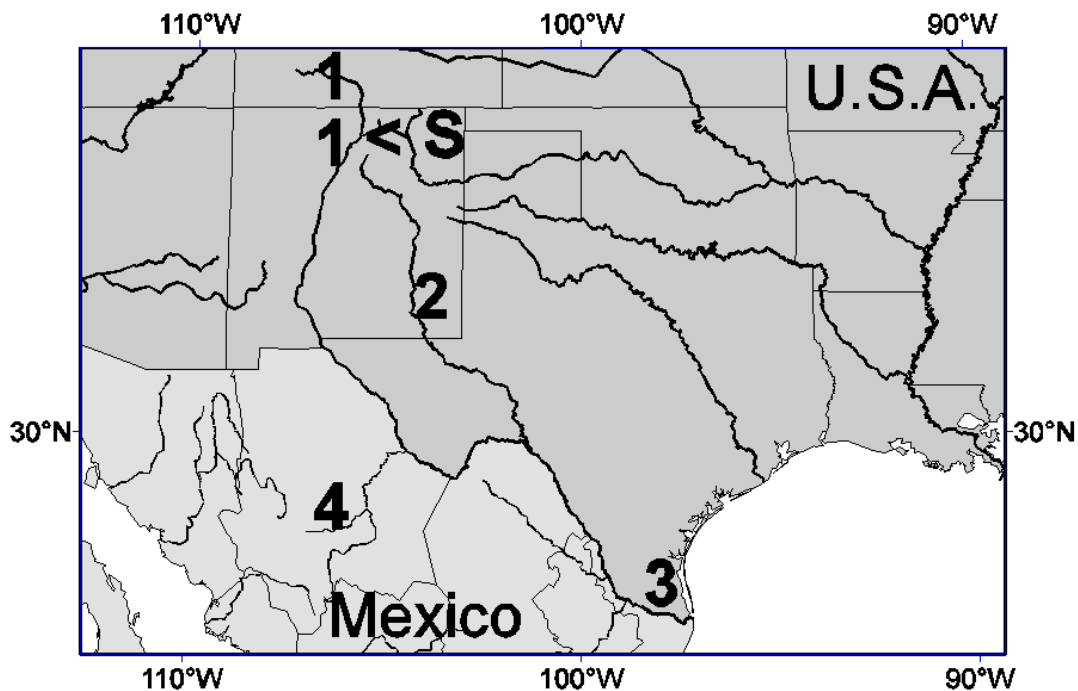
In 1997 the US Environmental Protection Agency declared the Río Grande to be an American Heritage River to further “natural resource and environmental protection” (Clinton. 1997). Sections of the river (and the tributaries including the Red River, Río Chama, East Fork of the Jemez River, and Pecos River) in northern New Mexico and west Texas have been classified as “Wild and Scenic Rivers” by the federal government. American Rivers, a non-profit river advocacy organization, ironically has declared the Río Grande and its tributaries the Río Chama and the Santa Fe River, one of the most threatened or endangered rivers in the US, eight times from the period 1986-2007 (American Rivers, 2007). Furthermore in 1993, the Río Grande topped the charts and in 2007 the Santa Fe River was listed as the most endangered. The Santa Fe River is now a dry ditch but once was a natural flowing stream in 1881. The Río Costilla, a tributary on the east bank on the Colorado/New Mexico border, is also dry

most of the year (Polechla, 2000). The Río Grande is truly endangered too since it only occasionally (e.g., 2000, 2001, and 2006) reaches the Gulf of Mexico like it formerly did. Reasons cited for its poor condition include intensive agriculture, overgrazing, plus improper disposal of toxins, industrial pollution, domestic sewage, and mine wastes. The Environmental Protection Agency (2000) had proposed a molybdenum mine on the Red River near Questa, NM as a “Superfund Site” for cleanup of mine tailings. By far, the largest threat to the Río Grande remains dewaterization.

New Mexico is the last state in the US to restore river otter populations (Anonymous 2006). Since river otters in the Río Grande are regarded as rare and their riverine habitat is also very endangered, this publication summarizing the current situation with the river otter in the Río Grande is very timely. This article is an attempt to correct this lack of attention devoted to the river otter in this drainage. We will take a historical as well as a contemporary examination of the evidence.

## MATERIALS AND METHODS

We searched for records in English and Spanish at: 1) the special collections at Center for Southwestern Research (CSWR) at the Zimmerman Library at the University of New Mexico, Albuquerque, NM, 2) City of Chihuahua Archives, CHIHUAHUA, México, and 3) antique maps at the Map and Geographic Information Center (MAGIC) at the Centennial Science and Engineering Library (CSEL), University of New Mexico for place names with otters, and 4) books written on regional fauna of the borderlands. Wherever possible, we read original primary sources. We also surveyed sections of the Río Grande and its tributaries ourselves (Figure 1). While conducting reconnaissance trips we interviewed local people along the river and its tributaries about otters.



**Figure 1.** Spatial distribution of recent records of native river otters (possibly *Lontra canadensis lataxina*) in the Rio Grande watershed (upper Rio Grande =1; middle Pecos river =2; lower Rio Grande Valley =3; upper Rio Conchos =4) and stocked populations of the exotic *L. c. pacifica* subspecies in the Rio Pueblo de Taos at > (S).

## RESULTS AND DISCUSSION

### USA

#### COLORADO

##### American Period

Otters are known historically from the so-called San Luis Valley or the upper Río Grande on the present-day New Mexico/Colorado border (Coues, 1898). American explorers, such as the phonetic speller Major Jacob Fowler trapped “bever” [sic = beaver (*Castor canadensis*)] and “aughter” [sic = otter] in 1822 in the upper Río Grande drainage of present day Colorado. He was an unusual trapper since he was educated enough to record his daily catch in a journal and use a sextant and compass to pinpoint his location all while enduring the rigors of outdoor life.

##### Twenty-first Century

At the southern part of Alamosa National Wildlife Refuge (ANWR), two wildlife biologists, Kelli Stone and Kristina Crowder, made an interesting observation while driving to check their mist nets. Kelli had been apart of the Green River, Utah otter translocation program (she had seen adults and young at Ouray National Wildlife Refuge, near Green River, Utah, and in a northern Rocky Mountain stream as well). On 12 September 2001 at about 0630 Mountain Standard Time (MST), both Kelli and Kristina saw an otter running across a sand bar close to the far bank of the Río Grande (river width = 18.3 m) above La Jara Creek, Alamosa County, Colorado. (mentioned briefly in Polechla 2002b, and recorded fully in the field notes of Paul Polechla, 28 February 2002). It appeared “long, thin, and dark” with its head and body about 76.2 – 91.4 cm long. They saw the animal at a distance of 27.4 m for about 3-5 s duration. It had “an S-shaped crimp” in its back displaying an up and down motion. After there initial observations, it bounded onto the willow bank. It did not resemble a mink (*Neovison vison*), weasel (*Mustela frenata*), muskrat (*Ondatra zibethicus*), or beaver in size, shape, and movement. One of Kelli and Kristina’s colleagues also saw one otter at 1900 MST at the same site. We regard their sightings as highly credible ones due to the precision and accuracy of their descriptions of the morphology and behavior of animal they saw and the match with those of the river otter.

To date, no translocations of otters have been conducted into the Río Grande (Polechla, 2002a). However, translocations of exotic otter subspecies were placed in the Piedra River, Dolores River, Gunnison River at Black Canyon, and headwaters of the Colorado River in Rocky Mountain National Park; all are apart of the Colorado River drainage. Otters were also translocated to Cheesman Reservoir along the South Platte (Polechla, 2002a,b; DePue and Schnurr, 2004) part of the Missouri/Mississippi River drainage.

Beaver and muskrat both occur at ANWR (Polechla, unpublished data) and south into New Mexico (Polechla, 2000). Besides the river the area has a myriad of abundant wetlands including: wet meadows, marshes, oxbows, sloughs, canals, and small reservoirs.

#### NEW MEXICO

##### Native American Period-Pre/Early European Contact

A photo in Dozier (1983) documents Santa Clara Pueblo men wearing otter fur in braids in their hair. Hill (1982) tells of people from Santa Clara Pueblo wearing otter fur headbands and collars. Bailey (1931) described the Native American knowledge about the otter along the Río Grande. “The Taos Indians are familiar with them, and

bits of fur were seen on their clothing and ornaments as well...” He added that the Taos Pueblo people not only utilized their skins but also had a unique name in their Tewa language for the otter. An otter effigy pot was excavated from Pecos Pueblo on Arroyo del Pueblo, a tributary of Glorieta Creek, a tributary of the upper Pecos River located about 4 km South and 0.8 km East of the village of Pecos, New Mexico (Polechla 2000, Kidder 1932). This site was estimated to be between 1200 and 1838 AD.

### **Spanish Colonial Period**

In 1541, Hernando de Alvarado commented that the “Río Pecos” or Pecos River “contains very good trout and otters” (Hodge, 1946). Nicolas de Lafora (Weber, 1971) wrote about the Río Grande in 1767 commenting that New Mexicans “pay no attention to otter, beaver, ermines, and martin [sic marten] skins, which they have in abundance, because they do not know their value.” Fray Morfi (1782 fide Rea 1947) records beaver and otter on the Río Grande in 1782.

The place called “Las Nutrias” along the “Camino Real” was named in Spanish after ‘the otters’ and dates back to 1682 (Rivera and Humboldt, 1807; Julyan, 1998, Polechla, 2000; LoPopolo, 2006; Carlos LoPopolo, personal communication). This village is located at 34.477 degrees N.106.770 degrees West Longitude on the east bank of the Río Grande in present-day Socorro County, NM.

There are a number of other place names with nutrias or otters for localities in New Mexico (Pearce, 1965; Julyan, 1998; Topozone.com) and Colorado (Polechla, 2002a). Often times place names with otter or nutria refer to an abundance of otters in this region historically (Polechla, 2002c).

The officials in City of Chihuahua, fearing over-trapping of beaver and otter in the Río Grande, closed the river to trapping these two species (Weber, 1971) publishing the declaration in the official newspaper “El Noticioso de Chihuahua” in 1838 (Polechla et al., in prep). This indicates a greater original abundance than was previously thought by authors such as Bailey (1931) and Findley et al. (1975).

### **Early American Period**

The military expedition known as the “Army of the West” led by Lieutenant Colonel W. H. Emory guarded the Mormon Battalion from Fort Leavenworth, Kansas to San Diego in present day California (Emory, 1848). They came via the Santa Fe Trail’s Mountain Route, passed from later-day Raton to Santa Fe, NM then to the Río Grande (on a main trail called the Camino Real) as far south as the Fra Cristobal Mountains and then exited the Río Grande valley west across the mountain gap now known as Emory Pass (Julyan, 1998), present-day NM. On 11 October 1846, Captain A. R. Johnston of the expedition wrote the following about the east bank of Río Del Norte at the base of Fra Cristobal Mountains (Emory, 1848). “In passing the river, I saw the tracks of the otter, the catamount, the wildcat, the bear, the raccoon, the crane, the duck, the plover, the deer, and the California [sic probably Gambel’s] quail.” Emory, the namesake of the Emory oak (*Quercus emoryi*), summarized the observations of others in the Mormon Battalion expedition by writing “...for here we saw for the first time in New Mexico, any considerable “ signs” of game in the tracks of the bear, the deer, and the beaver. We flushed several beavies of the blue quail, saw a flock of wild geese, summer ducks, the avocet, and crows.” It must be noted that the area north of this region along the “Camino Real” contained numerous human settlements, which had over harvested the wildlife along the Río Grande. Just north of Tome, Johnston wrote about the otter’s commensal partner, the beaver. “Above this camp, there is on

the river a considerable growth of cotton-wood, among which are found some ‘signs’ of beaver.”

Other observations are known from the upper Río Grande. A “Mr. Dowell” said that otter were found near the junction of the El Rito de los Frijoles and the Río Grande between 1910-1911 (Henderson and Harrington, 1914). The junction of these two waters lies within present-day Bandelier National Monument, Sandoval County, NM. Bailey (1931) cited otter records from the upper Río Grande on the following localities: “near Espanola, Rinconada, and Cienequilla.” “Cienequilla” or “Cieneguilla”, meaning small marsh in Spanish, is now known as Pilar, Taos County, NM (Julyan, 1998).

Bailey (1931) readily admits the conundrum of not having specimens to properly decide which taxa he is dealing. Writing about trappers’ records of the 1820’s for the Gila River of southwestern New Mexico in the Colorado River basin he says. “These records undoubtedly refer to the typical Arizona form [*L. c. sonora*], but no more records are available in New Mexico except for the upper Río Grande and Canadian Rivers in the northeastern part of the state, where the species is probably different. There is, however, not a specimen from the State available for study and comparison, and until specimens are obtained, no definite decision can be arrived at in regard to the subspecies.” Findley et al. (1975) merely cites Bailey (1931) and the record of McClellan (1954) in the Gila River (1 mile [1.6 km] S Cliff, Grant County) and adds “the species may well be extinct in the state.” Findley et al. (1975) do not indicate if any effort was made to survey for otters. They do not hazard a guess as to what subspecies might be in the Río Grande or Colorado, or Canadian River drainages of the state.

### **Modern Period**

#### **San Luis Valley**

In the 1970’s, Dean Swift saw three to four otters at Eastdale Reservoir (part of the Río Costilla drainage which winds its way across the Colorado/New Mexico border and flows into the Río Grande’s east bank (Polechla, 2000)). At the mouth of the Río Costilla, Jim and Peggy Swayback of MacKintosh, NM saw an otter (Polechla, 2000).

#### **Taos Gorge**

Dan Wood and Richard Spiegel of Bureau of Land Management (BLM) were rafting the Río Grande when they saw an otter about 11.7 km S of the Colorado/New Mexico state line (Stahlecker 1986). Doug Scott Murphy, a pioneer river outfitter on the upper Río Grande and artist, claims to have seen a river otter at “Razorblades” about 3.2 km upstream of Sheep’s Crossing in 1997 (Polechla, 2000). Todd Bates who lives on the Río Fernando de Taos (a tributary on the Río Grande’s east bank) claims to have seen an otter at the Sunshine Valley section of the Río Grande (Polechla, 2000).

#### **Red River**

Red River is a tributary on the east bank of the upper Río Grande in New Mexico. A New Mexico Environmental Improvement Division employee on the Red River at Columbine Canyon believed they saw an otter in 1999 (Polechla, 2000).

#### **Pecos River**

Bitter Lake National Wildlife Refuge (BLNWR), Chaves County, New Mexico lies on the Pecos River and has been a locality for several otter observations (Polechla, in prep. and 2002b, not cited by Anonymous, 2006). The refuge is characterized by a

myriad of different wetlands next to the river including: springs seeps, oxbow lakes, marshes, saline lakes, karst sinkholes, shallow reservoirs, and canals.

The US Department of Interior, Fish and Wildlife Service reported some sightings at BLNWR (Polechla 2002b). One of their reports (USDI F&WS 1994) states the following. “A river otter (*Lutra* [=*Lontra*] *canadensis*) was reported by a visitor on Unit 6 reservoir in early May [1994]. An otter has never been documented on the refuge, and seems highly unlikely. However, William R. Radke (refuge manager) found mammal prints along the Pecos River in October 1993, which he believed to possibly belong to a river otter. In addition, a fire crew dispatched from Washington State to aid the refuge during the summer fire season reported seeing a river otter at Unit 15 reservoir. None of these sightings were ever confirmed.” On 25 April 1999, Judy Dane, a volunteer coordinator with the New Mexico Museum of Natural History saw what she believes to have been an otter on the N end of Unit 6 impoundment of BLNWR (Radke, 1999, Judy Dane personal communication to Paul Polechla, 22 June 2004). This location is on the west side of the refuge and is close to the Pecos River. Judy is a long time birder and has seen lots of different species of wildlife on ecotours. She was standing on the road bird watching in the late afternoon when at a distance of 91.4 – 183 m, with the aid of her binoculars; she caught a quick glimpse of an otter. By the “dark color, long dark tail, size, and way it ran...humping its back and not waddling” she assured me it was a river otter and contends it was not a muskrat or a beaver. It was “bounding the weeds at the edge of the water”. Furthermore she says, “I’ve seen sea and river otters in Alaska... and beaver and muskrat in New Mexico and the Eastern US” Her description/observation is consistent with otter appearance and behavior and seems very credible. Shy of an actual photo or track cast, etc. this observation demonstrates the occurrence of river otter here.

### **Texas**

Since the early province of Chihuahua included some of present day west Texas along the Río Grande, the above-mentioned decree in the 1838 “El Noticioso de Chihuahua” also places otter in this part of the state (Polechla et al., in prep). In their “Mammals of North America”, Hall and Kelson (1959) do not have a Texas Río Grande location but do provide a central Texas distribution record on the Colorado River near Austin, citing Bailey, 1905. In the next addition of “Mammals of North America”, Hall (1981) shows the Brownsville, Cameron County, Texas location. This is based on an actual otter specimen that Van Zyll de Jong (1972) listed and measured and statically compared to other *Lontra* specimens including *L. canadensis* and *L. longicaudis*. Van Zyll de Jong identified the specimen as *L. canadensis lataxina*. Brownsville lies at the mouth of the Río Grande across the river from Matamoras, Tamaulipas, Mexico. Davis and Schmidly (1994) also showed the Río Grande locality but provided no further information. Earlier versions of this work (Davis 1966, 1974) do not show this locality. Polechla (1988, 1990) cites Hall (1981) and Polechla (1990) adds the rest of the Río Grande based on Weber (1971). Polechla (2000, 2002b) and Gallo (1986, 1989) cite this distribution locality in Cameron County, along the Río Grande (plus one at the mouth of Colorado River).

### **Mexico**

Harris (1968, p. 212) lists the type locality of the Neotropical otter of México (*Lontra longicaudis annectens*) Major, 1897 as Terro Tepic, Río de Tepic, Nayarit, Mexico and shows the trans-Madrecan distribution making a slight “U” shape along the Pacific coast from the Sierra Madre del Sur to a point about even on the Mexican mainland

with the tip of Baja California and on the Atlantic side of the Gulf of Mexico to Tamaulipas, Mexico (including an unnamed coastal river). Harris (1968) does not mention the Río Grande nor is it mapped for distribution for the Nearctic otter of the Southeastern US (*L. c. texensis* (now a synonym for *L. c. lataxina*)). New Mexico is listed as part of range of *L. c. sonora* and the upper part of Río Grande, Pecos, and Arkansas Rivers (in state of Colorado) shown on the distribution map. No individual records are shown on any of Harris's maps however.

### **Chihuahua**

The aforementioned decree in the 1838 "El Noticioso" for Chihuahua closing the Río Grande to trapping beaver and otter constitutes one of the first wildlife laws in the state of Chihuahua (Polechla et al., in prep). Now otter populations are known from other parts of the Río Grande drainage and western Chihuahua near the border with Sonora and Sinaloa.

### **"West"-Central Chihuahua- Río San Pedro, Río Conchos-Río Bravo Del Norte/Río Grande Drainage.**

This region lies on the eastern slope of the Sierra Madre Occidental of Mexico and has only been recently examined for otters. Carrillo-Rubio and Lafón (2004) published on the habitat of the otter in west-central Chihuahua, Mexico. They found otter scats and tracks plus even took a photograph that the second author (ECR) showed in a slide show at the 2004 IUCN Otter Specialist Group Colloquium (Carrillo-Rubio et al., 2004). They emphasized the microhabitat selection characterizing both the occupied and available habitat. Although this is an essential aspect of otter biology and conservation, there was an even greater significance of their work that was not mentioned. They had found otters where no other scientist had reported them before! Gallo (1986, 1989), Lariviere (1999), and even Gallo and Casariego (2005) do not show the west-central Chihuahuan population just the Chihuahuan/Sonoran border population described in detail in the next section. The previous population that other biologists had described was in extreme western Chihuahua near the Sonoran border on the west side of the Continental Divide running down the Sierra Madre Occidental. The population in west-central Chihuahua is totally new to science. Furthermore to date, this "new" population is 1) the only one on the east side of the Sierra Madre Occidental, 2) the eastern most population in Chihuahua, and 3) the northeastern most otter (*Lontra* spp.) population in México.

Not only that but, the species of river otter (*Lontra* sp.) that they are actually dealing with is not well understood. Recall that the arid US/Mexico borderlands are the regions where both the Nearctic otter of the north meets the Neotropical otter of the south. Prior to translocations (of different subspecies from other drainages) by the US states of Colorado, Arizona, and Utah, only the southwestern subspecies of the Nearctic river otter (*L. canadensis sonora*) occurred in the Colorado River (Polechla and Walker 2008). When Bailey (1931) wrote his "Mammals of New Mexico", he summarized a few reports of otters on the Río Grande. It is unknown whether he searched for them himself, but he probably was occupied investigating the diversity of mammals since the state ranks very high in diversity ranking with California and Texas (Caire 1978). The situation is further complicated since he did not have a specimen from the state but knew full well that they have long been a part of the native fauna. Without a specimen and knowing that the next drainage to the arid west was the Colorado River, he assigned the otters in the entire state; including the Gila, San Francisco, and San Juan River drainages, plus the Río Grande drainage, and the



Canadian River drainages, to that of the southwestern subspecies based on geographical proximity.

Carrillo-Rubio and Lafon (2004) and Carrillo-Rubio et al. (2004) working in Mexico where the most-abundant otter is the Neotropical otter, assumed that the otter in Chihuahua must be the Neotropical otter. They were not aware of *L. canadensis lataxina* from the mouth of the Río Grande at Brownsville, Texas that Van Zyll de Jong (1972) examined and identified. Since they worked in the Río San Pedro, which flows into the Río Conchos a tributary of the Río Grande, this might not be the case. Since both Carrillo-Rubio and his associates and Bailey knew of otters in the Río Grande but had no skin/skull specimens to examine for identifying characteristics (Polechla, Gallo, Tovar 1987), the true identity awaits further study to determine if it is the Nearctic, Neotropical, or an undescribed species or subspecies. Much study is needed to learn about this newly discovered population. It should be conserved at all costs.

### **Chihuahua/Sonora/ Sinaloa Border**

This area of Mexico is on the western slope of the Sierra Madre Occidental and drains into the Sea of Cortez (i.e. Gulf of California) and ultimately into the Pacific Ocean. Indigenous people are well aware of the Neotropical otter of this region. The Tarahumara and northern Tepehuan people in the Río Verde and Río Mayo of Chihuahua were familiar with the otter, using their meat for food, fat for folk medicine, and skin for a sleeping mat (Sturtevant, 1983).

In 1904, Carl Lumholtz's (1973) discovered "tracks of many raccoons and otters..." along the Barranca de San Carlos that drains into the Río Fuerte west of Nogal, Sinaloa, Mexico. Since Lumholtz' observations, the distribution of the Neotropical otter known to science has been moving northward along the west side of the Sierra Madre Occidental. This is largely attributed to an increase in mammalogical studies in northern Mexico associated with specimens, photographs, and sightings of otters.

Leopold (1959) provides records on the Río Gavilán. Cockrum (1964) reported on a specimen trapped from the Río Mayo near San Bernardo, in southeastern Sonora in spring of 1963. Anderson (1972) cited two specimens from northwestern Chihuahua from the Río Tutuaca, 20 km S Yaguarachie. In the same general region of the state of Chihuahua, Anderson (1972) also gives records for the Río Papigohi about 40 km down river from Temosahi. Roth and Cockrum (1976) reported on a specimen from the Río Mayo at Alamos from 1965 plus further to the north, another one at Los Pilares, 7 miles E [= 11.3 Km] of Yecora, on the Río Mulatos, a tributary of the Río Yaqui. Caire (1978) cites Roth and Cockrum (1976) and Anderson (1972) and states that native people at Tres Ríos on the Río Negro told him "that otters have occurred there occasionally". Brown et al. (1982) photographed three otters in the Río Yaqui, Sonora about 3 km downstream of the Río Chico confluence. The Río Yaqui flows into the Gulf of California between Guaymas and Ciudad Obregon, Sonora, Mexico.

Along the Río Bavispe east of Tres Ríos Mesa in the Sierra Occidental in Chihuahua, Johnson (2005) cites a Brian [Long] and Alan [last name unknown] searching for otters. Johnson is probably referring to the reconnaissance trip planned by Brian Long (2001, personal communication, 2001) of which no published reports have been produced from this trip. To date, this region may constitute the northern-most distribution of the Neotropical otter but lies on the west side of the Continental Divide and is not in the Río Grande drainage.

## **Coahuila/Nuevo Leon/Tamaulipas Border**

### **Río Salado**

These river headwaters on the eastern side of the Sierra Madre Oriental flow into the Río Grande on the Mexican side. The Río Salado, a Río Grande tributary in eastern Coahuila, northern Nuevo Leon, and northern Tamaulipas remains unsurveyed for otter, although Villa (1954) surveyed the river for beaver only. Bernal (1978) later surveyed beaver in this drainage in the state of Nuevo Leon.

### **Tamaulipas**

The rivers in this region south of the mouth of the Río Grande, headwaters on the eastern side of the Sierra Madre Oriental and flow (albeit now irregularly) directly into the Gulf of Mexico and finally into the Atlantic Ocean. Gallo-Reynoso (1997) gave the following record in his review of Neotropical otter in Mexico. "Río El Salado, afluyente del Río Conchos, 2 km O de Paso Hondo (Mpio. De San Fernando, 50 m). Se revisó la piel de un individuo macho. Este registro constituye el más norteño de la nutria neotropical en la vertiente del Golfo de México (N)." This is translated as follows. "The river 'El Salado', a tributary of the 'Río Conchos, 2 km west of Paso Hondo (Municipality of San Fernando, 50 m)'. I examined the pelt of an individual male. This constitutes the most northern record of the Neotropical otter on the coast of the Gulf of Mexico." This location is about 425 km south of the mouth of the Río Grande.

## **CONCLUSION**

In 1541, Spanish explorer Hernando de Alvarado is credited as the first person to observe otters in the Río Grande drainage and to write about his observation. Native American tribal knowledge of otters probably predates the Spanish record. Analysis of the early historical documents indicates that otters have been recorded in the Río Grande from the 16<sup>th</sup> through the 21<sup>st</sup> centuries. One archaeological record for an otter effigy pot was found in deposits dated from the 13<sup>th</sup> to the 19<sup>th</sup> centuries. Like the Arkansas (Polechla, 1987) and the Colorado (Polechla, 2002b) Rivers, the historical distribution of otters was from the headwaters to the mouth.

Unregulated fur trapping on Río Grande beavers and otters began in earnest in the Mexican Period and continued through the American Period. Undeniably there are at least three localities in the Río Grande where otters are currently known to occur (Figure 1): 1) the Río San Pedro in Chihuahua 2) in the upper Río Grande around ANWR near the New Mexican border, and 3) the Pecos River at BLNWR. Reports have come from competent biologists and naturalists with previous experience with otters. At this time, the most extensive population seems to be located in the Río San Pedro in Chihuahua that is about 106.9 km from the closest population near the Chihuahuan/Sonoran border on the other side of the Continental Divide. The habitat of the first locality is where a river passes through a deep canyon and the second and third localities are situations in which rivers flow by small reservoirs, ponds, oxbow lakes, and springs. The deep canyons might restrict some human visitation and development. Having a number of wetlands juxtapositioned near each other is ideal for otter foraging and traveling behavior. Very little of the Río Grande drainage has been sufficiently examined however, with only 292.8 km to date (Polechla, 2000; Carrillo-Rubio and Lafón, 2004; Polechla, unpubl. data), representing only 6.4-6.6 % of the total km of river ways in the Río Grande drainage. The newest discovery of otters in the Río Conchos necessitates that examination of the other tributaries as well

as the Río Grande per se, must be surveyed. The specific designation of these otter populations, let alone the subspecific designation, are unclear and await further study.

### **Management Implications and Recommendations**

Mark Twain's famous pun is applicable (Gore, 2006). "Denial ain't just a river in Egypt." Contrary to the prevailing opinion, native populations of river otters are present in the Río Grande drainage. Governmental agencies denial of this fact and refusal to protect them needs to be corrected. Currently, five river otters (*L. c. pacifica*) from the state of Washington were unscientifically stocked (Seattle Post-Intelligencer, 2008) into a river drainage that undeniably already has a native otter. The "New Mexico Friends of the River Otters", the group responsible for the action, has plans to stock more foreign Washington (Seattle Post-Intelligencer, 2008) and Oregon (Associated Press, 2007) otters into New Mexico. This threatens an existing native population of river otters, currently imperiled. The five stocked otters need to be live-captured and returned to Washington. A genetic study is needed to elucidate the taxonomic relationship of the otters of the US/Mexico border. Experienced otter trackers need to conduct additional surveys to determine the distribution of otters of the Río Grande and borderland region in general (e.g. Colorado River drainage to the west and the Canadian River drainage to the east).

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## RESUME

### REPARTITION ACTUELLE ET HISTORIQUE DES LOUTRES *Lontra canadensis* ET *Lontra longicaudis* SUR LE RIO GRANDE ET LE RIO BRAVO DU NORD DU COLORADO ET DU NOUVEAU MEXIQUE, USA ET CHIHUAHUA, MEXIQUE ET REGIONS ADJACENTES

Le réseau hydrographique du Rio Grande est une importante zone humide des aires arides proches des Etats-Unis et du Mexique mais elle est à ce jour largement en péril. Il existe actuellement un désir de restauration des populations de loutres sur cette rivière. Afin de suivre les lignes directrices de l'UICN sur la restauration des populations, les biologistes doivent avant tout évaluer la situation avant d'engager une gestion favorisant le retour des loutres. La première nécessité est de connaître les espèces présentes, leur distribution et leur abondance relative. Ainsi, les données historiques et les répartitions actuelles de la Loutre de rivière (*Lontra Canadensis*) et de la Loutre néotropicale (*L. longicaudis*) sur les zones limitrophes des Etats-Unis et du Mexique sont synthétisées dans cet article. Les indices indiquent que les loutres sont originaires de la vallée du Rio Grande et ont même été enregistrées dans les langages et les décorations des indiens d'Amérique tel que le peuple "Pueblo", et ce avant l'installation des européens. En effet, le premier document espagnol que nous ayons pu trouver mentionnant la Loutre date du milieu du 16<sup>ème</sup> siècle. Par le passé, les loutres étaient sans doute plus nombreuses que ce que nous pensons et l'une des premières lois sur la vie sauvage dans cette région tournait autour d'un moratoire sur le piégeage de la Loutre et du Castor. Aujourd'hui, les loutres sont présentes sur :

- 1) le Rio San Pedro du Chihuahua, un affluent du Rio Conchos qui se jette dans le Rio Grande par le sud-est,
- 2) la partie amont du Rio Grande près de la frontière du Colorado et du Nouveau Mexique,
- 3) la partie centrale de la Rivière "Picos" dans le sud-est du Nouveau Mexique qui se jette dans le Rio Grande par l'ouest.

Ces données résultent de multiples observations par des naturalistes compétents mais aussi par des photos de loutres et des indices de présence. Ces diverses populations fréquentent des aires dont les macro-habitats sont caractérisés par des rivières à courants rapides à travers des canyons profonds ou des zones humides secondaires. A vrai dire, des enquêtes de terrain plus détaillées seraient nécessaires pour affiner la distribution des loutres sur l'ensemble du système hydrographique du Rio Grande. Par ailleurs, une étude génétique est absolument indispensable afin de déterminer les distances génétiques entre ces populations récemment découvertes. Enfin, un moratoire sur les translocations pourrait être instauré sur le Rio Grande afin d'assurer la conservation de ses populations.

## RESUMEN

### DISTRIBUCION HISTORICA Y ACTUAL DE LOS NUTRIAS DEL RIO (*Lontra canadensis*, *Lontra longicaudis*) EN LA CUENCA DEL RIO GRANDE O RIO BRAVO DEL NORTE EN COLORADO Y NUEVO MEXICO, E.U.A., CHIHUAHUA, MEXICO, Y OTRAS AREAS ADYACENTES

La cuenca del Río Grande (llamado "Río Bravo del Norte" en México) contiene humedales importantes para las áreas desérticas de la frontera entre México y EUA. En la actualidad existen grupos de interés que pretenden restaurar poblaciones de

nutria de río en esta cuenca, pero para poder seguir los lineamientos de restauración de especies del IUCN es necesario conocer a detalle la situación de la especie antes de llevar a cabo cualquier esfuerzo de restauración. Uno de los prerrequisitos para la restauración es conocer la taxonomía del organismo (i.e., la taxa o especies y subespecies nativas del área bajo consideración), distribución, y abundancia relativa. La distribución histórica y actual de la nutria de río Neártica (*Lontra canadensis*) y Neotropical (*L. longicaudis*) en la frontera entre México y E.U.A. es examinada en este artículo. La evidencia indica que las nutrias eran nativas al valle del Río Grande y han sido registradas en la lengua y cultura de grupos indígenas previa la llegada de los europeos. Los primeros documentos en español datan del siglo XVI. Las nutrias eran probablemente más numerosas de lo que anteriormente se estimaba, y una de las primeras leyes de conservación de fauna silvestre en la frontera estableció una veda sobre la caza de nutria y castor. En la actualidad existen poblaciones de nutria en 1) la parte alta de la cuenca del río Conchos en Chihuahua, que a su vez alimenta al Río Grande; 2) la cuenca alta del Río Grande cerca de la frontera entre Colorado y Nuevo Mexico en E.U.A.; y 3) la porción central del Río Pecos en el sureste de Nuevo Mexico, que alimenta al Río Grande. Estos registros son corroborados por múltiples observaciones hechas por observadores competentes. Estas poblaciones se centran alrededor de áreas con macro-hábitats caracterizados por corrientes de agua permanentes que atraviesan 1) cañones profundos, o 2) humedales desérticos. Estudios adicionales son necesarios para determinar la distribución actual de las poblaciones de nutria presentes en la cuenca del Río Grande. También se requiere de estudios genéticos para poder determinar la verdadera afiliación genética de estas poblaciones recientemente descubiertas. Además, es necesario posponer cualquier proyecto de translocación de nutrias de otras poblaciones no nativas a la cuenca del Río Grande para poder conservar las poblaciones nativas existentes.

ARTICLE

**ASSESSING OTTER PRESENCE IN DAMS:  
A METHODOLOGICAL PROPOSAL**

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**Abstract:** Standard otter survey methodology proposed by the IUCN Otter Specialist Group enables comparisons in present/absence data in different countries or in different regions. However, otter presence and distribution assessment in dry areas, such as the Mediterranean region, which are characterized by highly marked seasonal climate with intermittent water flow coupled with different types of habitats or systems such as dams, may gain from adjustment to the methodology. Pressure for dam building still occurs in these regions and the need for studies on ecological communities and species protection is increasing. Dams are very different from usual otter riverine habitat and we need to understand their influence on otter populations. Variation of dam location, reservoir characteristics and season will all influence spraint detectability. Environmental Impact Assessment Studies and ecological studies are frequently limited by both budget and time requiring field researchers to apply more efficient methodologies. Based on experience from studies conducted in Portugal we propose adjustments to the standard survey methodology (using spraints) surveying otter presence in dams to be applied specifically to Mediterranean-type ecosystems. We define aspects to be considered regarding survey season, survey length and width, number and location of survey sites, among others. This paper will allow researchers to plan more effective field surveys based on standard otter survey methodology for the purpose of dam surveys, be that to detect otter presence/absence, a more in-depth comparative studies of otter presence, or simply improving the collecting of fresh spraints for molecular spraint analysis.

**Keywords:** Eurasian otters, Mediterranean, reservoirs, survey methodology.

## INTRODUCTION

One of the five species evaluation criteria in the IUCN Red List Categories and Criteria is the population trend (IUCN, 2001), and this requires observing changes in species distribution over time and space. For Eurasian otters (*Lutra lutra*) this translates mostly in presence/absence data resulting from spraint surveys. This occurs because otters are difficult to capture (particularly since the prohibition of use of leg-hold-traps – EEC 1991 - Council Regulation No 3254/91) and consequently to radio-track, and non-invasive molecular methods are still expensive and with a low rate of success due to the degraded condition of DNA from faecal samples.



In the 80's a survey method was developed for the Eurasian otter (Macdonald, 1983), and first adopted on a large scale during the national surveys of Britain and Ireland. This method uses surveys of stretches of 600 m of river banks for searching evidence of otter presence. Results are usually expressed in terms of percentage of positive sites, whether describing the data for a country, a region, a catchment, or some artificial unit such as a 10x10 km square (Chanin, 2003). This standard method for otter surveys was recognised as such by the IUCN Otter Specialist Group (OSG) after a major review of surveying methods carried out by Reuther et al., (2000). Most importantly the OSG standardised methodology enabled comparisons in presence/absence data in different countries whereas before it was difficult to assure that data were comparable (due to different surveys efforts, etc). This standard methodology for monitoring purposes in lotic systems (streams, rivers) may however, be complemented when applied to different types of systems, like lentic systems (large dams). This is especially relevant when we address otter presence and distribution in dry areas, such as the Mediterranean region, considered one of the biodiversity hotspots for conservation priorities (Myers et al., 2000), where different habitats or systems, such as dams, appear to have a role to play.

Dams, and specifically large ones (defined as having a dam wall with  $\geq 15$  m of height, or a wall height between 5-15 m and a reservoir volume greater than three million m<sup>3</sup> - WCD, 2000), are very different from the usual otter riverine habitats and we need to understand the influence of these "man-made" habitats on otter populations to be able to act on its protection. This context is especially relevant in Mediterranean areas or other similar regions, where water policy is largely based on such infrastructures, and streams suffer several other pressures (climatic and human). A reduction in dam building has occurred in North America and Europe in the last years, due to the facts that most of the technically appealing places for dam implementation having already been occupied, and there is now a greater concern for the environment. Nevertheless, dam building, especially large dams still continued in the last years in several countries (e.g. in Mediterranean countries like Portugal or Spain, or in developing Asian countries like India or China). As a consequence, case studies of otters and large dams appeared and, in the near future and with the uprising of environmental concerns, more studies are expected to occur, most of them linked with minimization and compensation environmental measures regarding dam implementation. The current scenario of climate change in Europe affects the riverine systems in the Mediterranean regions, mostly by extending the drought period. This is relevant, since increasing demand and management of water can influence otter distribution and affect long-term viability (Barbosa et al., 2003).

Portugal, located in Western Mediterranean Europe, has always been one of the strongholds of otter in Europe, considered to be one of the most viable and widespread populations in Europe. Nation-wide surveys conducted in 1995 and 1998 at the coarse grid resolution of 10x10 km, as advised by the OSG, resulted in a broad otter presence across all of the country with the exception of the two main cities (Lisbon and Oporto). As a result, otters were downgraded in Portugal from "Insufficiently Known" to "Least Concern" (Cabral et al., 2005), a result that contrasts with its European status - "Near Threatened" category (IUCN, 2006).

The objective of this paper is to propose adjustments to the OSG standard otter survey methodology, to focus on otter presence in dams, which can be applied specifically in the Mediterranean region or Mediterranean-type ecosystems, characterized by a highly marked seasonal climate with intermittent river flow. We will identify concerns of applying the OSG standard methodology to dam surveys and

use the experience gained in studies conducted in Portugal to address these adjustments.

## OTTERS IN DAMS

Few studies have addressed the use of dams by otters. Most of these complement the use of spraints with other methods, either because the authors were able to capture and radio-track otters (Somers and Nel, 2004), or because they could watch the individuals (Anoop and Hussain, 2004; 2005; Rosas et al., 2007). Somers and Nel (2004) caught seven Cape clawless otters *Aonyx capensis* in wire-cage traps in two rivers of South Africa and all included the Clanwilliam and Bulshoek dams in their home ranges. Anoop and Hussain (2004, 2005) in a study on smooth-coated otters *Lutra perspicillata* along the Periyar Dam (India) detected resting and foraging activities in that reservoir; they used both otter signs and direct observations of the species because smooth-coated otters are social carnivores that forage in groups and use communal sites for defecation (Hussain, 1996; Hussain and Choudhury, 1997). Rosas et al. (2007) collected data on the occurrence and habitat use of giant otters *Pteronura brasiliensis* in the Balbina hydroelectric lake in central Amazonia (Brazil), using motor boats to observe the otters.

Regarding Eurasian otters, studies involving lentic systems are mostly on diet analysis on the basis of spraints (Gourvelou et al., 2000; Rhodes, 2004, Sales-Luís et al., 2007), and those that address habitat use mainly use snow-tracking (from early studies - e.g. Erlinge 1967, 1968; to other more recent: e.g Rimov reservoir, Czech Republic – Rhodes, 2004; central Finland lakes - Sulkava, 2006). Georgiev and Stoycheva (2006) in a study of otter in the Rhodopes Mountain (Bulgaria) that included two large dams, used both tracking in mud and wet soil and spraints. However, neither snow-tracking nor telemetry can be easily applied in Mediterranean countries, such as Portugal, since captures are difficult (particularly since the prohibition of use of leg-hold-traps – EEC 1991 - Council Regulation No 3254/91) and there are very few areas with snow due to the average high temperatures. Furthermore, studies relying on direct observations are difficult to implement.

Research on the importance of lentic systems in the ecology of Eurasian otters in Portugal started in 1996 and is still ongoing. In this country, the authors showed that Eurasian otters use the reservoirs of large dams (Santos et al., 2007; Pedroso et al., 2007) and feed in them (Pedroso and Santos-Reis, 2006; Sales-Luis et al., 2007). Reservoirs seem to constitute an “attraction point” for otters particularly in drought periods when rivers and streams dry up (Prenda et al., 2001; Pedroso and Santos-Reis, 2006).

During these studies, that were sign survey-based, some methodological difficulties were encountered and adaptations were implemented. Of the 13 studied large dams, one is the Aguieira Dam, located in central Portugal, on the middle section of the River Mondego, which has a permanent water flow. The other 12 dams are all located in the South of Portugal, along the Guadiana and Sado river basins, that suffer high water level variation as in dry seasons most of the tributaries dry up (Table 1) (for further dam characterization and information see Pedroso and Santos-Reis 2006; Sales-Luis et al., 2007; Pedroso et al., 2007).

**Table 1.** Characteristics of surveyed dams in Portugal

Dam	Alvito	Odivelas	P. Altar	M. Rocha	F. Cerne	Campilhas
area (ha)	1480	973	876	1100	105	333
wall (m)	49	55	63	55	18	35
perimeter (km)	90.296	58.639	85.397	82.594	19.960	32.979
Dam	Roxo	V. Gaio	Caia	Lucefecit	Vigia	M. Novo
area (ha)	1378	550	1970	169	262	277
wall (m)	49	51	52	23	30	30
perimeter (km)	95.829	41.215	107.457	19.001	20.000	24.000
Dam	Aguieira					
area (ha)	2000					
wall (m)	89					
perimeter (km)	39 310					

## PARAMETERS OF CONCERN

Usually standard OSG method is applied to lotic systems, however there are obvious differences when we are dealing with large lentic systems (large reservoirs). From our studies we can point out several specific parameters of the lentic systems that can influence spraint detectability and otter marking behaviour, and should therefore be taken in consideration when surveying this type of habitats.

### 1 – Water level variation

All of the reservoirs have fluctuation of the water level that result in a bank flooding area with scarce riparian vegetation. This fluctuation may be rapid and frequent, when we are dealing with dams used for electricity production, and water level may change very quickly over some meters in few days (e.g. dams of North and Center of Portugal, like the Aguieira Dam), or be slower, occurring over several weeks or months, as in dams used for irrigation or water consumption (e.g. dams of South of Portugal, like the 12 studied dams in the Sado and Guadiana basins).

When reservoirs fill up to maximum or near maximum capability, the bank is flooded up to the vegetation line. This happens especially during wet seasons when the reservoirs fill up due to rainfall, and maintain the water level high, if possible up to the end of spring acting as a water reserve for irrigation and public consumption during summer and autumn. In the Aguieira Dam study (Pedroso et al., 2007), the water level was very high from March to July, sometimes submerging all the bank flooding area and thereby reducing spraint detectability. In this study, the decrease in numbers of signs in some of the months was associated with high water level in the reservoir.

To avoid loss of information, particularly in the drier months when water was at its lower level, surveys in all of the 13 dams were extended to the entire bank flooding area, easily recognisable by the absence of vegetation due to water level variation. Signs found were distributed throughout the entire width of the bank flooding area, although around 80% were concentrated in the first five meters from the water edge. (Pedroso et al., 2007; Pedroso, unpublished data). Similar results were found by Anoop and Hussain (2004), in a study with smooth-coated otters (*Lutra perspicillata*) in the Periyar Lake Dam (Kerala, India), who found that if otters are present in an area their signs were most likely to be encountered within the 10 m perpendicular to the shoreline, and these authors used surveys of 250x10m along the water's edge.

## 2 – Rainfall

Rainfall influences spraints durability in the field. Otter surveys should not be carried out during periods when there is heavy rain since this may lead to a decline in the proportion of positive sites (Chanin, 2003). In reservoirs, bank flooding areas usually lack riparian vegetation and frequently have steep margins. These promote the washing out of spraints when subjected to rain. In the Aguieira Dam study, the decrease in number of signs between months (up to 260%) was associated with heavy rain, mainly from November to January (Pedroso et al., 2007).

## 3 – Presence of marking sites

Most signs found in the studied reservoirs comprised spraints – 90.2%; 3.3% were prey remains, 3.0% were scent marks and 1.7% were footprints/tracks. The marking sites were consistent with those described for the species: isolated or small groups of rocks (55.0%), large rocky boulders (17.0%), soil surface (14.3%) and logs/branches/tree roots (8.0%); vegetation and small sand hills (<5.0% each) were also used (figure 1).



**Figure 1.** Otter marking sites at Monte Novo Dam, South Portugal

Several papers state the use of these substrates as common marking places for otter (e.g. Georgiev 2007, in a study in South-East Bulgaria that included two small artificial lakes - 2,7ha and 4,7ha - refer that stones were the most marked substrate). Spraints at a specific marking site (e.g conspicuous rock) were a common feature of most surveyed sites. This site fidelity by *Lutra lutra* was already reported by several authors (e.g. Kruuk et al., 1986; Mason and Macdonald, 1986). Kruuk (2006) also states that spraints are left on prominent aspects of landscape (e.g. rocks, logs) that may be permanent spraint sites. This author reports that, in the Shetlands, the same sprainting sites are often used for many years. A similar observation was made by Anoop and Hussain (2004) in the Periyar Lake Dam where grooming and sprainting sites were regularly visited by smooth-coated otters. In our studied dams the number of spraints found was correlated with the number of marking sites (Pedroso et al., 2007; Basto et al., in prep.), which is a relation common in streams also (Sales-Luís et al., 2007). Relations between marking intensity and otter use in certain survey sites must take this in consideration.

## 4 - Bank side characteristics

One aspect that may influence spraint detectability is bank steepness. Although no statistical significance was detected in the studied dams, generally banks with greater steepness had fewer signs than those less steep. Less steep stretches have a wider surface of bank flooding, corresponding to a larger potential marking area in

months of low water level and, when flooded, a better chance of prey capture (e.g. Kruuk, 2006). To what extent otters use the deeper water in the studied reservoirs it is still unclear but it is likely that the otter is mainly using the shoreline of the reservoir, restricting its activity, especially foraging, to the littoral zones. This is supported by the fact that the main prey consumed in the reservoirs studied are present mainly around the shoreline (Sales-Luís et al., 2007) (Figure 2).



**Figure 2.** Reservoir of Aguieira Dam, central Portugal

Other literature also addresses this aspect. Anoop and Hussain (2004) found that smooth-coated otters in the Periyar Lake Dam were confined to the shallower and narrower regions of the lake, where the bank was gradually sloping mud, avoiding deeper parts of the lake, with steeper rocky banks. The preferred areas for otters in the Periyar Lake were characterized by a slope of  $<5^\circ$  and low water depth that extended over a few metres, and offered excellent foraging ground. Duplaix (1980) in Surinam made a similar observation, with giant otters *Pteronura brasiliensis* preferring low sloping banks with good cover and easy access to abundant prey. In the Shetlands, Kruuk (1995) also made similar observations for the eurasian otter. For example, otters foraged mainly in water usually less than 8 meters deep, with short dives. Georgiev and Stoycheva (2006) also did not find evidence of otter in the deep margins of two large reservoirs, and only in the areas close to the river inflow.

Riparian vegetation, which plays an important role for otters in river tributaries (Macdonald and Mason, 1982; Bas et al., 1984; Lunnon and Reynolds, 1991), is expected to be also important in lentic systems. Kruuk and Goudswaard (1990), while investigating the reasons for the declining number of otters in Lake Victoria (Tanzania), described the virtual absence of otters from a section of the lake where the bank-side vegetation was poor. Anoop and Hussain (2004) made similar observations in Periyar Lake and suggest that vegetation cover on the bank may be important to otters throughout their distribution range. Results of the 12 dams in the South of Portugal confirm the importance of this resource, as vegetation availability was positively correlated with the number of spraints found. So it was expected that positive sites for otter presence would mostly be found in areas with good cover. However, in the Aguieira Dam, the number of otter signs was negatively correlated to cover (Pedroso et al., 2007). This, however, may have been a consequence of the fact that the reservoir of the dam was full for several months of the year, diminishing the bank flooding area; the flooding area available for survey was most of the times small or absent and the area next to it was difficult to survey since it was occupied by dense

vegetation. Also, Kruuk (2006) stated that radio-tracked otters in Shetland did not show preference for particular vegetation and just happen to spraint near trees or shrubs.

#### 5 – Survey length and width

In the Aguieira Dam, 16 sites (six 600m and ten 200m transects) were surveyed monthly for one year (Pedroso et al., 2007). All 600m transects were visited by otters in the 12 months of the survey, with the exception of one where no otter signs were found on one survey. Similarly, all the shorter transects (200 m) were visited by otters and the visiting rate (number of occasions a given transect was found positive for otter presence over the total number of surveys of that transect) varied from 0.42 to 0.95, with 4 showing values above 0.75. In the other 12 dams, which were surveyed only once (during summer), a series of 200m transects were regularly spaced along the water edge (Pedroso and Santos-Reis, 2006). Whenever no otter signs were found, the transect was extended to 600m but this was necessary just in 16% of the occasions. This result suggests that 200m transects may be suitable for heavily marked dams (like the ones in dry regions during dry seasons). Although, Anoop and Hussain (2004) used 94 survey sites of 250m and only 69% were positive for otters, indicating that in less marked dams 200m might not be enough.

#### 6 - Location of surveys

As in streams, location of surveys in reservoirs is important for spraint detectability. When present in a reservoir, otters may not use the entire reservoir so we have to bear this in mind when choosing survey sites. In each of the 12 surveyed reservoirs in southern Portugal, a set of survey sites was implemented around the entire perimeter and 14.5% of these proved negative for otter presence (Pedroso and Santos-Reis, 2006). The criterion for selection of survey sites was that these should be approximately 5 kms apart. According to Erlinge (1967) most home ranges of Eurasian otter family groups that included lakes within their boundaries were found to extend over distances greater than 5 km, and those on rivers were larger. However, this data concerns the snow tracking method and a northern European country (Sweden). For Mediterranean streams, Saavedra (2002) found a mean of around 30 km of average total range and around 6km of core area, (Catalonian Region - Spain) and Jiménez et al. (1998) found home ranges of around 30km for males and 20 km for females (Castellón and Teruel - Spain). Therefore, the chance of a home range lying entirely between two survey points is low thus minimizing false negatives.

Also, proximity to tributaries seems to be important, especially in reservoirs in the drier regions of southern Portugal. Here confluences of tributaries in reservoirs were heavily marked (Sales-Luís et al., 2007). The otters seemed to divide their time and movements between the dam, which provided nourishment, and the associated tributaries, which provided shelter (Sales-Luís et al., 2007; Pedroso et al., 2007; Pedroso, unpublished data). Georgiev (2009), in a study with eurasian otters in Southern Bulgaria, also addressed the question of where to place the monitoring zones, although this was in relation to small dams. In that study, the author stated that most of otter spraints were found in the areas close to the river inflow, followed by those near the wall of the dam. Anoop and Hussain (2004) also found that smooth-coated otters in the Periyar Lake Dam were usually found at the mouths of small streams that join the lake. The number of streams joining the lake, which influences the congregation of fish and the vegetation density, was interpreted to be the most important factor in determining habitat selection by otters around the Periyar Lake.

One last aspect of survey location is the wall of the dam. All of the studied dam walls that allowed otter passage from and to the downstream tributary (small wall steepness, short distance from the wall to the downstream river) were marked in the surroundings, most of them on and around the wall itself and on small dirt pedestrian tracks leading from the wall to the reservoir and the tributary (Figure 3). Georgiev (2009) found that after the areas close to the river inflow, it was in the areas near the wall of the dam where most of otter spraints were found (although it must be repeated that this study took place in small dams).



**Figure 3.** Location of otter spraints found around Vale do Gaio Dam wall: ✦ – otter spraint; 1 - downstream; 2 – wall road; 3 – upstream.

### 7 – Human disturbance

Human disturbance influences otter presence in several ways and may even limit otter populations (e.g. Beja, 1992; Robitaille and Laurence, 2002; Kruuk, 2006). That being so, one would expect marking behaviour and the corresponding amount of otter signs detected would also be influenced by human disturbance (i.e. fishing and aquatic sports). However, in the studied dams, no such relation was found. This may be because during most of the year disturbance in reservoirs is quite low, except during summer time when sporting and camping activities take place, or because there is a certain degree of adaptation to human presence and encounters are avoided with the usual secretive otter behaviour (nocturnal and discrete). This tolerance to human presence was also observed in the Periyar Lake, India (Anoop and Hussain, 2004; 2005).

## **PROPOSAL FOR A METHODOLOGICAL APPROACH**

Portugal and other Mediterranean countries have a very distinct seasonality in water availability, with an almost complete absence of water from many streams in the dry season. The favourable status of otter populations in Portugal may lead otters to occupy, especially during dry seasons, habitats which are suboptimal in terms of refuge but offer profitable prey (Pedroso et al., 2004; Sales-Luís et al., 2007; Pedroso et al., 2007). Pressure for dam building and water management issues relating to it are more intense in drier regions, hence the necessity for studies on ecological communities and species protection, especially in Environmental Impact Assessments. The following methodological proposal, although clearly directed at dry regions, can also apply to regions with different characteristics and otter status.

The suggested methodological approach to survey otter presence in dams is based on the standard survey methodology (OSG), which surveys 600m of riverbank for evidence of otter presence. Transects should be located along the bank of the reservoir (one bank instead of two as in streams). Further adjustments relate to:

### Surveying season

Consideration of season is important in rivers with intermittent water regimes. As the effect of water level and rain can mask the influence of other variables in otter sprinting activity, it is important to survey in months that minimize these effects. In Mediterranean countries that may principally be in the summer and autumn. When performing single surveys these should not be implemented during the days after heavy rain or high water level (according to Chanin, 2003, there should be a period of at least five days without rain before surveying). Also, when dealing with sprinting, one should take into account seasonal variations in otter sprinting behaviour, which maybe up to tenfold between seasons (e.g. Kruuk, 2006). So, annual monitoring schemes should be conducted each year in the same season to diminish otter sprinting behavioural differences.

### Survey length and width

Similarly to river surveys, 600 m transects are a reasonable compromise for otter regular monitoring, either only to detect otter presence/absence or for more in depth comparative studies. The survey should be concentrated in the first five metres from shore of the entire width of the bank flooding area. Nevertheless, for monitoring otter presence/absence in dams in dry regions, 200m transects are adequate as this minimises survey time and thus the number of sites to be surveyed per day. However, this survey length should only be used when more than one site is to be surveyed in the same reservoir. Alternatively, surveys may be planned to begin with 200m transects, moving up to a maximum of 600m transects in case no otter signs are found. Similarly to river surveys, this has the effect of avoiding false negatives.

### Number of survey sites

To make it possible to say that otters are present in all of a reservoir, a series of regularly spaced survey sites, approximately 5 km apart, should be established. This degree of surveying in depth would give an insight into the otter's specific habitat use, such as whether they are present at the point where tributaries run into the reservoir, or if they use the overall perimeter of the reservoir.

### Location of the survey sites

When performing presence/absence surveys, and if proving otter presence in the entire reservoir is unimportant, the most crucial aspect is choosing the right sites for surveying. Suitable sites are usually selected by ease of access. Our data suggest that surveys located in the main inflow of the tributaries into the reservoir (Pedroso, unpublished data; Sales-Luís et al., 2007) are ideal places to survey. However, it must be considered that this is not necessarily representative of otter use in the totality of the reservoir perimeter, particularly when dealing with large reservoirs. To improve the probability of finding otter signs, surveys should be located on gently sloping banks, with many suitable potential marking places, near shallow water and beside or under any existing bridge. The dam wall itself can also be a good place to consider surveying, providing the wall is not steep and is a short distance from the downstream river, allowing otters to cross (Figure 4). Furthermore, if surveys are replicated seasonally, special attention must be given to traditional otter marking places in order to promote efficiency in detecting sprints.



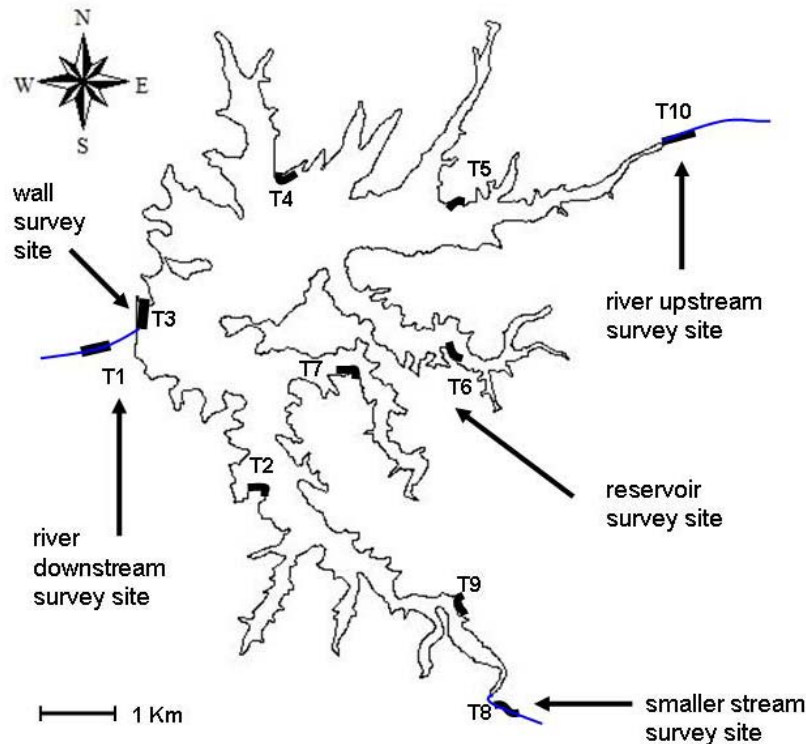


Figure 4. Location of otter survey sites in Roxo Dam, South Portugal

### Vegetation

Survey sites with good vegetation cover above the bank flooding areas may reveal a high degree of marking behaviour and otter presence. However, the same sites during high water level may yield a very small surveying area due to the fact that the water reaches the dense vegetation (Pedroso et al, 2007). If surveys are to be repeated in time, looking for good marking substrates above the flooding area (if the vegetation allows it) is advisable before choosing survey sites.

### Type of dam

The function of the dam is an important aspect, since it implies different water management policies. Hydroelectric dams have larger and faster shifts in water level, while agriculture/water reserve dams do not suffer sudden fluctuations. Water discharge downstream is also very different, and surveys in tributaries below hydroelectric dam may be compromised by the sudden water discharge that occurs for electricity production. Field surveys should therefore take place in the shortest time frame, in order to guarantee comparable conditions. The same applies to comparisons of presence/absence surveys in different years, such as in nation-wide surveys.

### CONCLUDING REMARKS

The above suggestions may assist in a more efficient design of methodology for assessing otter presence/absence, and they contain some adjustments for applying standard survey methodology to large dams for Mediterranean or Mediterranean-type ecosystems which are characterized by highly marked seasonal climate with intermittent water flow. Generally Environmental Impact Assessment Studies are limited by both budget and time, and field researchers and biologists are forced to apply efficient and cheap methodologies. Good distribution data on otters is a first

step to assess the effects of dam construction. The Eurasian otter is a target species under the Habitat Directive, requiring regular monitoring. Surveys in reservoirs, particularly when combined with surveys in associated tributaries, will help to understand the impact of dam building on otter populations. Further understanding of marking behaviour for making inferences on habitat use and time spent by otters in these man-made habitats must take into consideration not only that otters often use certain areas without leaving any detectable signs, but that there is also variation in the marking behaviour of otters of different age, gender and reproductive status. Seasonality and prey availability may also bring variation to marking behaviour and should be taken into account. Radio-tracking data or molecular spraint analysis of otters in dams would therefore complement these data, giving a better understanding of how the otters use dams. This paper gives researchers some basic guidelines in preparing dam surveys, to allow more effective surveys to be conducted, whether surveying simply for otter presence, for regular monitoring or for improving the collecting of fresh spraints for molecular spraint analysis.

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## **RESUME**

### **EVALUATION DE LA PRESENCE DE LA LOUTRE SUR LES BARRAGES: PROPOSITION D'UNE METHODOLOGIE**

L'enquête standardisée de répartition de la Loutre d'Europe proposée par le Groupe spécialisé des loutres de l'IUCN permet la comparaison des données de présence/absence de l'espèce entre différents pays ou régions. Toutefois, la présence et la distribution de la Loutre sur des aires arides telle la région méditerranéenne qui est caractérisée par des saisons très marquées, des variations hydrométriques importantes associées à différents habitats ou systèmes comme des barrages, devrait bénéficier de légers ajustements de méthodologie. Dans ces régions, les pressions pour la construction de barrages persistent et les besoins d'études sur les associations écologiques ou la protection d'espèces augmentent. Les barrages sont bien différents des habitats rivulaires habituellement fréquentés par la Loutre c'est pourquoi nous devons comprendre leur influence sur les populations. La localisation des barrages, les caractéristiques du réservoir et les saisons influencent la recherche des épreintes. En règle générale, les études d'impacts environnementales et les études écologiques sont limitées par le temps et les budgets c'est pourquoi il est indispensable de trouver des méthodes plus efficaces. A partir d'expériences conduites au Portugal, nous proposons des ajustements à la méthodologie de suivi standardisé (utilisant les épreintes) afin d'évaluer la présence de la Loutre sur les barrages dans des écosystèmes purement méditerranéens. Nous avons finalement défini plusieurs critères notamment ceux en rapport avec la saison d'échantillonnage, les largeurs et longueurs de parcours, la quantité et localisation des sites échantillonnés. Cet article permettra aux chercheurs de mieux planifier leurs échantillonnages sur les barrages et ce à partir du suivi standardisé de l'IUCN à la fois dans le but d'évaluer la présence/absence de la Loutre ou simplement d'optimiser la collecte d'épreintes fraîches en vue d'analyses moléculaires.

## **RESUMEN**

### **EVALUACIÓN DE LA PRESENCIA DE LA NUTRIA EN EMBALSES: UNA PROPUESTA METODOLÓGICA**

La metodología estándar para el sondeo de nutria propuesta por el Grupo Especialista de Nutrias de la IUCN permite comparaciones de datos de presencia/ausencia en diferentes países o en diferentes regiones. Sin embargo, la metodología de evaluación de la presencia y distribución de la nutria en zonas secas, como la región Mediterránea que se caracteriza por un clima marcadamente estacional con intermitentes crecidas de agua y asociada con diferentes tipos de hábitats o sistemas como los embalses, puede ser ajustada. En estas regiones, la presión de la construcción de embalses sigue estando presente y, la necesidad de estudios en la protección de especies y las comunidades ecológicas está en aumento. Variaciones en la localización de los embalses, sus características y las estaciones influyen en la detectabilidad de los excrementos de nutria. Generalmente, los Estudios de Evaluación de Impacto Ambiental y la mayoría de los estudios ecológicos son económicos y de tiempo limitado, y necesitan de metodologías eficientes. Basado en nuestra experiencia en Portugal, proponemos ajustes de la metodología estándar de sondeo (uso de excrementos) para detectar la presencia de nutria en embalses, especialmente en ecosistemas de tipo Mediterráneo. Este trabajo permite mejorar la planificación de los muestreos de campo basada en la metodología estándar de sondeos de nutria en embalses, tanto para detectar la presencia/ausencia o para una mayor profundidad comparativa de estudios de presencia o para mejorar la recolección de excrementos frescos de nutria para su posterior análisis molecular.

## **WORKSHOP REPORT**

### **OTTER TRAINING WORKSHOP PHNOM PENH, CAMBODIA**

February 24<sup>th</sup> to March 3<sup>rd</sup>, 2009

International Otter Survival Fund (IOSF), Conservation International (CI) and IUCN Otter Specialist Group (OSG) jointly organized an 8-day International Workshop on Asian Otter Conservation in Phnom Penh, Cambodia from February 24 to March 03, 2009. The main objective of the workshop was to raise the interest and awareness about otters and their conservation in Cambodia and to train Cambodian University students in otter research. However, a few international students and researchers were also invited to share their experiences.

The workshop started on 24<sup>th</sup> February under the chairmanship of Mr. Ros Chor from Ministry of Environment, Government of Cambodia and after covering a number of indoor and outdoor training activities, ended successfully with a nice closing ceremony on 3<sup>rd</sup> March, 2009 with souvenirs, prizes and certificates distribution among the participants.

Fortyeight participants representing 11 different countries including Cambodia, Denmark, India, Indonesia, Malaysia, Pakistan, Sri Lanka, Thailand, UK, USA and Vietnam attended the workshop. Around 25 International students and otter researchers, 11 resource persons and 12 officials from different government departments from Cambodia participated. A pre-course evaluation test of the students, introductory lectures and presentations, question and answer sessions, students' presentations, visits to zoo and otter habitats like lakes, forests etc. and quiz competition among the students at the end of the workshop were the major activities of the workshop. A delegation of three conservationists from WWF Pakistan also shared with the participants the otter conservation activities in Pakistan through a presentation.

Resource persons included Dr. Nicole Duplaix and Ms. Clarisse Reiter (USA), Carol Benetto (UK), Dr. Syed Ainul Hussain and Dr. Rochi Badola (India), Dr. Padma de Silva and Dr. Mangala de Silva (Sri Lanka), Mr. Heng Sokrith, Mr. Peov Somanak and Ms. Annette Olsson (Cambodia) and Dr. Budsabong (Thailand).

The workshop was a unique opportunity for the students to learn about the otters especially the Asian otter species, meet and exchange the experiences with the experts, and have an idea of the latest advancements in the field. The participants of the workshop learnt about otter identification techniques, camera trapping techniques, captive breeding techniques for otters, food habits analysis, spraint analysis and otter habitat assessment techniques.

The role of Workshop Organizing Committee lead by Annette Olsson, Research Manager CI, Cambodia and the active support of IUCN OSG, CI and IOSF in the successful organization of the workshop were greatly appreciated. All the team members worked devotedly day and night to make this event successful. We congratulate the IUCN OSG, CI and IOSF on the successful organization of the workshop.

Waseem Ahmad Khan  
WWF Pakistan





## WORKSHOP REPORT

### INTERNATIONAL TRAINING WORKSHOP ON ASIAN OTTER RESEARCH AND CONSERVATION

February 24<sup>th</sup> to March 3<sup>rd</sup>, 2009

Carol Bennetto  
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#### A BIT OF BACKGROUND

It happened over a cup of coffee at the X<sup>th</sup> International Otter Colloquium in South Korea in 2007. Annette Olsen (Conservation International), Lesley Wright, Grace Yoxon (International Otter Survival Fund), and I commented on the presentations we had heard about the huge decline of otters in Asia and decided that to make the research worthwhile, we would have a go at doing something. So Furget-me-not was born, along with the concept of an otter workshop in Cambodia, if we could get the funding. Furget-me-not is a campaign of the IOSF and during the last year a lot of awareness and fundraising has taken place despite the poor economic climate. In Dec 2007 Dara, the world's only captive hairy-nosed otter, was rescued from his captors where he would have been doomed for the fur trade. He was sent to Phnom Tamao Wildlife Rescue Centre where a new pen had to be built, and which was paid for by the IOSF through fundraising mainly by Knowsley Safari Park. The Rescue Centre then lost its funding from Wild Aid as they pulled out of Cambodia, so as a result all the otters at the Centre needed feeding: 11 smooth-coated and 1 hairy-nosed otter. Wild Aid has recently returned, but Furget-me-not and IOSF continue to feed and support the otters here. Fundraising included 'Dara's day' at town centres and zoos, jumble sales, street events, and raffles: anywhere where we could raise awareness, and generate funds.

#### THE WORKSHOP HAPPENED

The workshop was organised and hosted by Annette Olssen and her colleagues from Conservation International, Cambodia Programme, and also funded by IOSF Furget-me-not, Asian Otter Trust, Rufford Maurice Laing Foundation, and Twycross Zoo UK. Also involved were the Cambodian Forestry Administration, Fisheries Administration, and Ministry of the Environment, who as partners on the ground, have taken a keen interest in otter conservation, and who are working with Conservation International both in-situ and ex-situ to protect otters in Cambodia.

The Cambodian Otter Conservation Project was initiated in 2006 as a partnership between Conservation International and the Forestry Administration. The project initially focussed on conducting surveys in Cambodia to learn more about the range and status of otter species. The project found a population of hairy-nosed otters on Tonle Sap Lake, and probably the world's largest population, so a lot of effort has gone on to protect the species here. Cambodia is a crucially important country for global conservation of otters. Three of Asia's species live in Cambodia: The Asian small-clawed otter, *Aonyx cinerea*, the smooth-coated otter, *Lutra perspicillata*, and the Hairy-nosed otter, *Lutra sumatrana*. All of these species are threatened throughout Asia by degradation of wetlands, depletion of food sources and hunting for the



wildlife trade. Otters are harvested in their thousands throughout the region because their fur gets a high price in the illegal wildlife trade.

The smooth-coated otter (Figure 2), is relatively abundant in Cambodia (although very rare worldwide and is classified by the IUCN as vulnerable with an urgent need for conservation action to prevent extinction). The hairy-nosed otter (Figure 1) is probably the world's rarest otter, and was believed to be extinct until a few isolated and highly threatened populations were recently found. A 2008 assessment of the status of this species has led them being listed as Endangered on the IUCN Red List. This species is still found in Cambodia. The small-clawed otter (Figure 3) has recently been up-listed to vulnerable on the Red List as it has been hunted extensively throughout Asia. This species is still found in Cambodia. The Eurasian otter (Figure 4, listed as lower risk as in Europe and northern Asia the populations are stable) however is under severe threat in the South East Asian part of its range.



Figure 1: Hairy-nosed otter



Figure 2: Smooth-coated otter



Figure 3: Asian small-clawed otter



Figure 4: Eurasian otter

The local understanding of the importance of the conservation of otters is very low in Cambodia. Despite the Forestry Administration listing 2 species on the rare list of nationally protected species, many decision makers and Protected Area managers are unaware of the global importance of Cambodia's otter populations. Compared to other 'high status' species, such as tigers and elephants, otters have received little attention. This is mainly due to a lack of funding, research and conservation actions focusing on these species.

The workshop was arranged to help improve the interest, awareness and for support for protection of otters in Cambodia, and to build much needed research capacity and knowledge in Cambodian university students and government staff, as well as international researchers (Figure 5).



Figure 5: All participants in the workshop

### The Objectives

The objectives of the workshop were to:

- Create a high-level awareness about otter conservation with relevant government departments and decision makers.
- Support and guide the decision-making process for future updates of the national Red List to ensure that otters are listed on the best available information.
- Select and train 10 University BSc and MSc students in otter research and conservation methods. This will be based on field methods and will enable the students to undertake much needed studies on otters in the wild in Cambodia. During the workshop the students developed research proposals; the 2 best were chosen and the students given a small research grant to carry out their work with support from the CI/FA otter team.
- Select and train 3 government appointed officers in otter research methods. This will ensure site based research, with government staff support, protected area management, and red list reviews. CI will support these staff in the future to conduct research, raise awareness of otter conservation at field sites, and to train rangers to improve otter protection.
- Invite and train international otter researchers from the region in otter research. This will ensure that key otter researchers throughout the region learn the best methods for otter focused research, and also help create a network of researchers throughout the region.

- Bring in otter experts from around the world to meet Cambodian researchers and discuss priorities and action steps for future otter research and conservation, both in Cambodia and throughout the region. These experts, most of whom are members of the IUCN Otter Specialist Group, also functioned as trainers and presenters for the workshop.

### **The Hairy-Nosed Otter**

In 2008, Wright et al published a paper on the status of the hairy-nosed otter summarizing all that we knew about hairy-nosed otters at the end of 2008. CI is currently developing extensive research and conservation at key sites at Tonle Sap Lake to undertake in-depth studies of the hairy-nosed otters here, and through training, awareness, and community based activities, to improve the conservation of otters and other wildlife. As a result of the workshop Cambodian students are conducting surveys at key sites to identify more sites with hairy-nosed otters.

### **AND NOW THE WORKSHOP**

The workshop lasted for 8 days and was action-packed.

#### **Day 1**

The first day focused on the global conservation status of otters, their threats, and specific issues and opportunities for otter conservation in Cambodia. Several key Government representatives were invited to help raise awareness and interest in otter conservation in Cambodia (Figure 6 - 8). Classroom based training of students by Cambodian and international otter experts followed. This was done by PowerPoint presentations, interactive role play - which really helped us to get to know each other - and discussions. There was a pre-course test for the students (and for us all just to check our knowledge!).



Figure 6: Workshop opening with Government officials      Figure 7: Workshop banner



Figure 8: Nicole Duplaix addressing the participants

## **Day 2**

Early start and off to Phnom Tamao Wildlife Rescue Centre (Figure 9) to meet the Director, Mr Ratanapich, and Nick Marx from Wild Aid, who lives on a shoe string but is a key player at the Centre, and who works tirelessly for the rescue of illegally kept animals.

We visit the otter enclosures, and some of the other rare, captive wildlife there, some of which will be released. There is a strong emphasis here on rehabilitation.



Figure 9: Phnom Tamao Rescue Centre

From there we travel to Koh Kong town, the biggest part of the road having been only tarmaced last year.

## **Day 3**

Classroom based activities today started with ecology and threats to Asian otters, tracks and signs, camera trapping, otter observations, project design and development

(research questions, methods, and site selection), spraint analysis, and finishing with the student presentations (Figures 10 and 11). In the evening the students became the tutors, and had much fun as we learnt Cambodian dancing.



Figure 10: Classroom discussion



Figure 11: Student presentation

#### **Day 4**

More class room based activities covering how to do an otter survey, and social surveys with role play practice. We covered how to use GPS, map reading, and field safety. Then after lunch off the field site, to the river Tatai Krom where we went down stream in small boats to interview an indigenous family (Figures 12 and 13) to do initial field observations, and to put into practice what had been learnt in the classroom (Figure 14). We were divided into small groups supervised by a trainer. We all recorded our data, and we presented the results to the group on the last day. We were practicing how to carry out a survey, record, analyze and present data.



Figure 12: The family home of the village elder



Figure 13: Talking to the village elder



*Figure 14: Nicole Duplaix teaching us GPS positioning*

**Day 5**

Back to the field but further downstream to practice camera trapping, smooth-coated otter tracks and signs practical, surveying and habitat assessment (Figures 15 – 21). A lot of hands-on experience today – well, feet in mud anyway! We were given lunch here, cooked by the local family, and we all ate in their house and dried off after we got totally soaked in the morning (Figure 22).



*Figure 15: Smooth-coated otter*



*Figure 16: Smooth-coated otter den*



*Figure 17: Smooth-coated otter scat*



*Figure 18: Walking through the boggy water to place the camera trap*



*Figure 19: Setting up the camera trap*



*Figure 20: Positioning the site*



*Figure 21: The storm arrives*



*Figure 22: We are given food and shelter with the family who live here*

**Day 6**

Scat analysis practical (Figure 23), student time on project development, and bus back to Phnom Penh



*Figure 23: Padma de Silva leading the scat analysis session*

### **Day 7**

Early start to Tonle Sap Lake where 2 hours later we board a boat to one of the communities living on boats in the flooded forest. The area is now protected and managed by CI and the Cambodian Fisheries Administration. It is great otter habitat here, and has small fishing communities living within the area. Annette has been doing a lot of conservation work here with the community, and with which CI has started collaboration for habitat and wildlife protection, including otters. Annette has been doing education work here with the school teacher and with the children in the school. There are 15 children in the school, and in groups of 3 they gave a presentation of the paintings they had drawn, each with a conservation message about their environment and the wildlife. (This is part of a large project CI has started here at this and other villages) It was hard to choose a winner! There were 3 judges, Padma, Hussein, and myself. See Figures 25 – 31. After lunch prepared by the community, we set off in small boats and at one site we found scats of hairy-nosed otters on a low branch of a tree, in the flooded forest habitat (Figure 24).



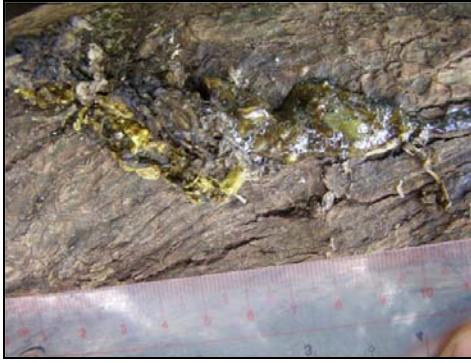


Figure 24: Hairy nosed otter scat



Figure 25: CI's research boat on Tonle Sap



Figure 26: The village



Figure 27: Typical village homes



Figure 28: Making fish paste



Figure 29: The school children go to school by boat



Figure 30: They give presentations ...



Figure 31: ... and get prizes



Figure 32: Fishing is their main livelihood



Figure 33: Pelt of a hairy-nosed otter found in nets in December 2008

### **Day 8**

Student presentations and projects, student tests, and otter Olympics. Presentation of certificates, and dinner in the evening with sad goodbyes.



Figure 34: Article in Phnom Penh Post

During the workshop the Cambodian students were given time to develop proposals for future studies in otter research and conservation. Of the final 6 proposals, 2 were selected. The 2 chosen were partly selected because the results will greatly contribute to the knowledge of otters in Cambodia which will be very useful for future planning of conservation efforts, and partly because these students showed great motivation and interest to work with otter research. One group of students will carry out a project with the title 'Food and habitats of smooth-coated and small-clawed otters at Kashep Stream, Veun Sia district, Ratanakiri province'. The other team will carry out a project titled 'Exploration of species and distribution of otters at Tropeang Rong Koh Kong Province'. These projects have now started, thanks to the support of CI, Forget-me-not and IOSF.

### **And a final note**

The workshop was a success in many ways. A large number of Cambodian University students were trained in otter research, were keen to learn and showed a lot of interest and gained a great experience. Annette believes we managed to create a group of future otter (and other wildlife) researchers in the academic world in Cambodia. By supporting these students in future otter focused work we will keep their interest and motivation. During the first half day, where government representatives were invited, we seem to have created better awareness of otter conservation and interest in the government, which is so important for the future otter-focused work in Cambodia. The government-run Phnom Tamao Wildlife and Rescue Centre holds the only hairy-nosed Otter in captivity in the world and is therefore crucially important for this species.

Nicole Duplaix, Annette, and I, met with the director of the centre and discussed opportunities for ex-situ conservation work for otters. This meeting was very positive and had great outcomes based on collaboration and knowledge sharing for keeping and breeding hairy nosed otters. After a request from government staff, the deputy chair of the IUCN Otter Specialist group, Nicole Duplaix, and Annette, met the Director of the Cambodian Forestry Administration, who is directly responsible for conservation of otters in Cambodia. The meeting went well and the director of the FA showed great support for otter conservation. One Cambodian language newspaper and one English newspaper covered the first morning of the workshop, with following articles in the newspapers and mention on national radio, which greatly helped to spread awareness about otters and their conservation importance to Cambodia.

Trainees from Indonesia, Vietnam, Malaysia, Thailand and Pakistan also joined the workshop. They were either students or researchers, with a special interest in otters. They all thought the course improved their skills enormously and were eager to return home to apply their knowledge to their own work.

Having people in the workshop from so many countries all interested in and learning about otters was such a great way of creating a strong network with collaboration across the whole region. This will greatly improve communication and collaboration and sharing of knowledge in the future.

Several of the trainers at the workshop, who are also members of the IUCN Otter Specialist Group, got the chance to meet, to catch up and discuss thoughts and ideas for conservation activities in the future. It was agreed that this kind of training was very useful and should be repeated in other Asian countries, when possible. It is a great way to get young people trained and motivated to carry out other otter related work and to enforce the networks and to share the experiences.

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## GLOSSARY

<b>CI</b>	Conservation International Website: <a href="http://www.conservation.org/Pages/default.aspx">http://www.conservation.org/Pages/default.aspx</a>
<b>CI/FA Otter Team</b>	Conservation International / Cambodian Forestry Administration Otter Team (partnership project) Website for Forestry Administration: <a href="http://www.forestry.gov.kh/AboutFA/VisionMision_Eng.html">http://www.forestry.gov.kh/AboutFA/VisionMision_Eng.html</a> Website for Fisheries Administration <a href="http://www.maff.gov.kh/eng/depts/fia.html">http://www.maff.gov.kh/eng/depts/fia.html</a>
<b>Phnom Tamau Wildlife Rescue Centre</b>	Link to an article about Dara the hairy-nosed otter at Phnom Tamau Wildlife Rescue Centre <a href="http://wildlifealliance.org/news/in-the-news/otter-gets-new-digs-at-phnom.html">http://wildlifealliance.org/news/in-the-news/otter-gets-new-digs-at-phnom.html</a>
<b>Furget-me-not</b>	Website: <a href="http://www.furgetmenot.org.uk/">http://www.furgetmenot.org.uk/</a>
<b>IOSF</b>	International Otter Survival Fund Website: <a href="http://www.otter.org/">http://www.otter.org/</a>
<b>IUCN</b>	International Union for Conservation of Nature Website: <a href="http://www.iucn.org/">http://www.iucn.org/</a>
<b>IUCN Otter Specialist Group</b>	Website: <a href="http://www.otterspecialistgroup.org/">http://www.otterspecialistgroup.org/</a>
<b>IUCN Red List</b>	The goals of the IUCN Red List are to: <ul style="list-style-type: none"> <li>• Identify and document those species most in need of conservation attention if global extinction rates are to be reduced; and</li> <li>• Provide a global index of the state of change of biodiversity</li> </ul> Website: <a href="http://www.iucnredlist.org/">http://www.iucnredlist.org/</a>
<b>Rufford Maurice Laing Foundation</b>	Website: <a href="http://www.rufford.org/">http://www.rufford.org/</a>
<b>Wild Aid</b>	Website: <a href="http://www.wildaid.org/">http://www.wildaid.org/</a>

## CONGRESS ANNOUNCEMENT

### POST MORTEM TOOLS FOR OTTER: MONITORING AND RESEARCH – WORKSHOP

24–27 February 2010  
Rønne, Denmark

Dear Colleagues

Post mortem procedures have been presented and discussed at several otter conferences and workshops. At the European Otter workshop in Slovenia last autumn it was suggested to arrange a workshop on post mortems to standardize the procedures.

Anna Roos from Natural History Museum in Sweden and I now have the pleasure to invite you to a workshop on otter post mortem procedures from 24-27 February 2010 in Rønne, Denmark. The workshop will be held at National Environmental Research Institute (NERI) and Danish Hunters Association's Game Management School.

- Program (PDF 366 KB) - includes venue information
- Registration - download the registration form, fill it in and email to [elm@dmu.dk](mailto:elm@dmu.dk) or [anna.roos@nrm.se](mailto:anna.roos@nrm.se)

Morten Elmeros and Anna Roos

## LITERATURE

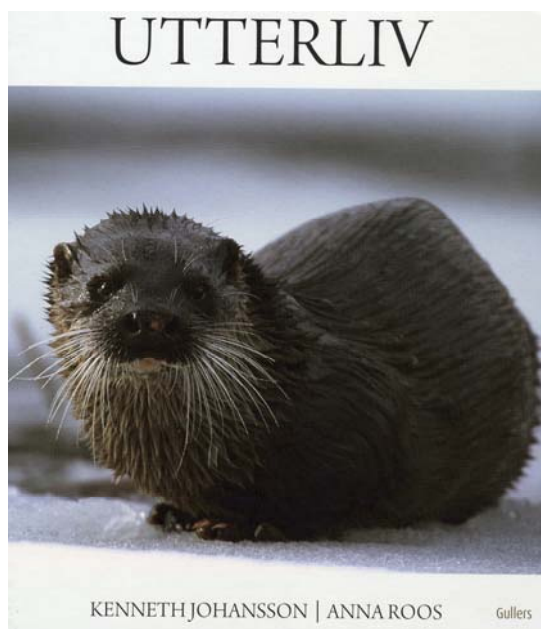
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## NEW BOOKS

### UTTERLIV

Kenneth Johansson, Anna Roos



Kenneth Johansson is a well recognized Swedish nature photographer with over 40 years of experience and Anna Roos is best known to most of us as an excellent otter specialist and as the Swedish National Representative of IUCN/SSC OSG.

They have published a remarkable book about the Eurasian otter in Sweden. While the book is very easy to read for the general public, but still all major threats and many biological facts about otters and other species living in the same environment in Sweden are described in a sound scientific way. The book describes biological facts divided in chapters such as otter, mink and beaver, causes for decline, signs of otters but also some facts about other otter species outside of Europe.

Most remarkably and different from most other books are the descriptions of many encounters with otters in a lively and personal language that makes one really experiencing the setting in which the meeting with an otter occurred. The lines breath the love of nature and especially of otters and the photos, many of them arranged as “film-strips”, sequences of several pictures showing a certain movement, are very unique.

The book is in Swedish and while this will not cause a problem to anybody speaking a Scandinavian language, the book is definitely still worth looking through for anyone even if it is just for the photos.

Hardcover: 144 pages (full color)

Publisher: Votum Förlag [www.votumforlag.se](http://www.votumforlag.se)

ISBN: 978-91-88238-99-3

## OSG Group Members News

### News Items Involving OSG Members

- Pathological findings in 66 wild European otters (*Lutra lutra*) in Scotland: 2007-2008 - Grace and Paul Yoxon and Jim Conroy collaborated with Adrian Philbey, Dominic McCafferty and Glen Tyler on a presentation made by Adrian at the 63rd Annual Meeting of the Association of Veterinary Teaching and Research Work, Scarborough, England, 6-8 April 2009. (PDF 2 MB)
- Renaissance of the Italian otter - Anna Loy and Andreas Kranz are interviewed by Stephanie Sears in this popular article from Wildlife Extra
- Guyana expedition finds biodiversity trove in area slated for oil and gas development - Rob Pickles is interviewed by Jeremy Hance in this popular and well-illustrated article from MongaBay.com, one of the top 15 environmental websites according to Time magazine.
- TRAFFIC, 09/12/09: Otters feel the heat in South East Asia - Otters and some species of wild cats are at serious risk in Southeast Asia, according to a recent meeting of small carnivore experts in Bangkok, reported by Chris Shephard, Acting Director for TRAFFIC Southeast Asia (in Malaysia).
- Motorists warned as conservation group reports high number of otter deaths - Jim Conroy reports on the decline of the otter population in Shetland
- TRAFFIC, 11/12/09: TRAFFIC helps board up major wildlife market - Chris Shepherd reports on billboard campaign at Bangkok's Chatuchak market, warning buyers not to buy illegal wildlife

### New Members of OSG

Thus far this year, we have welcomed 15 new members to the OSG: you can read more about them on the [Members-Only pages](#).

**Masood Arshad, Pakistan:** I am Programme manager for the Pakistan Wetlands Programme, organising the conservation of Wetlands Dependent Biodiversity especially the endemic Indus Dolphin, highly traded softshelled turtles, severely hunted populations of crocodile, Hog Deer and the ruthlessly killed species of otters. Pakistan is lucky to host two species of otters (Eurasian Otter and the Smooth Coated Otter). Both species are facing risk and are threatened. We have initiated efforts to conserve both the species and have worked in 2007 and also in 2008 on this programme.

**Lyca Sandra G. Castro, Phillippines:** My team and I are working on surveying for Asian small-clawed otters on Palewan, Phillippines

**Gareth DaBell, United Kingdom:** I work with two female Asian Small-Clawed Otters at the Lakes Aquarium. I am particularly interested in the role of training in otter welfare, specifically using training to overcome behavioural problems. I also plan to privately establish an otter boarding facility for zoo otters that need a temporary home whilst a permanent home is being found for them; I can also offer behavioural assessment and modification for these animals.

**Ruth Davidson, Indonesia:** I am hand-raising an orphaned Asian Small-Clawed Otter cub in Jakarta. I am actively involved with informal community education about the otters in our area, and am looking into possibilities for otter rehabilitation here

**Morten Elmeros, Denmark:** I work on applied research and management of mammals, focusing on carnivore population dynamics and spatial ecology, and monitoring of carnivores and bats, landscape ecology including fragmentation and fauna passages, environmental impact assessment, management plans, environmental capacity building and ecotoxicological risk assessment.

**Allison Ford, USA:** I am the new Executive Director of the Otter Project, looking after Sea Otters in California

**Charlie Hamilton James, United Kingdom:** A professional wildlife cameraman and photographer, I have spent many years filming otters, as well as having practical experience of rearing otters for



rehabilitation/release. I am currently working on underwater camera trapping of otters. I am keen not only to learn more about otters but hopefully be of some use to other people studying otters.

**Waseem Ahmad Khan, Pakistan:** By membership of this group, I hope to fully utilize my expertise for natural resources management, specifically biodiversity conservation, environmental sustainability, Natural history museology, scientific research, and project planning & management for a better environment in the country.

**Reinhard Klenke, Germany:** I work on Sustainable Development of Forest Landscapes in the Northeastern Lowlands of Germany. I am also active in analysis and modelling of habitat suitability of selected species of birds and mammals, behavioural ecology, Population ecology, Landscape ecology, Evolutionary biology, Applied computer science (Ecological modelling, Databases). I am interested in Island biogeography, Metapopulation theory and Evolutionary epistemology

**Rachel Kuhn, France:** I have worked on otters for many years, in France and then in Germany at the Otter-Zentrum. My PhD is on the Comparative analysis of structural and functional hair coat characteristics, including heat loss regulation, in the Lutrinae (Carnivora: Mustelidae). I currently work for the French Mammal Society (SFEPM) on the editing of the National Action Plan for Otters.

**Ivan Rubiano, Colombia:** I am a veterinarian with extensive experience in the rearing and rehabilitating of orphaned Giant Otter cubs. I am an advisor to the OSG Captive Otter Taskforce

**Katrin Ruff, Germany:** I did my PhD on Nutrition and energetics of otters, and am now working for OtterFranken, establishing a habitat corridor connecting the Czech Republic through Upper Franconia in Germany to Luxembourg and Belgium to connect the eastern and western European otter populations. I am nutrition advisor to the OSG Captive Otter Taskforce

**Steven Schaefer, USA:** Since I was a child I have been interested in otters. I graduated from Columbia University majoring in Biology and did my course work for a degree in wildlife biology at University of Vermont. While there I did a paper on otter populations by comparing trapping records and interviewing trappers. I have recently retired from a career as a lawyer and want to get back into the Biology. I helped start a 501c (non-profit) corporation that does mostly Manatee work. I serve on the board and do a lot of volunteer work capturing, tagging and monitoring of manatees. The name of the group is sea@shore Alliance and the web site is sea2shore.org. At this point I would like to try to do a population study on the otters in this area.

**Graham Scholey:** I have been working actively in otter conservation for 22 years. I am currently Conservation Team Leader for the Environment Agency in West Area, Thames Region, where I have worked in the Conservation department since 1991. I am responsible for ensuring the safeguard and enhancement of ecological assets and habitat integrity related to the water environment with respect to the operational (eg river maintenance), regulatory and advisory work of the Agency, which is Europe's largest government environmental regulator. Since 2001 I have chaired the UK Otter Biodiversity Action Plan (BAP) Steering Group, have led on UK BAP reporting for the otter, and am closely involved in a number of related issues such as policy and funding for otter post-mortem and tissue analysis, roadkill prevention, surveillance and monitoring, conflicts with fisheries interests (now a growing area of controversy), accidental mortality in fish traps, various research studies and proposals, rehabilitation of injured otters, etc. I currently have an executive role in overseeing the fifth national otter surveys of England and Wales and secured the funding for the former.

**Chris Shepherd, Malaysia:** I have been working for TRAFFIC in Southeast Asia for many years and have been recording evidence and observations on Smooth-coated and Small-clawed Otters mainly in Malaysia. The trade in otters in Asia is a field I am having a close look at. This is becoming a huge problem, with shipments of thousands at a time becoming a regular issue, mostly coming from Myanmar, India and Bangladesh.

**Roberta Silva, Brazil:** Otters are very special for me. Since 2003, I have been working with both otter species that occur in Brazil (the giant and the neotropical otter), and I could see how interesting these animals are and how little we know about them. Many studies still must be done with these species to learn more about their biology and ecology in order to make the right decisions about their conservation. In 2010 I intend to travel and study in South Africa and work with conservation of other otter species with the aim of coming back to Brazil and apply the knowledge acquired there for the conservations of Brazilian otters.

**Aleš Toman, Czech Republic:** I am the OSG Captive Otter Taskforce veterinary advisor.

**Tran Quang Phuong, Vietnam:** For the last ten years, I have been working in practical conservation in Vietnam. I currently manage a species conservation program focusing on carnivores and pangolins, and am organising a survey for *L. sumatrana* in the U Minh wetlands.

**Daniel Willcox, Vietnam:** I am currently working as the field research advisor for the Carnivore and Pangolin Conservation Program (CPCP) in Vietnam, designing fieldwork studies on priority species of carnivore and pangolin throughout Vietnam, and training local conservation officers.

**James Williams, United Kingdom:** Chairman of the Somerset Otter Group, James has been an active otter surveyor for many years. He has been keeping records on otter populations in Somerset and East Devon since 1967, written a book, "The Otter Among Us", and is co-author on several recent papers. He is Rob Williams' father (see below).

**Rob Williams, Peru:** I am the Director of Frankfurt Zoological Society's Andes-Amazon Conservation Programme and have been in charge of the Giant Otter project in Peru since 2006. He is the son of James Williams (above).