NOTE FROM THE EDITOR

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Another year has passed and meanwhile I can say that I write once again an editorial note for the online version of the IUCN OSG Bulletin. Actually this is the 3rd issue going online and from the reactions I get it seems that practically everybody is satisfied with the change. Those that print the pdfs will not even see any difference as we had decided to keep to exactly the old layout in order to make the Bulletin recognisable.

Lesley did not only do a tremendous job to get new articles online once final version came back from the authors but proceeded to upload the old issues and the gap of missing issues is closing down. Lesley came up with the idea to have an OSG Member News section. This will be both in the Bulletin and on website and will be linked to each other.

Thanks to those who sent us manuscripts and those that took the task to review the manuscripts and especially assist with the editing of the English! We appreciate also that many of you send us the references and that we link on the webpage whenever possible improving the usefulness of the website. Thanks a lot to Rachel Kuhn, Nicole Duplaix and Daniel Scognamillo for translating the abstracts into French and Spanish.

Looking back to 2007 I think I can speak from the heart of everybody who was in Korea on the Xth International Otter Colloquium that this was an “once-in-a-lifetime event. Thanks a lot to the organisers for the tremendous job they did and for the hospitality that we could experience in the nice area of HwaCheon. Everybody is invited to send pictures to Lesley as we put at least some of them on the website. The conference gave us all lots of good spirits for new otter work.

The spirits were even that good that we started to upload the abstracts from the VIIIth International Otter Colloquium in Valdivia as a special issue 18A on the website. The delay happened due to a serious computer crash in Chile. Those of you who still have any abstracts available please send them to me so that we can add them consecutively. The Proceedings from the IXth International Otter Colloquium in Frostburg are in a final round and are expected to be uploaded as special issue 21A sometime in spring 2008 hopefully not later than March.

With regards,

Arno

There was an additional delay in the printing of the Proceedings of the conference held on Skye in 2003 but they should be printed soon and copies may be ordered from Grace. Please contact her for details (Grace M. Yoxon, E-mail: iosf2@aol.com, www.otter.org).

W O R D S IN M E M O R I U M

Dear Otter-friends and friends of Claus,

This was the first International Otter Colloquium since 1979 that took place without Claus. You know that he organized the very first International Otter Colloquium in Göttingen and that was the real beginning of everything! Since that, he and sometimes I, participated in all International Otter Colloquiums.

We were like a big family and even the language difficulties with Claus` "Teutonic" English have neither been an obstacle to discuss the otter problematic nor to spend a happy evening together.

We hope that the 10th Otter Colloquium was successful – and I have no doubt that our Korean friends will make it to that – and we hope, that you thought of Claus for a short while hopefully drank a bear to him in the evening. He would have liked this.

We would like to say thank you for all the letters, mails and flower we got. It is hard to live without Claus.

We think of him a lot and will never forget him.

With best thoughts and kind regards

Biggi and family

Liebe Otterfreunde und Freunde von Claus!

Das war das 1. Otter-Kolloquium seit 1979, dass ohne Claus stattfand. Ihr wisst, dass er das 1. Otter-Kolloquium in Göttingen organisiert hat und das war der Beginn von allem!

Seitdem waren er und teilweise auch ich bei allen Kolloquien dabei. Es war wie eine große Familie und selbst die Sprachschwierigkeiten mit Claus` „teutonischem" Englisch waren nie ein Hindernis sich über die Otter-Problematik auszutauschen und erst recht nicht, die Abende gemütlich miteinander zu verbringen.
Wir hoffen, dass das 10. Otter-Kolloquium ein Erfolg war und da habe ich bei unseren Koreanischen Freunden keine Zweifel - und hoffen, dass ihr mal kurz an Claus dachtet und vielleicht am Abend ein Bier auf ihn getrunken habt.
Er hätte sich sehr gefreut.

Wir möchten uns auch noch für die Briefe, Mails und Blumen bedanken, die uns erreicht haben. Es ist schwer ohne Claus.
Wir denken viel an ihn und werden ihn nie vergessen.

Mit den besten Gedanken und Grüßen

Biggi und Familie

I U C N / S S C O S G G R O U P

OSG NEWS

News Items Involving OSG Members

- Otters offer insights into pollution - Michael Bellanger and Catrin Wittnich, two of our new Canadian members from 2007, with a press release also mentioning OSG. Jan 15th 2008

OSG Events

- February 2008: Jim Conroy attended the IUCN/SSC Chairmens' Meeting in Dubai
- March 2008: OSG Members at "Development of water bodies and habitat corridors for and with the
  indicator species otter (Lutra lutra)" in Bayern, Bavaria. Report from Andreas Kranz
- European Otter Workshop 2008 in Slovenia

New Members of OSG

Thus far this year, we have welcomed 17 new members to the OSG: you can read more about them in the Members-Only pages.

Jyoti Bhandari, Nepal

Laura Bonesi, Italy

Christian Buchli, Switzerland

John Cambell, UK

Romina Fusillo, Italy

Dilian Georgiev, Bulgaria

Sokrith Heng, Cambodia

Gandhiv Kafle, Nepa

Eleanor Kean, United Kingdo

George Kolias, USA

Jozsef Lanski, Hungary

Manlio Marcelli, Italy

Nhuan Van Nguyen, Vietnam

Nuna Pedroso

Teresa Sales-Luís, Portugal

Scott Roberton, Vietnam

Maria Schmalz, East Germany

Jon Watt, Scotland

Jean-Marc Weber, Switzerland

BECOMING A MEMBER OF THE OSG

Many people have been wondering how membership of the OSG is decided, so the Membership Team have produced this short note.

As with all Specialist Groups of the World Conservation Union (IUCN), group members are appointed by, and at the discretion of, the Chairman of the OSG.

The Chairman has set up a small Membership Team to handle applications and proposals for membership and to conduct the initial assessment. This team consists of Lesley Wright, Arno Gutleb, Grace Yoxon and Nicole Duplaix. We then recommend new appointees to the Chairman. If he approves them, Lesley Wright, the Membership Secretary, issues the formal invitation to join the group, acting on the Chairman's behalf.

There are three levels of membership: full members, affiliate members and student members. Affiliate membership is an intermediate category, usually reserved for new applicants who may eventually become full members, depending on their level of experience with otters.
Any member of the OSG can propose others for membership. What we are looking for is people who demonstrate a long-term commitment to otter conservation, in the broadest sense – this means that we have a very wide range of members: researchers, environmentalists, ecologists, toxicologists, zoo staff, rehabilitators, vets, educators and many others. This produces an active forum with a wide range of views, but everyone should have as their primary focus the continued survival of otters.

When someone is proposed as a new member, or applies for membership, we need a resume of their otter-related work and interests, and of course a working email address. Please email this to Lesley (L.C.Wright@rl.ac.uk). If and when they are accepted as members, we will also need a short description of their interests to add to the Members-Only area of the website, so other members can find out what they do.

This is a good time to remind all current members that we would also like a short resume (about 100 words) summarising experience and interests from everyone, as this helps new members get oriented, and should be of interest to everyone.

The OSG Membership Team

A R T I C L E

A COMPARISON OF TWO DIFFERENT METHODS FOR ESTIMATING THE DIET OF THE NEOTROPICAL OTTER, *Lontra longicaudis,* WITH THE PROPOSAL OF A NEW INDEX FOR DIETARY STUDIES

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Abstract - We analyzed scats of the Neotropical otter (*Lontra longicaudis*) with two methods in order to compare any difference in results. The method “frequency of occurrence” is the most commonly used in dietary studies of the Neotropical otter and carnivores in general. The other method was “score-bulk estimate”. The results showed that the rank order of prey categories in the diet of the otter was similar for both methods, even though proportions of different prey in the diet varied considerably. We advocate that future otter diet studies should use an index that combines complementary methods like the ones used in this study, and propose such an index, the Rescaled Importance Index (RII). This index was intended to provide a single value expressing the importance of each dietary category, in order to allow easier comparisons between different studies.

Keywords: *Lontra longicaudis*, dietary analysis, methodology, frequency of occurrence, score-bulk

INTRODUCTION

Otter dietary studies are useful in determining how species deal with ecological changes in prey populations and habitat availability (Anoop and Hussain, 2005). Analysis of scats is still widely used for this purpose, despite some caveats. Kruuk (2006) cautioned that, with the scat analysis, one can only obtain a rough ranking of the importance of prey taxa in otter diet, but without accurate estimates of percentual composition of each prey category. Unfortunately, for the Neotropical otter (*L. longicaudis*) there are not many alternatives. Kruuk (2006) points out that the most reliable method to study otter diet is by direct observation. For *L. longicaudis*, however, the application of such a technique would be very difficult due to its nocturnal habits in most of its range, which could hinder not only the observation of animals but also the identification of their prey. A large proportion of all studies published until recently on this species is limited to its feeding habits, most of them merely listing prey taxa and frequency of occurrence (Waldemarin, 2004). The use of scats for studying *L. longicaudis* diet has the advantage that there is no need to sacrifice or to disturb the animals (Wise, 1980). It is also an easy method, since Neotropical otters defecate in conspicuous places (Waldemarin, 2004; Kasper et al., 2004), making it simple to collect an adequate sample size of feces.

Frequency of occurrence (FO) is the most commonly used method to assess diet from carnivore scats (Neale and Sacks, 2001), but it is known that it can provide biased results (Carss et al., 1998). Results may underestimate the importance of bigger prey, and overestimate smaller prey (Roser and Lavers, 1976). Besides, the occurrence of a single item and occurrences of several similar items will both have the same weight in the analysis (Carss, 1995; Neale and Sacks, 2001). Thus, frequently consumed prey can be underestimated, because even if fragments of several individuals are found together in a single fecal sample, they will still count as a single occurrence (Zabala and Zuberogoitia, 2003).

Captive trials, in which a diet of known composition (in species and weights) was given to minks, showed that frequency of occurrence did not provide a reliable estimate of the food ingested (Wise et al., 1981). In the literature, there are not many studies indicating statistical concerns, such as calculating confidence intervals for the categories of prey (Carss, 1995). Despite these limitations, the frequency of occurrence method is able to provide the estimates of seasonal and spatial variation in the diet of otters (Spinola and Vaughan, 1995; Soldateli and Blacher, 1996; Helder and Andrade, 1997; Pardini, 1998; Utreras et al., 1998; Quadros and Monteiro-Filho, 2001; Rheingantz, 2006; Waldemarin, 2004).

Another method to study diets, which has seldom been used for otters, is the score-bulk estimate (SBE) (Wise et. al., 1981). SBE is a relative volumetric method based on a scale of scores which are visually attributed to the quantity of each category in each sample.

SBE has the advantage of taking in account the amount of each food item which is present in each sample.

In general, the weight or volume of prey in scats gives a more reliable result, but frequency of occurrence can be accurate to rank the importance of prey categories (Wise et al., 1981; Carss and Parkinson, 1996; Anoop and Hussain, 2005). On the other hand, SBE can be more time-consuming than FO, and there is some degree of subjectivity involved in visually estimating the scores.

Our study aims to compare two different analytical methods, (1) FO and (2) SBE, to assess the diet of the Neotropical otter from fecal samples: the frequency of occurrence method and the score-bulk method (Wise et al., 1981). Rather than trying to point out which of them would be the best method, we intend to discuss the advantages and disadvantages in each of them, evaluating how much difference there is between their results. Additionally, we propose a new index combining both methods.

STUDY AREA AND METHODS

Otter scats were collected at Mambucaba River Basin, southeastern Brazil. At the laboratory, samples were washed in flowing water on a 1mm mesh sieve, and dried for 48 hours in an oven at 40 ^{o}C. After drying, non-digested food items (scales, bones and exoskeletal elements) were identified and placed in one of the following categories: insects, crustaceans, amphibians, reptiles, fish, birds or mammals. Unidentified items were included in the "others" category.

Subsequently, the items were analyzed using the two methods. With FO, the presence or absence of a certain category was recorded in each fecal sample, and the results were expressed as the percentage of samples which had that category in relation to the total number of samples, that is:

$$FO\ (\%) = \frac{100\ n}{N}$$

Where:
FO (%): Relative frequency of occurrence of a prey category
n: Number of samples with occurrence of a prey category
N: Total number of fecal samples analyzed

In the SBE method, a score, from 1 to 10, is visually attributed to the quantity of each category in each sample (total score for one scat is 10). Each score was multiplied by the dry weight of the sample, and these results (SBE) were summed for each sample which had a given category. Finally, estimates were expressed for each category as the percentage of SBE of that category in relation to the sum of SBEs of all categories, that is:

$$SBE\ (\%) = \frac{100\ SBE}{total\ SBE}$$

Where:

SBE (%): Relative percentage of the score-bulk of a prey category
SBE: "Score-bulk" of a prey category
total SBE: sum of the score-bulks of all categories

The correlation between the rank orders of prey categories (from the most to the least consumed), obtained by the two methods, was calculated by Spearman rank correlation, using the software Statistica 6.0 (Statsoft Inc., Tulsa, OK, USA).

RESULTS

We analyzed 73 scat samples. Fish was the item most consumed by otters, according to both methods. In terms of FO, we found fish in 90.4%, crustaceans in 57.5%, mammals in 16.4%, amphibians in 13.7%, non-identified material in 5.5% and reptiles in 1.4% of the samples. Using the SBE, the proportions were 60.9%, 29.3%, 3.5%, 2.9%, 2.7% and 1.0% respectively (Figure 1). The percentages are not comparable between methods, since for SBE the sum of percentages is always equal to 100%, while for FO it is more than 100%, as two or more taxonomic categories can occur in one fecal sample. Nevertheless, the rank order of categories, from the most to the least frequent, was identical for the two methods (Spearman rank correlation, $r_s=1$, $P<0.01$).

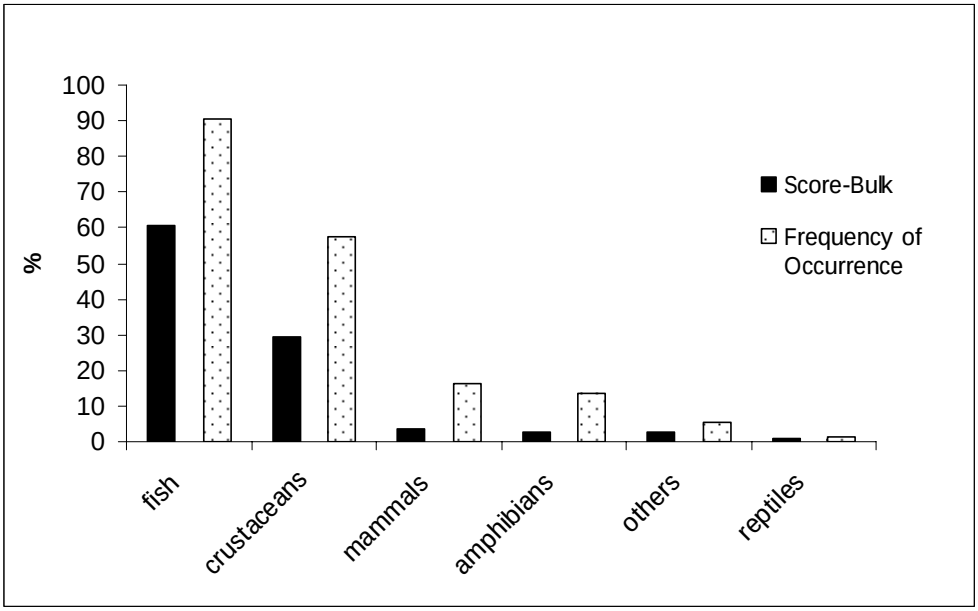

Figure 1. Proportion of items in the diet of otter obtained by SBE and FO analytical methods.

DISCUSSION

At least in the present work, the rank order of categories was identical for the two methods, but it can be seen that the differences between percentages were higher with the score-bulk method (Figure 1). In studies with other otter species, SBE gave a more

reliable result, showing with more accuracy the proportion of prey than the FO (Wise et al., 1981; Jacobsen and Hansen, 1996; Carss and Parkinson, 1996; Anoop and Hussain, 2005). However, the rank order of categories is usually the same for both methods (Wise et al., 1981; Jacobsen and Hansen, 1996; Anoop and Hussain, 2005).

A problem that may be found is that the different prey categories may have different degrees of digestibility (Putnam, 1984; Zabala and Zuberogoitia, 2003), so that quantity and volume of non-digested parts that are eliminated may vary, according to the kind of prey. For example, different prey categories are likely to present different surface area / volume relations, which may influence digestibility. Besides, animals which have rigid digestion–resistant exoskeletons, such as the crustaceans, could be overestimated. However, in this study, crustacean importance, as estimated by SBE, was not high, probably due to the many fish scales and bones found on the scats. The parts of fish eaten by Neotropical otter in this study had many big scales and bones, increasing the importance of the "fish" category on SBE. The advantage in using a method like the SBE is to establish a more realistic relationship between the smaller and bigger fragments of prey (Wise et al., 1981; Jacobsen and Hansen, 1996).

We conclude that the most viable recommendation for dietary studies would be an index combining two or more analytical methods, one volumetric, such as SBE, and the other frequency-based, such as FO. This could combine the information of how frequently a certain prey taxa is consumed with how much it is consumed, offering then a more overall view of the feeding habits. Therefore we suggest such an index, the Rescaled Importance Index (RII), as follows.

The importance (I) of each prey category, i, can be expressed, for each of n prey categories, as:

$$I_i = \frac{FO_i(\%)}{100} \times \frac{SBE_i(\%)}{100}$$

It is useful to rescale I_i by dividing it by the sum of I's for all prey categories; the result is the Rescaled Importance Index for each category (RII_i):

$$RII_i = \frac{I_i}{\sum_{i=1,\ldots,n} I}$$

In this way the result, RII_i now varies from 0 to 1. This index expresses the importance of each prey category in a single value, taking in account both its frequency and its volume. An useful property of RII is that:

$$\sum_{i=1,\ldots,n} RII = 1$$

This property allows that the RII_i can be meaningfully compared with the RII_i for that same category in other studies, carried out at different places or with different species.

Therefore we suggest this index can be useful for comparing diets in studies on otters and other species as well.

ACKNOWLEDGEMENTS - *We would like to thank "Hotel do Bosque" and "Associação Ecológica Ecomarapendi" for the logistic support, Helen Waldemarin and Erica Caramaschi for the supervising, CNPq for financial support, and all the colleagues of Laboratório de Ecologia e Conservação de Populações/UFRJ. Two anonymous reviewers provided constructive criticism that contributed to improve the quality and content of the paper.*

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RÉSUMÉ: **COMPARAISON DE DEUX MÉTHODES DIFFÉRENTES VISANT À ESTIMER LE RÉGIME ALIMENTAIRE DE LA LOUTRE À LONGUE QUEUE (*LONTRA LONGICAUDIS*) AVEC PROPOSITION D'UN NOUVEL INDEX POUR CE TYPE D'ÉTUDES**

Nous avons analysé les épreintes de la loutre à longue queue (*Lontra longicaudis*) en utilisant deux méthodes afin de comparer d'éventuelles différences dans les résultats. La méthode «frequency of occurrence» est la plus couramment utilisée lors des études du régime alimentaire de la loutre à longue queue et des carnivores en général. L'autre méthode était le «score-bulk estimate». Les resultants ont démontré que l'ordre des types de proies dans le régime alimentaire de la loutre était le même quelque soit la méthode utilisée, même si la proportion des différentes proies variait considérablement. Nous recommandons pour les etudes à venir, l'utilisation d'un index combinant des méthodes complémentaires telles que celles évoquées dans cette étude, et proposons un tel index: le "Rescaled Importance Index" (RII). Cet index a pour but de procurer une seule valeur exprimant l'importance de chaque type de régime alimentaire afin de faciliter la comparaison entre différentes études.

RESUMEN: **COMPARACIÓN DE DOS MÉTODOS DIFERENTES PARA ESTIMAR LA DIETA DE LA NUTRIA NEOTROPICAL DE RÍO, LONTRA LONGICAUDIS, Y LA PROPOSICIÓN DE UN NUEVO ÍNDICE PARA LOS ESTUDIOS DE DIETA.**

Analizamos feces de la nutria neotropical de río (Lontra longicaudis) con dos métodos para comparar resultados. El método de frecuencia de ocurrencia es el más usado en estudios de la dieta de nutria neotropical de río y de carnívoros en general. El otro método fue el de "score-bulk estimate". Los resultados mostraron que el rango del orden de las categorías de presa en la dieta de la nutria de río fue similar con ambos métodos, aunque las proporciones de diferentes presas en la dieta variaron considerablemente. Nosotros recomendamos que futuros estudios de la dieta de nutrias de río usen un índice que combine métodos complementarios como los usados en este estudio, para lo cual proponemos el Índice de Importancia Escalar. Este índice pretende obtener un valor único que exprese la importancia de cada categoría en la dieta, para así facilitar la comparación entre diferentes estudios.

A R T I C L E

RANGE EXTENSION AND A CASE FOR A PERSISTENT POPULATION OF RIVER OTTERS (*Lontra canadensis*) IN NEW MEXICO

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Abstract
Prior to 2004, some biologists claimed river otters (*Lontra canadensis*) were extirpated in New Mexico, USA. In November 2004, the first physical evidence of the river otter in New Mexico in over 50 years was found between Grassy and Albino Canyons on the Los Pinos branch of Navajo Reservoir in San Juan County. With the observation of river otters and their scats, tracks, and nesting site or den (nestled in a rocky escarpment and overtaken from beavers) in La Jara Canyon in the summer of 2007, the known range of this species in New Mexico is extended to a second county (Rio Arriba) and a second river (San Juan) in the state. We also provide evidence for a persistent population of the species occurring in multiple localities and dates in the early 21st century. With previous sightings occurring prior to translocations with other river otter subspecies, we raise the question if the recent river otter observations belong to those of the exotic translocated subspecies, the native *L. c. sonora*, or a hybrid between the two. Other commensal wetland and animals and plants living on or among rocks are listed. Management recommendations are provided to protect this population from non-target otter trapping focused on beaver removal.

Keywords: range extension, *Lontra canadensis*, *L. c. sonora*, beaver, Conibear 330 trap

INTRODUCTION

Ethnozoological data provide evidence that Ute, Navajo, and Jicarilla Apache people knew of river otters (*Lontra canadensis*) in their homelands in present-day southwestern U.S. using them for clothing, adornment, and ceremonial purposes prior to the advent of scientists (Polechla 2000, 2002a,b). In 1844, Lieutenant John C. Fremont and scout Christopher "Kit" Carson trapped and traded with the Utes of the upper Colorado River drainage collecting "18 packs" of beavers (*Castor canadensis*), otters, and pine martens (*Martes americana*) (Sabin, 1912).

Authors of previous writings about otters in New Mexico (Findley et al., 1975; Jones and Schmitt, 1997; New Mexico Friends of the Otter 2005-2007 http://www.amigosbravos.org/river_otter.php, BISON-M 2005 http://fwie.fw.vt.edu/states/nmex_main/species/050555.htm) declared that otters are extirpated from the entire state. Polechla et al. (2004) reported on finds of river otter scats, confirmed by DNA analysis, near Grassy and Albino Canyons of the Los Pinos River arm of Navajo Reservoir, San Juan County, New Mexico, USA. The Los Pinos

or “The Pines” River is a tributary of the San Juan River and a branch of the Colorado River drainage at large. Navajo Reservoir is the second largest artificial lake in New Mexico (the 5th largest state in the USA) with a capacity of over 1.85 billion cubic meters of water (http://www.usbr.gov/uc/wcao/water/rsvrs/ds/navajo.html). The upper reaches of the reservoir are in the state of Colorado.

The 2004 discovery (Polechla et al., 2004) constituted the 1st time in over 50 years that anyone had collected physical evidence of river otters in the state (McClellan, 1954; Findley et al., 1975; Polechla et al., 2004). No information had been published documenting otters at other localities in New Mexico and it was virtually unknown whether or not this constituted a transient otter or a member of a resident population. The purpose of this paper is to address the following questions. Does the river otter occur elsewhere in New Mexico? If so, how abundant are they?

MATERIALS AND METHODS

On 9 June 2007 at 0800 M.S.T., the second author was fishing in La Jara Canyon of the San Juan River branch of Navajo Reservoir, Rio Arriba County, New Mexico when he heard a commotion and observed an active dark-colored, wet animal on the bank about 15.2 m away. The long-necked animal periscoped out of the water as he noticed the two-toned face darker above and lighter below. It “wolfed” and “barked” repeatedly and swam to a range of 22.8 m. It had a long, tapering tail. Just as his daughter was readying a camera, the animal dove. They were certain the animal they saw was a river otter and they notified park officials who then notified the first author. The two authors arranged a rendezvous to search for physical evidence. We used Murie (1974) and Polechla (1987, 2001) as guides for tracking and trailing riparian mammals, Ivey (2000) for tree and shrub identification, and a Field Guide to the Birds of North America (National Geographic, 2002) as an aide in bird identification. A reconnaissance trip to that same locality by both authors on 7 July 2007 revealed bona fide sign of river otters beneath the shelter of overhanging rocks.

RESULTS

Evidence

Sign consisted of tracks (seals in British English) and scat (or spraint in British English) and was only 10 m from the last sighting of the river otter in the previous calendar month. This constitutes only the 2nd time physical evidence of river otters has been collected in the state. Preliminary examination of the nine or more scats of different ages (shown by different colors, including white, dark brown, and black) revealed both fish scales and bones and crayfish exoskeleton. The five-toed, 1-3-1 patterned tracks lead to a rocky sandstone crevice amongst sandstone boulders.

We found abundant sticks cut by beaver placed onto the base of the rocky nook created by the rocks. This crevice, about 2.44-3.05 m high, was about 25.4-30.5 vertical cm above the water and 1.52 m horizontally from the lake margin. It served as a beaver feeding/den site and then was subsequently used by one or more river otters. Local fishermen had seen a beaver swimming in the area the day before our visit.

We also found recent white gnawing grooves of beaver incisors on five Rio Grande cottonwood (*Populus deltoides wislizenii*) 2.5-6 cm in diameter and eight salt cedar

(*Tamarix ramosissima chinensis*) 1-2 cm in diameter. These shrubs were prevalent since the U.S. Bureau of Reclamation dammed the San Juan and Los Pinos Rivers and their tributaries in 1962, raising the water level to the cusp of the cliff face (elevation 1,854 m) overlooking the river canyon. One-seed juniper (*Juniperus monosperma*), cliff rose (*Purshia stansburiana*), and serviceberry (*Amelanchier creophila*), three typical shrubs of cliff faces, grew in the rocky outcropping undoubtedly established before the dam flooded the canyon.

We observed other animals in the vicinity. Exotic bluegill (*Lepomis macrochirus*) and crayfish (*Orconectes virilis*) were observed swimming amongst the jumble of rocks. Carp (*Cyprinus carpio*) and white crappie (*Poxomis annularis*) were seen or caught in the area. River otters prey on all these animal species (Melquist et al., 2003). Sign of mule deer (*Odocoileus hemionus*) and deer mice (*Peromyscus maniculatus*) were also observed. We also saw American robins (*Turdus migratorius*) and rock wrens (*Salpinctes obsoletus*) along the water/soil/rock interface. The margin of the reservoir was exceedingly difficult to traverse due to a combination of a jumble of various-sized boulders, thickets of dense shrubs, and the current water level, making access difficult for surveying.

We collected seven of the nine otter scats for later analysis. Two were left to encourage revisiting by otters. We cast the tracks with plaster-of-Paris and took photos of the habitat (Figure 1 and 2). Figure 3 is a map of the distribution of recent observations of otters in the San Juan River drainages in context with key past observations.

Figure 1. Site where a river otter (*Lontra canadensis*) den was found (to the left of the large boulder), La Jara Canyon, San Juan River branch, Navajo Reservoir, Rio Arriba County, New Mexico, on 7 July 2007. Note the light green Rio Grande cottonwood at waters edge and the dark green one-seed juniper higher in the rocky escarpment.

Figure 2. A closer view of the area where a river otter (*Lontra canadensis*) den was found in La Jara Canyon, San Juan River branch of Navajo Reservoir, Rio Arriba County, New Mexico on 7 July 2007. The den is located beneath the lower right hand corner of the large rock in the foreground. Note the dead snags in the water in the foreground caused by rising waters behind Navajo Dam, and the feather light green foliage of the tamarisk just above the water.

Distribution

Otters were observed on the San Juan, Piedra, and Los Pinos Rivers prior to translocation of otters of other subspecies into the waters inhabited by the southwestern river otter (*L. c. sonora*) from 1973 to 1975 on the upper Piedra River. In 2002, otter sign was found during an intensive walking survey extending a total of 178.2 km in length (i.e., 64 km on the Los Pinos, 56.3 km on the Piedra, and 57.9 km on the San Juan) at 29 different localities in the Piedra River and its tributary, Stollsteimer Creek (Polechla, 2002a). Polechla (2002b) also collected observations of otters by other people (Fig. 3, small solid stars) in the Piedra, San Juan, and Los Pinos Rivers. The senior author necropsied and prepared specimens (PJP 2966 and 2967) of salvaged river otters of both sexes (Fig. 3, open stars) from beaver control trappers via the Colorado Division of Wildlife. The specimens were derived from the upper Los Pinos River. The most recent sites (Polechla et al., 2004 and this study) (Fig. 3, solid circles) occur in the lower reaches of the Los Pinos River and now the San Juan River where the water backs upstream of Navajo Dam in New Mexico. These observations occurred at side canyons where smaller tributaries (Figure 3, dash and three dots) now join Navajo Reservoir. There are many intermittent tributaries flowing from the south into the San Juan River in New Mexico that only flow periodically after torrential thunderstorms. No otters or their sign have been observed in these tributaries to date.

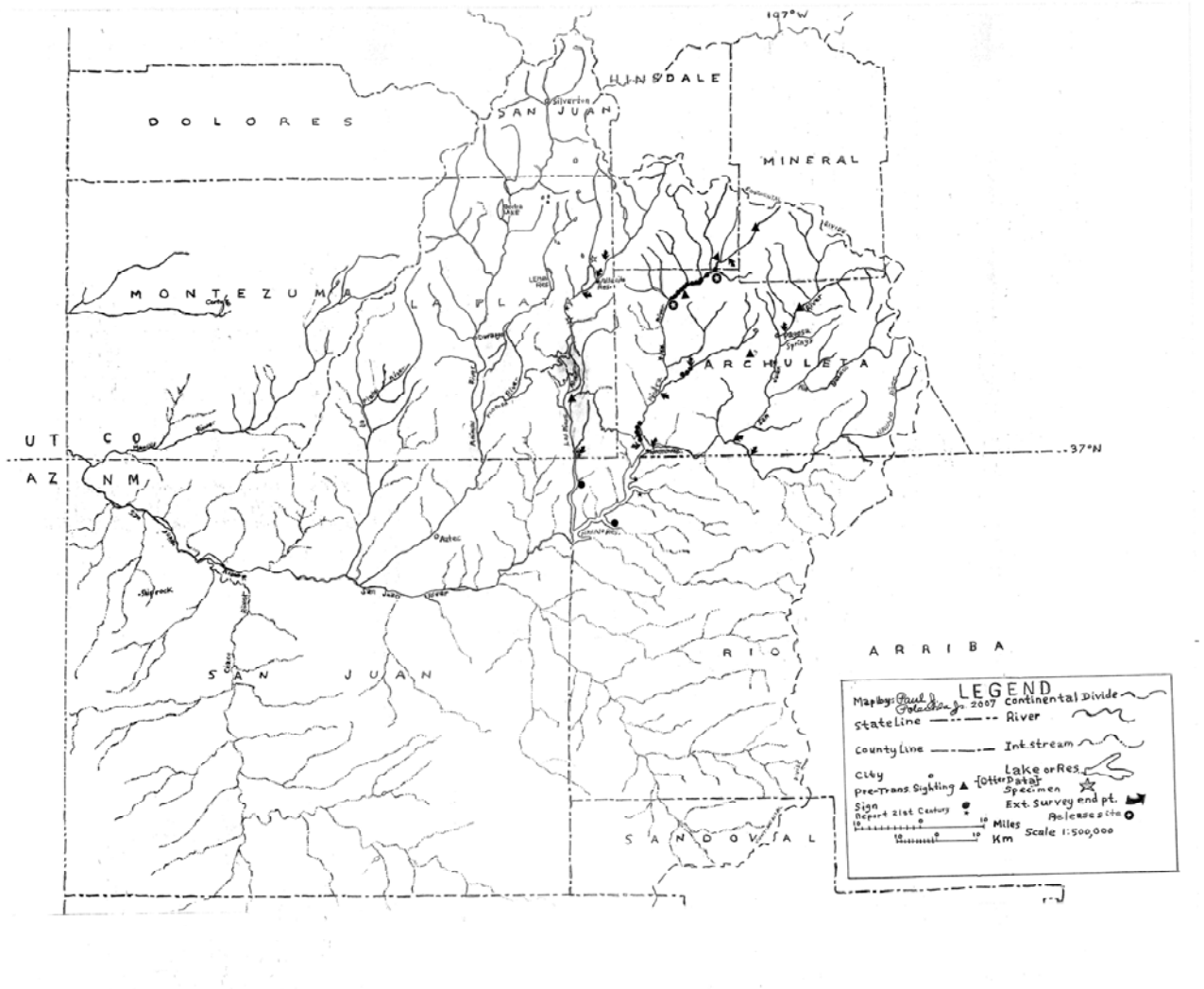

Figure 3. River otter (*Lontra canadensis*) localities of the San Juan drainage of the states of Colorado (CO) and New Mexico (NM), USA, at approximately 37° North Latitude and 107° West Longitude. County boundaries of this area are displayed. The corners of the states of Utah (UT) and Arizona (AZ) are also shown. Map from U.S. Geological Survey (1971, 1973, 1983) with river otter data from Polechla, 2002a, b; Polechla et al. 2004, and this study. Locations of pre-translocation (1973-75) river otter observation sites were positioned using the Colorado Division of Wildlife web site (http://wildlife.state.co.us/Hunting/GMUnitMaps.htm). The remainder is otter localities from the 21st century, signified by small solid stars. Observations of native river otters from 1973 to 1975 are signified by solid triangles. Open stars, inside a solid circle, represent release sites of exotic trans-located otters from 1979-1983. Survey point starts and stops (performed in 2002) are indicated with arrows. Large solid circles represent points where otter sign was located in the present study.

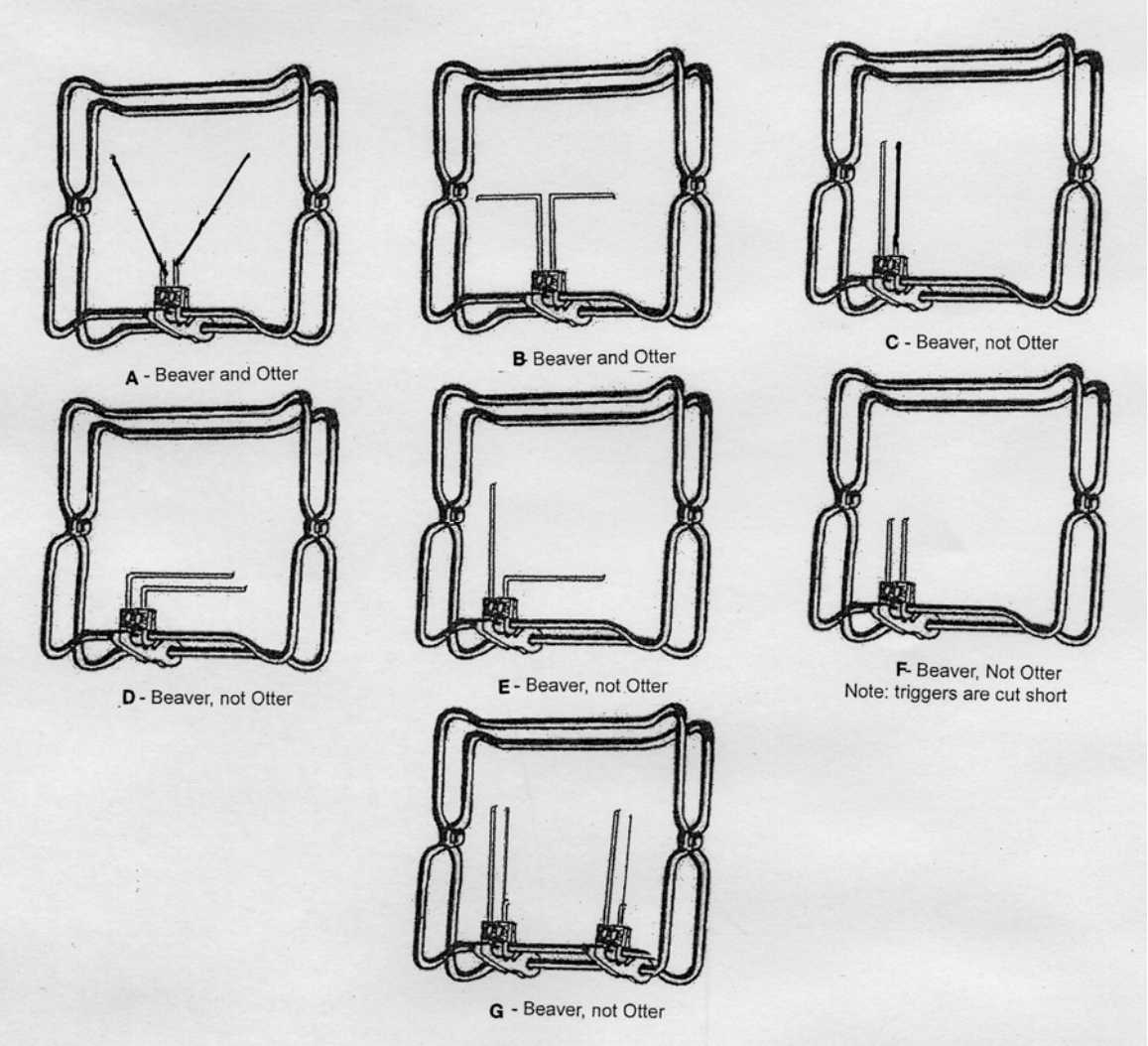

Figure 4. Modifications to a body-gripping Conibear 330 style trap to reduce chance of catching a river otter (*Lontra canadensis*) (From International Association of Fish and Wildlife Agencies 2005, http://www.in.gov/dnr/fishwild/publications/otter/raccoon.htm, and Utah Division of Wildlife Resources 2007-2008).

DISCUSSION

Apparently the river otter(s) had overtaken a beaver feeding /den site, consisting of a rocky c
revice or lair (holt in British English) modified with sticks. Along the entire escarpment of this large reservoir were innumerable crevices in the jumble of rocks along the escarpment, affording numerous potential den sites. Neither typical beaver bank dens nor stick lodges were observed in Navajo Reservoir from 2004 to 2007 although beaver sign was common. In apparent response to Navajo Reservoir's highly fluctuating water levels, gradually sloping or rocky banks, and lack of a well-defined riparian tree border; beavers modify cracks in rocks by piling sticks to create a makeshift den. Beavers are forced to be opportunistic in choice and modification of shelters and otters respond accordingly. In other parts of their range beaver, with their den and dam-building behavior, augment otter habitat (Polechla, 1987; Melquist et al., 2003). In the present case, beavers provided insulation and protection with their cut branches in the resting site/den that otters had used.

Different lines of evidence document that a persistent, widely distributed, and growing population of river otters exists in the San Juan drainages along the New Mexico/Colorado border. Observations from the present study and by other wildlife biologists, from the Bureau of Reclamation (personal communication, 5 May 2005), New Mexico Game and Fish (personal communication, 28-29 November 2007), and Colorado Division of Wildlife (CDOW) (Polechla 2002 from CDOW files), and fishermen (e.g., Dr. J. Daggett, personal communication, 2001 in Polechla et al., 2004) indicate there is a persistent, resident river otter population in the Los Pinos, Piedra, and San Juan Rivers (plus possibly adjacent rivers) of the New Mexico/Colorado border (Figure 3).

Our observations of different-age scats indicated multiple use of the same latrine site by one otter many times or more than one otter a few times. Regardless, these observations demonstrate persistence and site fidelity.

Visits to the area revealed seasonally abundant fish during spawning runs of carp and kokanee salmon (*Oncorhynchus nerka*) during spring, summer, and fall. Fishermen often clean the salmon they catch on rod and reel and discard the remains in the water. This common practice probably attracts otters.

Different and widely separated locations where otters have been documented in the bi-state area (Polechla, 2002a) indicate that otters are more widely distributed than previously known, and that the population is likely growing. A combination of DNA and scat samples of river otters from both sides of the New Mexico/Colorado state border (Polechla, 2002a; Polechla et al., 2004) and 2 museum specimens salvaged on the Colorado side of the drainage indicate a wide distribution in the San Juan, Los Pinos, and Piedra Rivers.

From 1973 to 1975, a combination of aquatic ecologists, a fisherman, and trappers made seven observations of river otters, their tracks, scats, and dens (Polechla 2002a from CDOW files), prior to translocating 16-24 otters (of different subspecies) from Wisconsin, Nova Scotia, and an unknown location during 1979-1983 (Polechla 2002a). These observations demonstrate that the native, southwestern river otter (*L. c. sonora*) (Van Zyll de Jong, 1972; Wilson and Reeder, 2005) were extant prior to translocation of other subspecies (e.g., *L. c. pacifica* and *L. c. canadensis*).

Observer fatigue may be a factor why otters have gone unreported for so long in New Mexico. For novice trackers, eager to find otter sign but not familiar with it, the likelihood of making a false positive (Type I error) is initially greater than a false negative (Type II error) (e.g., New Mexico Otter Working Group 2002). Accuracy changes with experience, however. For an experienced tracker familiar with otter sign, the likelihood of making a Type II error (error of omission) is greater than a Type I error. The error of omission is great on rugged, rocky terrain on the reservoir's (e.g., Navajo) shore, because scrambling and climbing across large boulders along an ever-changing waterline (Polechla, 2002a) is physically and mentally exhausting for the researchers. And, because an animal as large as the rare and endangered grizzly bear (*Ursus arctos horribilis*) was collected as late as 1979 on the Continental Divide separating the Navajo River of the San Juan River drainage (on the west side) and the Conejos River of the Rio Grande drainage (on the east side) (Murray 1987)

underscores that this bi-state area still has many wild, inaccessible reaches where humans can easily overlook the presence of a grizzly bear, much less the smaller otter.

Existing Management and Management Recommendations

Currently, the New Mexico Game and Fish Department (NMGFD) is conducting intensive beaver trapping, trapping 26 beavers in a 5.6-km stretch of the tail waters of Navajo dam (M. Wethington, pers. communication, 5 May 2005). This threatens the river otter population because trapping is being conducted with Conibear 330 traps, which are body-constricting traps, usually set under the water. This trap can kill non-target otters (Polechla 1987) within minutes. The NMGFD reported that some unidentified person(s) have already been suspected of killing otters in these tail waters (Anonymous, 2006). Beaver activities benefit other wetland wildlife populations (Melquist et al., 2003), most notably macro-invertebrates and trout (Huey and Wolfrum, 1956). In almost all cases, beaver presence should be encouraged. In areas where populations are high, several effective mitigation techniques can be used. In circumstances where beavers are cutting trees in high profile recreation areas, trees can be wrapped with wire mesh. Pond levelers can be installed where beaver dams flood roads. Where trapping beavers is necessary to reduce populations, we recommend, with appropriate permits, live-trapping (e.g., Hancock live traps) and relocating to other parts of the same drainage. Where beaver relocation areas are not available and body-gripping kill-type (e.g. Conibear 330) traps will be used, to reduce non-target otter catches, the trap should be modified (Fig. 4). Each trap comes from the factory with a single trigger in the middle of the trap with the trigger wires forming a “V” or “T” (Fig. 4a, b). First, triggers can be modified by: 1) moving the entire mechanism to the side (Fig. 4c), 2) bending the trigger wires so that they are; a) both parallel and up (Fig. 4c), b) both at right angles (Fig. 4d), or c) one wire up and one at a right angle (Fig. 4e), 3) cutting both trigger wires to 10.2-12.7 cm in length (Fig. 4f), or 4) adding another trigger mechanism and positioning them one on each side (Fig. 4g) (International Association of Fish and Wildlife Agencies, 2005, http://www.in.gov/dnr/fishwild/publications/otter/raccoon.htm, Utah Division of Wildlife Resources 2007-2008). Second, the trap tension can be adjusted by installing a new “special tensioning trigger” :

(http://www.in.gov/dnr/fishwild/publications/otter/raccoon.htm).

These modifications are supposed to work, because on average beavers are larger and less agile than otters and when they attempt to pass through the open trap, they are more likely to bump the trigger and close the trap than an otter.

Finally, other tributaries rivers within the Colorado River of New Mexico, Colorado, and neighboring states need to be surveyed.

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RESUME
ESSOR ET SITUATION D'UNE POPULATION STABLE DE LOUTRE DE RIVIÈRE (*Lontra canadensis*) AU NOUVEAU MEXIQUE

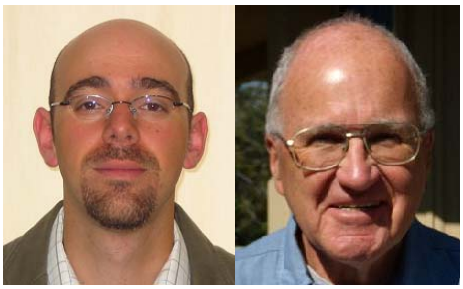
Avant 2004, certains biologistes prétendaient que les loutres de rivière (*Lontra canadensis*) avaient disparu du Nouveau Mexique. En novembre 2004, la première preuve de présence physique de la loutre de rivière a été trouvée entre les canyons de Grassy et Albino dans le bras de Los Pinos de la retenue Navajo située dans le département de San Juan.
Suite à l'observation de loutres de rivière, leur répartition, leur voie, leur abri ou catiche (située dans un escarpement rocheux et empruntée aux castors) dans le canyon de La Jara en été 2007, la connaissance de cette espèce au Nouveau Mexique s'est étendue à une deuxième région (Rio Arriba) et à un deuxième cours d'eau (San Juan) de l'Etat. Nous avons également remarqué la présence d'une population stable de loutre de rivière dans différentes localités en ce début du 21ième siècle. Suite à ces dernières observations antérieures à l'introduction d'autres sous espèces de loutres de rivière, nous nous sommes posé la question de savoir si ces observations récentes appartiennent à ces sous espèces exotiques introduites, à l'espèce indigène *L.c. sonora* ou à un hybride des 2. D'autres espèces commensales des milieux humides, animaux et plantes liés aux rochers ont été observés. Des recommandations en matière de gestion sont proposées afin de protéger cette population de loutre de toute capture accidentelle liée à l'élimination du castor.

RESUMEN
DESARROLLO Y SITUACIÓN DE UNA POBLACIÓN ESTABLE DE NUTRIA DE RÍO (*Lontra canadensis*) EN NUEVO MÉXICO

Antes del año 2004. algunos biólogos sostenían que la nutria de río (*Lontra canadensis*) estaba extirpada del estado de Nueva México, Estado Unidos. En noviembre del año 2004, la primera evidencia física en 50 años de la presencia de nutria de río en Nueva México fue encontrada entre los cañones Grassy y Albino en la rama Los Pinos de la reserve navaja en el condado San Juan. Con la observación de nutrias de río y sus excrementos, huellas, y madrigueras (en escarpados rocosos y usurpadas a castores) en el cañon La Jara durante el verano del año 2007, el rango conocido de esta especies en Nueva México se ha extendido a un segundo condado (Río Arriba) y un segundo río (San Juan). Además ofrecemos evidencias de la persistencia de una población de esta especie en multiples localidades y fechas del principio del siglo XXI. Con avistajes previos a la translocación de otra subespecies de nutria de río, nosotros questionamos si las recientes observaciones corresponden a la translocada exotica subespecie, a la subespecies nativa *L. c. sonora* , o a un híbrido entre las dos. Otros humedales, animals y plantas viviendo entre rocas son listados. Proveemos recomendaciones de manejo para proteger esta población del trampeo accidental durante la remoción de castores.

REPORT

AGONISTIC INTERACTIONS BETWEEN RIVER OTTERS AND BEAVERS: AN OBSERVATION AND REVIEW



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Abstract

We describe a rare observation of reciprocal aggression between two river otters (*Lontra canadensis*) and a beaver (*Castor canadensis*). Our observations and other literature accounts suggest that the relationship between these species may not be the commensal one suggested by some researchers. Because information on otter-beaver interactions in the literature is scarce and contradictory, we appeal for more information about behavioral interactions between the two species. Future research should aim to determine the frequency of these agonistic events and their overall cost to beaver survival and reproductive success, to determine if this relationship is really a commensal one or some integration of strong positive and negative effects.

Keywords: river otter, *Lontra canadensis*, Beaver, *Castor canadensis*, interspecific aggression, agonistic interactions

INTRODUCTION

The North American river otter (*Lontra canadensis*) is very difficult to observe in its natural environment. Because of this, behavioral information about specific topics such as aggressive behavior is scarce. Concerning events of intraspecific aggression, direct observations of river otters have been reported before, most notably during a long-term study of human-habituated coastal river otter groups on the north coast of California by J. Scott Shannon, who logged over 6000 otter hours of direct observations from 1986 to 1992 (Shannon, 1989, 1991, 1992, 1993). Liers (1951) also observed such events of aggression between river otters. Several accounts of this were reported for the giant otter (*Pteronura brasiliensis*), in South America (Weber Rosas and De Mattos, 2003; Ribas and Mourão, 2004; McTurk and Spelman, 2005). Direct observations (Erlinge, 1968) and indirect evidence (Simpson and Coxon, 2000; Simpson, 2000, 2006) of intraspecific aggression have also been reported for the Eurasian otter (*Lutra lutra*) in Europe. For these last two species, evidence of cannibalism has been reported (Simpson and Coxon, 2000; Mourão and Carvalho, 2001).

All these accounts show that aggression is a behavioral aspect of sociality in species of the Lutrinae, although the frequency with which otters in the wild take part in aggressive behavior is unknown and subject to debate (Simpson, 2006). Direct observations of aggressive interactions between otters and other animals are even scarcer. We have not found any observational account of this in the literature. In this

paper, we describe in detail an observation of agonistic interactions involving a beaver (*Castor canadensis*) and two river otters.

These two species are frequently associated together (e.g., Dubuc et al., 1990; Swimley et al., 1998). However, little is actually known about the nature of the relationship between them, apart from the well-documented river otter's use of habitats and structures created by beavers (Melquist and Hornocker, 1983; Rosell et al., 2005; Gallant, 2006). We discuss potential explanations for the observations we describe, in relation to the scarce and divergent behavioral information found in the literature for these two species. We also propose directions for future investigations aimed at elucidating this relationship.

ACCOUNT OF OBSERVATIONS

The observations we report were made by one of us (ALS) in August 1960. At the time, ALS had a career in other aspects of freshwater ecology and never appreciated the unusual character of the episode until discussions with DG. No written notes were made at the time but the event was memorable both for the interaction and because these were the first river otters seen by ALS. On that evening, three off-duty fishery biologists visited a large beaver pond in Fourmile Brook, Coos Co., New Hampshire (44°55'N, 71°11'W). This pond, although fairly remote, was approached by a logging road and received regular but light use by anglers fishing for brook trout (*Salvelinus fontinalis*).

Between 18:00 and 20:00 Eastern Daylight Time, the three of us gathered on a large beaver lodge built against the bank. While eating and talking quietly, we heard mewing sounds from inside the lodge which we attributed to a litter of kits. Soon after, we noticed a pair of otters approaching from across the pond. The otters stopped approximately 20 m away from the lodge, postured vertically in the water, and vocalized (barked) at us. After a minute, we heard a splash inside the lodge and a large beaver surfaced between the lodge and the otters. The beaver swam rapidly toward the otters but never made contact. The threatened otter would dive and swim away while the other otter remained in place until the beaver rushed it also. The otter first attacked would then posture, bark and draw the next attack. During four to five attacks, the beaver never got closer than approximately 1 m and the otters never attempted to bite the beaver. The otters then withdrew approximately 100 m across the pond where they remained visible.

The beaver then swam toward the lodge but did not enter. Instead, it began to swim steadily, not directly toward the otters but counter-clockwise along the shoreline. Only the top of its head was visible and its wake was minimal. After traversing at least 200 m of shoreline, the beaver approached the otters with the low evening sun behind it. At the same time, the human observers stood up to see better; this movement may have distracted the otters and contributed to the next events. When 10 to 15 m from the otters, the beaver accelerated dramatically. Tailbeat frequency increased and its back appeared above water. The beaver struck one otter, which "screamed" loudly. There was much splashing and, at one point, half the otter's body length was above water. The two animals disengaged. The trio then resumed the chase and escape behaviour we had seen near the lodge but with one difference. This time the non-target otter darted in, struck and, presumably, bit the beaver. The beaver broke off its attack and pursued the attacking otter, which evaded it easily. After three or four chases by the beaver and successful attacks by both otters, the beaver swam

directly to the lodge and entered it. The otters were visible for several minutes and then disappeared from our sight.

DISCUSSION

The presence of humans clearly influenced the intensity of the interactions we observed but probably not their direction or form. If the otters' curiosity about the three humans drew them closer to the lodge than they would have come otherwise, the first interaction was a consequence of our presence. We do not know how long the otters had been present in the pond. The otters, possibly after earlier interactions, might have avoided the vicinity of the lodge. In the second interaction bout, it is likely that the otters' attention was drawn to human movement on the lodge and the beaver would have been less successful in its attack without this distraction. However, the circuitous route and quiet swimming suggest a directed attack on the otters. The approach with the sun behind it probably was advantageous for the beaver but no foresight need be suggested; the route taken was simply the shortest shoreline distance between the lodge and the otters. In spite of the complicating role of observers, we suggest that beavers will defend not only the immediate neighborhood of a lodge containing young but larger areas possibly extending to entire ponds.

The fact that several studies have found beaver to be a small part of the river otter's diet (e.g., Greer, 1955; Reid, 1984; Reid et al., 1994a), suggests that river otters occasionally prey on beavers, possibly in response to instances of low availability of preferred prey such as fish. Young kits would be more vulnerable to otter predation than mature beavers and the aggressive stance adopted by the beaver in the event we described above could be linked to the kits that were in the lodge. In Manitoba, during winter, Green (1932) observed a changed, more prudent behavior of beavers at a pond that had been frequented by otters. Traditional knowledge gathered by Green (1932) asserts that otters can gang up on a lone adult beaver and kill it, and that otters would predate beaver kits opportunistically. Reid (1984) provided evidence suggesting that otters can occasionally displace beavers from their lodges in fall. This information, along with the direct observations of interspecific aggression we described above, is contrastingly different from those made by Melquist and Hornocker (1983) in Idaho. On three separate occasions, they observed beavers and otters in the same lodge simultaneously, without any discernable sign of agonism. In one of those instances, as many as four otters and three beavers were together in one large lodge. We therefore propose that availability of common prey items to river otters may determine their behavior toward beavers, while timing of parturition and rearing of young kits would determine the behavior of beavers toward otters. More information and focussed investigations are required to test these proposed hypotheses. Additionally, it remains to be proven that beaver hair found in otter scats (Greer, 1955; Reid, 1984; Reid et al., 1994*a*) more often result from predation and not scavenging.

Otters can purposefully create breaches in beaver dams in winter, possibly to create pockets of air between the ice and the water's surface, or to reduce water levels in ponds for easy predation on fish (Green, 1932; Reid, 1984; Reid et al., 1988). Dam-rifting has been recognised as an indirect source of stress that could be detrimental to beavers, because their survival in winter could be affected by low water levels that limit access to the food cache and by the entry of cold air under the ice, which would increase thermal stress (Reid, 1984). According to Reid (1984), loss of reproductive fitness from energetic stress (caused by dam-rifting) could be potentially caused by:

reduction of beavers' resistance to pathogens, reduction of body growth, increased predation risk from terrestrial predators, and resorption or abortion of foetuses. None of these potential effects have been documented to this date. If winter dam rifting by otters is found to be common and is proven to affect beaver survival and reproductive success by a considerable measure, the relationship between the species would be more akin to a parasitic one during winter at northern latitudes, while remaining a rather commensal one year-round in southern regions of North America, if a low frequency of direct aggressions by otters is assumed.

It is well known that the changes that beavers bring to freshwater ecosystems are beneficial to river otters, which often frequent ponds and use lodges and bank burrows created by beavers (e.g., Melquist and Hornocker, 1983; Reid et al., 1994*b*; Gallant, 2006). Noordhuis (2002) considered that the return of the river otter to Clarke County, Georgia (USA), was facilitated in part by the recovery of the beaver population in that area. Reid (1984) also suggested such a hypothesis for explaining an increase in the otter population of Alberta during the 1970's. LeBlanc et al. (2007) studied river otter usage of beaver ponds during summer, in the context of a commensal relationship in which the beavers and their ecosystem modifications influence river otter habitat use, without them being adversely affected by this semi-aquatic predator in any considerable way. However, for this relationship to be unambiguously viewed as a commensal one, as first proposed by Tumlison et al. (1982), future studies will need to determine the frequency of agonistic events between these species and the level of impact they have on beaver survival and reproductive success. The effects of dam-rifting on beaver fitness in temperate climates also needs to be assessed.

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RESUME

LES INTERACTIONS AGRESSIVES ENTRE LA LOUTRE DE RIVIÈRE ET LE CASTOR: UN RAPPORT D'OBSERVATION ET UNE REVUE DE LA LITTÉRATURE

Dans cette note, nous décrivons une observation rare d'interactions agressives entre deux loutres de rivière (*Lontra canadensis*) et un castor (*Castor canadensis*). Nos observations et d'autres informations dans la littérature suggèrent que la relation écologique entre ces deux espèces ne soit pas commensale, comme le suggèrent certains chercheurs. Puisque l'information sur les relations loutre-castor est rarissime et contradictoire dans la littérature, nous faisons appel pour plus d'informations à propos des interactions comportementales entre ces deux espèces afin de pouvoir déterminer la nature de la relation entre elles. Les recherches futures devraient viser à déterminer quelle est la fréquence de ces interactions agressives et quel est le coût encouru par le castor au niveau de la survie et du succès reproducteur, pour déterminer si la relation entre ces deux espèces peut toujours être considérée comme étant commensaliste ou si elle implique à la fois des effets positifs et négatifs considérables.

RESUMEN

INTERACCIONES AGONISTAS ENTRE NUTRIAS DE RÍO Y CASTORS: UNA OBSERVACIÓN Y REVISION.

Describimos una observación rara de agresión recíproca entre dos nutrias de río (*Lontra canadensis*) y un castor (*Castor canadensis*). Nuestras observaciones y otras referencias en la literature sugieren que la relación entre estas especies podría no ser comensal, como fuera sugerido por algunos investigadores. Dado que la información sobre interacciones nutria de río-castor en la literature son escasas y contradictorias, nosotros urgimos por más información sobre comportamiento durante interacciones entre estas dos especies. Investigaciones futuras deben ser dirigidas a determiner la frecuencia de estos eventos agonistas y su costo total para la supervivencia y éxito reproductivo de los castors, para determiner si esta relación es en verdad comensal o si existe alguna integración de efectos positivos y negativos.

REPORT

OTTERS (*Lutra lutra*) IN SWEDISH PREHISTORY – WITH NOTES ON BEHAVIOUR

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Abstract: Three thousand year old engravings (petroglyphs) probably of otters *Lutra lutra* were found in a Bronze Age burial site in Kivik, southern Sweden. The postures of the animals in the very prominent, stylised images, sitting upright, suggests that they represent captive otters, which had an important place in Scandinavian bronze age society.

Keywords: otter, Bronze Age, petroglyphs, behaviour

INTRODUCTION

Many civilizations have a pictorial record of their involvement with animals from times before they used written evidence. Also in the present day there are peoples using rock art or cave painting, such as Australian aborigines, East African Masai and until recently South African Bushmen. These records provide information on the relationship between people and some of their surrounding fauna.

Animals in such prehistoric art tend to be species that have economic significance, either as livestock, or as objects of hunting, or in some other role. Contemporary Masai art in East Africa depicts mostly cattle, but also wild animals such as lion, elephant, wildebeest, and giraffe, which, according to the artists themselves, have important roles in people's daily lives (Kruuk, 1965). Probably this was true also for European cave art in France and Spain, with wild animals in e.g. Lascaux, Altamira.

In more northern areas of Europe far fewer examples of prehistoric art have been found. This note concerns some clear stone-engravings, or petroglyphs, of animals in southern Sweden. Amongst those animals, striking, stylized figures that appear to be otters are prominent, suggesting that these animals had an important significance in northern Bronze Age society.

The only species of otter known to occur in northern Europe in the present era (Holocene) is *Lutra lutra*.

DESCRIPTION

The petroglyphs are situated in a large burial mound in the Swedish province of Skåne, outside the village of Kivik on the east coast along the Baltic Sea (55°41′N, 14°14′E). The mound, some 75m in diameter and 3.5m high, consists of small rocks, and is locally known as the King's Grave. It has been extensively restored after damage by locals extracting stones, in the 19th century, and is now in the charge of the Swedish National Heritage Board. The grave is from the Northern Bronze age, and has been dated as 3000 years old, from about 1000 BC (http://en.wikipedia.org/wiki/The_King's_Grave).

An entrance passage leads into a central chamber with a burial cist, some 1.2m long and 0.65m wide, which contained some teeth, and small fragments of bronze when excavated. The cist is lined with large stone slabs, with many petroglyphs on the inner surface facing the burial.

The engravings have been recently clarified by some colour-restoration (Fig. 1-2). Both show human figures, some with swords, and some with musical instruments, one horse-drawn chariot, a fish and a couple of unknown animals. Most striking are, on each of the two slabs, eight stylised figures of some ten cm high, which strongly suggest that they are otters (and therefore *Lutra lutra*), sitting in upright position.

Figure 1. Petroglyphs of eight otters (and six people, horse-drawn chariot, fish and other animals) in Bronze Age grave in Kivik, southern Sweden (photograph Hans Kruuk).

DISCUSSION

The assumption is that the elegant, stylized figures in these pictures show otters, and are produced by someone who knew the animals and their behaviour well. The posture in the engravings is the one so often seen in photographs of the species (sitting upright, or in German 'Männchen machen'). The posture in this context is especially interesting, as it is associated with captivity. Unlike several other otter species, which I saw do this in the wild, for *Lutra lutra* one appears to see this posture only in captive animals. In hundreds of observations on behaviour of *Lutra lutra* in the wild over many years, I have never seen them sitting upright, whereas this is common in captivity, to the extent that if one sees a photograph of an otter in this posture, one can be confident that it concerns a captive animal.

Figure 2. Petroglyphs of eight otters (and 14 people, musical instruments, other symbols) in Bronze Age grave in Kivik, southern Sweden (photograph Hans Kruuk).

Obviously, sitting upright must be part of the behavioural repertoire of *Lutra lutra*, and very rarely they must do this also in the wild, but I have not seen this. Perhaps this behaviour is shown by animals when curious about something in the environment, at a time when possible escape behaviour is blocked.

The point is relevant to the Swedish engravings, which are therefore likely to refer to captive animals. Taking this further, I speculate that, as pre-historic art usually refers to animals with practical significance to the artist, three millennia ago otters were kept in captivity not just for companionship or decoration, but also for some practical purpose. Perhaps they were used for fishing, as is the custom in some present-day Asian countries with the smooth otter (Hendrichs, 1975; Feeroz 2004; Kruuk 2006). Unfortunately however, this will always remain no more than speculation.

Whatever the exact significance of these images, they do show otters to have had a prominent role in Scandinavian Bronze Age society, and to be part of European culture for at least three millennia.

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RESUME

Les pétroglyphes suédois de Loutre (*Lutra lutra*) de l'Age de Bronze: indications sur leurs comportements.

Des gravures rupestres de plus de 3000 ans (appelées encore pétroglyphes), de Loutre, probablement de l'espèce *Lutra lutra*, ont été découvertes dans le site funéraire de l'âge de Bronze de Kivik, situé au sud de la Suède. Les postures de ces animaux, réalisées de façon stylisée en position dressée sur les pattes arrières, laissent suggérer qu'il s'agit d'animaux captifs qui avaient une place importante dans les sociétés scandinaves de l'âge de bronze.

RESUMEN

Nutrias (*Lutra lutra*) en la prehistoria sueca y notas sobre su comportamiento

Grabados (petroglifos) de 300 años de antigüedad probablemente representando nutrias (*Lutra lutra*) han sido descubiertos en un enterramiento de la Edad de Bronce en Kivik, en el sur de Suecia. La posición sentada de los animales en las prominentes y estilizadas imágenes sugiere que representan nutrias cautivas con un importante papel en la sociedad escandinava de la Edad del Bronce.

R E P O R T

ABUNDANCE OF THE EURASIAN OTTER *Lutra Lutra* (LINNAEUS, 1758) IN TWO AREAS FROM CENTRAL SPAIN (PROVINCE OF SALAMANCA, RIVER TORMES)

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Abstract: The Eurasian otter (*Lutra lutra*) is a widely distributed species in central Spain. Studies about its occurrence and diet are abundant, but data about population size are scarce. The density of the species was estimated during consecutive winters in two contrasted areas from central Spain by means of track censuses. The KAI index (Kilometrical Abundance Index) varied between 0.14 otters/km in the vicinity of the city of Salamanca and 0.25 otters/km in a conserved area. These results fit well with moderate productivity rivers and are similar to those obtained in other localities from the Mediterranean basin.

Keywords: *Lutra lutra*, population size, track census

INTRODUCTION

The Eurasian otter *Lutra lutra* (Linnaeus, 1758) is nowadays widely distributed in central Spain (Delibes, 1990; Morales et al., 1998; Ruiz-Olmo and Delibes, 1998; Cortés et al., 1998; Palomo et al., 2007), especially in riparian areas with certain water flow. In the last decades an increase and a colonizing pattern in the species range have been registered in this area after a worrying decrease in the central decades of the 20th century (see previous references).

Although a large number of studies about distribution and trophic ecology of the species have been carried out and an extensive monitoring of some otter populations (Delibes, 1990; Morales et al., 1998; Ruiz-Olmo and Delibes, 1998) only one work concerning otter population size has been published in reference to a naturally protected park (Bravo et al., 1998) and thus density remains poorly known.

Data on otter abundance in central Spain are based in defecation rates (Díez-Frontón, 1998; Morales et al., 1998; Pérez-Alonso, 1999) that can be used as an indirect method for estimating population size (Mason and MacDonald, 1987; Ruiz-Olmo et al., 2001a; Guter et al., 2008; Lanzski et al., 2008), but the application of this rate as estimator depends on climatic factors, mainly rainfalls, availability of defecation sites, season of the year and other factors (Conroy et al., 1991; Kranz, 1996; Strachan and Jefferies, 1996; Kruuk, 2006; Ruiz-Olmo et al., 2001a) making this spraint index not always adequate for abundance evaluation purposes.

In this communication some data about abundance and density of the otter in two different areas from central Spain are discussed.

MATERIAL AND METHODS

Fieldwork was carried out in two localities of the river Tormes, one of the major tributaries of the Duero basin, in the province of Salamanca, central Spain (Fig. 1). Herein the occurrence of otter is well know on the basis of large monitoring surveys using spraints but also registered by direct observations from the later 1980s (Delibes, 1990; Ruiz-Olmo and Delibes, 1998; Pérez-Alonso, 1999).

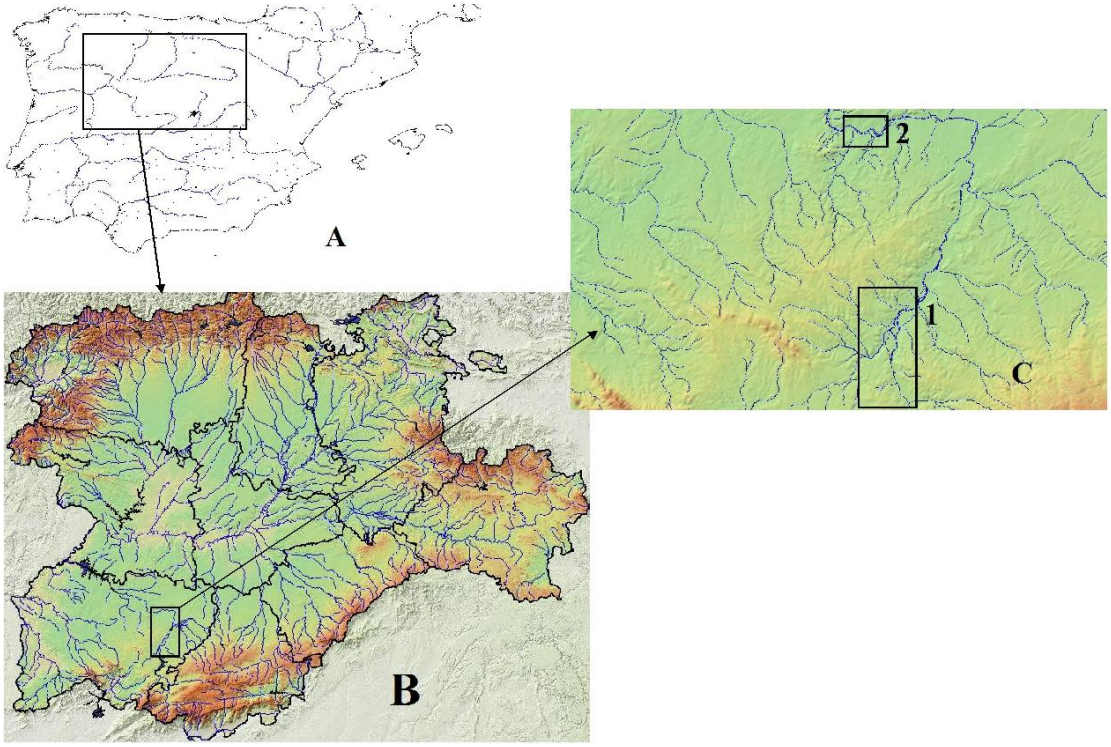

Figure 1. Study area. A. Location on the Iberian Peninsula. B. Digital Elevation Model of the study area. C. Digital Elevation Model and hydrographic web of the two localities surveyed; 1: Santa Teresa dam; 2: Salamanca.

The first set of stretches studied is located downstream from the Santa Teresa dam (GPS coordinates of the medium area point: 30T 280849, 4508295; 820 m. high) in a sedimentary plain intensively used as croplands surrounded by oak forest (*Quercus ilex*), managed with extensive livestock (called "dehesas"). The riparian forest is structured in gallery where *Salix sp*., *Populus sp*., *Ulmus sp*. and *Fraxinus sp*. are the dominant species, and with high shrub cover in the inferior strata. Punctually, this forest is removed and replaced for monospecific plantations of *Populus nigra*. The water network is well developed, mainly by the beds of the rivers Tormes and Alhandiga, which drains the flow of numerous rivers and irrigation ditches. Moreover, gravel extraction activities create some new lakes.

The second area studied was in the vicinity of the city of Salamanca situated on the river Tormes and two of itd tributaries (GPS coordinates of the medium area point: 30T 276181, 4537213; 800 m.). Here the riparian habitat is largely degraded because the influence of the human pressure on the river due to population size of the city and recreational activities. Currently the forest is mainly reduced to a series of islands in the middle of the river while banks are used as a "river street" and parks for human activities.

In both territories helophyte vegetation (*Phragmites australis*, *Typha latifolia*) covers up to a 10 % of the water surface, but in some particular situations can reach more than 90 %.

The abundance of the otter in these areas where studied by means of track censuses, a reliable indicator of real otter population in a fixed surface (Sidorovich and Lauzhel, 1992; Reid et al., 1987; Ruiz-Olmo et al., 2001a; Sulkava, 2007; Sulkava and Liuko, 2007).

The banks of all water bodies included in any of the work zones were intensively surveyed from November to February of several consecutive winters (three in the first locality and two in the second) searching for adequate points for track stamp. On the basis of the adequate substrate availability the length surveyed in Santa Teresa was 15.7 kilometers but in Salamanca only seven kilometers were surveyed.

Only those fresh, clear and well-marked tracks on clay substrates were used in the study (Hertweck et al., 1998; Mercier and Fried, 2004). Another signs found were not used for avoiding biases. In those tracks keeping these characteristics the total length including claws were measured with a digital caliper (accurate: ± 1 mm.).

Results are expressed as Minimum Number of different Tracks (MNT) and standardized by using a Kilometrical Abundance Index (KAI = MNT / length of the stretch surveyed).

RESULTS AND DISCUSSION

In the first area studied, three MNTs were registered during the 2004-2005 winter and the winters of 2005-2006 and 2006-2007 registered four consistent MNTs (Table 1). In the city of Salamanca only one MNT was estimated during the two winters of study (Table 2). In both cases the low variation MNT indicates a stable, although small, otter population.

Table 1. Winter censuses of otter downstream of the Santa Teresa dam. MNT: minimum number of different tracks registered. KAI: Kilometrical Abundance Index (MNT / length surveyed).

	Length surveyed (km)	MNT	KAI
2005-2006	15.72	3	0.19
2006-2007	15.72	4	0.25
2007-2008	15.72	4	0.25

KAI: Kilometrical Abundance Index (MNT / length surveyed).

Table 2. Winter censuses of otter in the river Tormes in the city of Salamanca.

	Length surveyed (km)	MNT	KAI
2006-2007	7.00	1	0.14
2007-2008	7.00	1	0.14

KAI: Kilometrical Abundance Index (MNT / length surveyed).

Mean relative abundances (KAI) are higher in the floodplain downstream the Santa Teresa dam (0.23 MNT) than in Salamanca (0.14 MNT), thus reflecting a larger population in the first area than in the second. Probably this can be related to a low habitat quality and productivity of the river Tormes in the vicinity of Salamanca (Mason, 1995; Ruiz-Olmo et al., 2001b) but the scarce sample size does not allows adequate conclusions.

Otter spraints were also found during samplings, consistent with a constant occupation of the stretches.

These short estimated abundances during fieldwork are in agreement with a territorial mammal, which occurs in lineal habitats such as rivers or streams (Kruuk, 2006). The obtained KAI belongs, in the Mediterranean basin, with moderate or intermediate otter densities of the cyprinid dominant area (Ruiz-Olmo, 1995; Ruiz-Olmo et al., 2001a).

These KAI values were similar to those measured in Spain, Mediterranean basin and northern Europe (about 0.20 otters/km; Sidorovich and Lauzhel, 1992; Ruiz-Olmo, 1995; Bravo et al., 1998; Sulkava et al., 2007), high than in central and eastern Europe (Georgiev and Stoycheva, 2006; Kalz et al., 2006; Lanzski et al., 2008), but lower in comparison with some populations from north Scotland, China or Germany where densities higher as 1.66 otters/km are reported (Kruuk et al., 1989; Hung et al., 2004; Kruuk, 2006).

However it is necessary to take into account that the number of otters estimated in winter was less than in summer (Ruiz-Olmo, 1995), although this effect seems to be an effect of the water flow restriction during this season (Prenda et al., 2001), bringing together a large number of otters in areas with available resources.

Anyway, the variability in the length studied in both areas (see Tables 1 and 2) could influence the results obtained and makes comparisons among localities hard to interpetrate. An appropriate length for surveying otters was estimated as ten kilometers in Spain (Ruiz-Olmo, 1995) but this were not accomplished in Salamanca and the results then should be interpreted cautiously.

Despite the reported increase in otter range in central Spain a need for increasing the knowledge on population size could be important for implementing conservation measures.

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RESUME

Repartition de la loutre eurasienne *Lutra lutra* (Linnaeus, 1758) dans deux regions du centre de l'Espagne (Province de Salamanque, Rivière Tormes)

La loutre eurasienne (*Lutra lutra*) est une espèce particulièrement abondante dans le centre de l'Espagne. Il existe de nombreuses études sur sa répartition et son alimentation. Cependant, des données sur l'importance de la population sont rares. La densité de l'espèce a été estimée par inventaire des traces durant deux hivers consécutifs dans deux régions différentes du centre de l'Espagne. L'Indice d'Abondance Kilométrique (IAK) varie entre 0.14 loutre/km dans les environs de la ville de Salamanque et 0.25 loutre/km dans une région préservée. Ces résultats correspondent bien aux rivières de productivité moyenne et sont similaires à ceux obtenus dans le bassin méditerranéen.

RESUMEN

Abundancia de la nutria paleártica *Lutra lutra* (Linnaeus, 1758) en dos áreas de España central (provincia de Salamanca, río Tormes)

La nutria paleártica (*Lutra lutra*) es una especie bien distribuida en España central. Los estudios sobre presencia y dieta son abundantes, pero apenas existen datos sobre el tamaño poblacional. Se estimó la abundancia de la especie en dos áreas contrastadas de España central mediante el censo de huellas durante varios inviernos. El índice KAI (Índice Kilómetro de Abundancia) varió entre 0.14 nutrias/km en las cercanías de la ciudad de Salamanca y 0.25 nutrias/km en un área mejor conservada. Estos resultados son concordantes con ríos de productividad media y similares a los obtenidos en otras localidades de la cuenca mediterránea.

ARTICLE

A WORKING REVIEW OF THE HAIRY-NOSED OTTER (*Lutra sumatrana*)

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Abstract: The hairy-nosed otter (*Lutra sumatrana*) is one of the rarest and least-known of the 13 otter species. A review of current knowledge about this species, its historical and current known range and the threats facing it, derived from both the published literature and current ongoing investigations is presented. The future for this species is poor, with large-scale habitat degradation and hunting for the illegal skin trade assaulting the tiny and fragmented populations at utterly unsustainable levels. Immediate and urgent actions to save this species from extinction in the very near future are recommended.
Keywords: Hairy-nosed otter; *Lutra sumatrana*, skin trade, poaching, threats

INTRODUCTION

This paper is an attempt to synthesise field work and literature reviews to give some idea of the current situation of the Hairy-Nosed Otter (*Lutra sumatrana*), in order to give a basis for future conservation decisions. It covers the physical appearance of this animal, what we know about behaviour and diet, an indication of its former range and habitat use, and what we currently know of its range and use of

habitat today. Threats facing this species and its current conservation situation are covered, and recommendations for urgent further work are given.

The hairy-nosed otter is a medium-sized otter, around 1.3m in length and weighing around 7-8kg. The paws are fully webbed with well-developed claws. The fur is dark brown above, slightly paler underneath with a contrasting pale chin and upper lip. The whole nasal area (rhinarium) is covered in short, dark fur. It was formerly found across much of Southeast Asia but is now known only as tiny populations in a handful of locations.

APPEARANCE AND ANATOMY

This otter is very long and snaky in shape, which is more obvious in life than in mounted specimens. The tail is long and slender, and more rounded in cross section than in the smooth coated otter (*Lutrogale perspicillata*). The paws are fully webbed with well-developed claws, with fine fur on the upper surfaces and naked beneath fore and hind. Kanchanasaka (2001) gives casts of footprints of this animal. Whole body measurements are given in Table 1; skull measurements in Table 2.

Table 1: Body measurements of ***Lutra sumatrana***

Source	**Length**			**Weight (kg)**
	Head + Body (cm)	**Tail (cm)**	**Total (cm)**	
Harris (1968)	70 – 82.6	35 – 50.9	105 – 133.5	
Kanchanasaka (unpublished data)	63 – 67.7	41 – 46.6	104 – 114.3	5 - 8 kg
Payne et al (2005)	57.5	37.5	95	7 kg
	61.5	38.5	100	

Table 2: Skull Measurements of ***Lutra sumatrana***

Source	**Total Length (cm)**	**Condylobasal Length (cm)**	**Interorbital (cm)**	**Maxillary Toothrow**
Harris (1968)	10 – 10.1 (Quoting Lyon, 1908)	5.5 – 7.3 (Quoting Pocock, 1941)	1.5 – 1.8 (Quoting Pocock, 1941)	
Payne et al. (2005)		9.1-10.1 (3 specimens)	14.4-14.8 (3 specimens)	31.5-31.6 (3 specimens)

There is little information available about sexual dimorphism – although the skull measurements given in Harris (1968) show the two adult males measured as larger than the single adult female, the animals were from different populations, and it does seem that Malaysian otters were historically considered larger than Sumatran ones. However, Kanchanasaka found that in two captured otters, the female weighed 7kg and the male 8kg, and considers that in the Thai population, the male is the larger. Of 15 skins recorded from Cambodia from 2006-2008 the head-body length ranged from 62-93 cm, and the width of the skins ranged from 40-56 cm. One of the largest skins recorded was from an adult (pregnant) female. Tails could not be measured as they in most cases were cut off. Other *Lutra* species do show sexual dimorphism, with males being somewhat larger and heavier than females (Lynch et al., 1996 for *Lutra lutra*, Harris, 1968 for *L. maculicollis*), so it would not be surprising if the same were true for *L. sumatrana*.

Sasaki (per comm.) compared the skulls of the four species of otters found in Asia, finding that *L. sumatrana* and *L. lutra* are very similar, both being distinct from *Lutrogale perspicillata* and *Aonyx cinereus*. Detailed statistical treatment of measurements indicated that *L. sumatrana* has a more elongated skull, with a shorter distance from eye to nose, but a more rounded braincase *than L. lutra*. Nguyen Xuan Dang (2005), the Sarawak Forestry Department (2007), and Payne et al. (2005) agree that the skull is flattened compared to *Lutrogale perspicillata*; Sivasothi and Nor (1994) provide a set of skull drawings comparing the four species in Asia, and Sasaki has photographs of skulls and mandibles of the four species, which he has allowed us to use (Figure 1). These features are of limited use in field identification to differentiate between *L. lutra* and *L. sumatrana*, but if a body of measurements can be built up from dead animals such as from road kills, it may eventually be possible to use this in identification of, for example, badly decomposed cadavers where external features cannot be used. The dental formula is I 3/3 C 1/1 P 4/3 M ½

Figure 1: Skulls and lower mandibles of the four Asian otter species (by permission of Hiroshi Sasaki). From left to right: *Aonyx cinereus, Lutra lutra, Lutra sumatrana, Lutrogale perspicillata*

The diagnostic feature of this species, the rhinarium, is entirely covered in short, dark fur, apart from the upper edge of the nostrils, which is naked (see Figure 2). In old animals, skins and museum specimens, this hair may be abraded, but the skin texture left is finely pitted (visible under a hand lens), different from that of the other otter species, which have naked, leathery rhinaria (Pocock, 1941).

The main coat colour is dark brown, sometimes a reddish chestnut but usually dark chocolate brown, with the ventral and dorsal surfaces almost the same (Harris, 1968). The male is slightly darker than female in both adults and juveniles (Kanchanasaka et al., 2003). Both sexes have a sharply contrasting white or yellowish upper lip, chin and the front part of the throat, which does not extend down the breast as in the other otter species in the area (see Figure 2); this feature is of great use in field identification if the head is clearly visible. The underfur is very pale. In Cambodia the hairy-nosed otter is referred to as the 'black otter' by local people, whereas the smooth-coated otter is called the ' grey otter' (see Figure 3) as in general they consider that *L. sumatrana* has a darker coat than *Lutrogale*.

Little is known about internal anatomy. Cantor (1846) describing the post-mortem dissection of a male hairy-nosed otter, says the intestinal canal measured 2.7m, with a circumference of 57 mm, with no caecum. He also states that the kidney consists of "ten loosely connected glands".

Nothing has been published about the physiology of this species.

Fig 2: Left: The white throat patch is in sharp contrast with the rest of the body, and is smaller than in other otter species in the region. Right: Fine hairs cover the rhinarium apart for the very edge of the nostrils.

Fig 3: Skin of hairy-nosed otter (left) and smooth-coated otter (right). The colour of the hairy-nosed otter is generally much darker than that of the other otters in the region. The throat patch is small and in high contrast to the rest of the body.

BEHAVIOUR

Kanchanasaka (2007) in a film excerpt showed that this animal is a very sinuous and snaky animal, much more so than *Lutra lutra*. They also stand up on their hind legs as many other otter species do (Sivasothi and Nor, 1994). They are considered by local people to be fast swimmers.

Nothing is known about the territoriality of this species. Kanchanasaka (2007) considers from observation that it is probably solitary like its sister species, *L. lutra.* Nor (1999) describes two otters in traps and a third trying to rescue them. Nguyen Xuan Dang (2005) reports that hairy-nosed otters often forage in small groups of two to five individuals, which stay together as they move from one area to another. Nguyen Van Nhuan et al. (2008) had a direct sighting of two *Lutra sumatrana* together on land along a canal bank in U Minh Ha National Park, about 30 km U Minh Thuong National Park. The Sarawak Forestry Department website (in reference list) says "May be seen solitary or in groups of up to at least six. Pairing of male and female may be limited to the breeding period" (*sic*), but gives no original source. The nature of these groups – mothers with cubs, or parents with cubs, or bachelor groups or some other combination – is unknown.

Cantor (1846) indicates that juveniles are easily tamed, and that the species is used by people in Malaya for river fishing. The single captive representative is also very tame, and appears to wish for social interaction (Olssen, pers. obs.), which may indicate a higher degree of sociality than in, for example, *L. Lutra*, where tamed animals usually become less tame and more solitary upon maturity.

Cantor (1846) says that 'Its voice is a short shrill whistling, not unlike the sound of the cricket, but stronger'. The Sarawak Forestry Department describe the typical otter contact call of a single syllabic chirp, and says that mothers use a staccato chatter with their offspring. Nicole Duplaix recorded vocalisations in captive animals and considers them to be similar to *Lutra lutra* (N. Duplaix, pers. comm.)

Little is known about holts and resting behaviour, but Kanchanasaka *et al* (2003) found an old resting place described as “like a bird’s nest” in the melaleuca forest in tall grass i.e. a mound of grass with a central depression. Nguyen Van Nhuan et al. (2008) found that from interviews with local hunters and people living and working around their study area in U Minh Ha National Park, Mekong Delta, Vietnam, that their opinion was that both of these species like to rest and sleep on high ground with thick reed areas. The same authors say that these animals prefer to use natural canal banks with thick reeds rather than banana plantations. They also prefer to live in traditionally planted forest areas more than intensively planted forest, partly because the water in such plantations has lately become brackish, and most of the native fish and other aquatic prey animals that the otters eat cannot survive in it. In addition, in the dry season, this habitat dries out completely.

Nguyen Vu Khoi *et al* (2007) found that in Viet Nam, in the Mekong Delta, this species is active in the morning between 06:00 and 07:30, and again in the late afternoon, from 16:30 to 17:30, even when people were present. The most common time to see the otters is between four and five in the afternoon. In Nguyen Van Nhuan et al. (2008), however, the researchers directly observed two *L. sumatrana* at 20:30 pm in the evening on 28th March 2008 for around 20-30 seconds. The animals did not appear to be disturbed by their presence, and one was apparently curious about the LED torch, approaching within 2 m. The area in which they were encountered has a significant level of human disturbance during the dry season.

Data from camera trapping in Thailand showed that the hairy-nosed otters are active all day with high frequency in the morning (6.00-10.00) and at night (24.00-3.00) (Kanchanasaka et al., 2003).

In Cambodia, camera trap photos are from early morning or late afternoon.

Kanchanasaka (2001, 2007) indicated that in Thai flooded forest, this species prefers to defaecate on sloping or horizontal tree trunks, branches and aerial roots. Rather than producing a scat heap, the deposit is long and thin, and laid along the route. In a piece of film footage of this species (Kanchanasaka, 2007), the animal walked up a sloping branch, then turned and smeared scat down the branch. Nguyen Xuan Dang (2005) in Viet Nam also found that they do not have regular latrines. This is possibly because they mainly live in seasonally flooded forest with differing water levels – scat not placed on tree limbs will not persist. In Cambodia, hairy-nosed otters have also been found to defaecate on logs or branches reaching out of the water (Figure 4). Only a few scats are found at each site. In Cambodia, local people report that this species always defaecates on branched or stumps, never on the ground in the dry season when the ground is dry.

According to Nguyen Vu Khoi and Hoang Xuan Thuy (2007), interviews with fishermen indicated that this species mainly breeds in November-December in the Mekong delta.

Kanchanasaka et al. (2003) found that gestation was around 2 months as with other otters, and cubs were seen in December to February, and one family observed consisted of both parents and a cub.

Figure 4: Hairy-nosed otter defaecating on branch just above the water level at Tonle Sap Lake, Cambodia.

In Cambodia, the skin of a recently caught pregnant female (foetus 8-9 cm long) was recorded at Tonle Sap Lake in December 2006 (Olsson, pers. obs.).

As far as we can generalise from these accounts, the otters are active in the morning, and again later in the day, evening or night (it may depend on the patterns of human disturbance, or prey activity patterns in the different environments). The gestation appears to be the otter norm of about 2 months, with birth between November and February, and it is possible that the male remains with the female and young, but more work is needed to clarify this.

HABITAT

Current Habitat Use

In Thailand, the otters were first rediscovered in 1998 in the Toa Daeng peat swamp forests of Narathiwat province (Figure 5), scattered in the evergreen inundated primary forest, and also near the mouth of the Bang Nara River. The main habitat is two types of swamp forest - a central flooded primary forest zone consisting of a three-storey formation of climax vegetation, which is very hard for humans to penetrate, and surrounding by secondary forest of stands of almost pure *Melaleuca cajuputi*, with adjacent grassland. The Bang Nara River is tidal.

There are a few records from Klong Saeng Wildlife Sanctuary and Khao Sok National park in 1984 before the construction of the dam in that area – these are from streams in evergreen forest at least 100m above sea level (Kanchanasaka et al., 2003), but

surveys after the reservoir filled found no further sign. The area still contains Smooth-Coated Otters and Small-Clawed Otters (Passanan, 2008, pers. comm.).

In Viet Nam, the otters are found in U Minh Thuong National Park and the nearby Vo Doi Nature Reserve (30km away), both in the Mekong Delta, near the Cambodian border and lying at about 2.5m above sea level. Both of these are peat swamp forests, with core areas mostly of *Meleleuca cajuputi* 15m high, covered in dense lianas (such as *Stenochlaena palustri*s), surrounded by secondary, replanted melaleuca forest, which usually have a well-developed grass ground layer, and outside this are seasonally inundated meadows dominated by *Eleocharis dulcis*. The area has many canals and these and the swamps are covered by dense floating aquatic plants such as *Eichhornia crassipes*, *Pistia stratiotes* (both invasive aliens), *Salvinia cucullata* and *Ipomoea aquatica*. Surrounding all of this are buffer zones containing paddy fields and isolated stands of melaleuca. In addition, two hairy-nosed otters were observed directly on a canal bank in U Minh Ha National Park, in an area of young melaleuca plantation which was replanted 5 to 6 years agao following a forest fire. The canals contain many species of fish, and the area is densely reeded (Nguyen Van Nhuan *et al*, 2008).

Figure 5: Toa Daeng peat swamp forest

In Cambodia, this species has been recorded from the flooded forest surrounding the the large Tonle Sap Lake (see Figure 6.) The largest permanent freshwater lake in SE Asia, it is a natural reservoir in a depression in the Cambodian plain (10-30 m asl), and is really a widening of the Tonle Sap River which flows into the Mekong River near Phnom Penh. During the dry season (Dec to June), the lake is much reduced in size and in some places is only about a metre deep. In the Monsoon, the Mekong pushes water up the Tonle Sap River, reversing its flow and flooding the lake into nearby fields and forests and increasing to up to ten metres in depth. The area of the lake is about 2,500 km2 during the dry season, expanding to about 15,000 during the wet season. The otters live mainly in the flooded forest and scrub surrounding the lake, using the drainage canals and ponds in the dry season, but foraging into the flooded forests of *Barringtonia acutangula*, *Hydrocarpus anthelminthica*, *Terminalia chabula, Homalium brevidans* and *Amelia asiatica* when available.

A recent camera trap sighting of *L. sumatrana* has been made in highland marsh at 560m in the Central Cardamom Protected Forest in the Cardamom Mountains of southwest Cambodia. These marshes comprise reeds, sedges and melaleuca, and vary in size from 1000 to 50 ha depending on the season; the area is used locally as lowland rice paddy, and is surrounded by evergreen hill forest

(Simpson, 2007). In addition, Olssen has recorded a camera trap photograph and a skin from a tributary of the Tonle Sap River at about 300m; the hunter reported that the otter came from the stream near the village, which is in mixed forest (Olssen et al., in prep).

In Sumatra, the animal was found in an area of oil palm and rubber plantations, with rivers and other small watercourses and areas of flooded open swamp (Lubis, 2005).

Figure 6. Flooded forest habitat of hairy-nosed otter at Tonle Sap Lake, Cambodia

Earlier Records of Habitat Use

All the modern records describe the habitat of this species to be lowland flooded forests with watercourses and adjacent grassland, and this seems to have always been its main habitat. The current distribution of these habitats is very limited in these countries today, but in times past extended much further.

Historically however, the animals seem to have also made use of higher altitude rocky streams in jungle areas. Sivasothi and Nor (1994) quote other researchers finding this otter at 3900' (1800m) in the Kelabit Highlands of Sarawak (Davis commenting on Harrison's collection, 1956), and at 800m in inland forest in Malaya (Wayre, 1974 reporting Medway pers. comm.). The Sarawak Forestry Department (2007) consider the animal to be found from coast up to far (mountainous) interior. Hussain (2004) also gives shallow, swampy coastal environments as a possibility for this animal, based on the sources in Sivasothi and Nor (1994).

DISCUSSION

When dealing with older historical sources, we have to consider whether the species identification was accurate, and whether the animal was personally collected/sighted by the person reporting, or whether they relied on what local people reported. In the case of at least one species, Gurney's Pitta, it transpired that the reported collecting locations were inaccurate, leading to a false representation of the species' range (Deignan, 1955). We present the data in the previous paragraph, but can make no assessment of accuracy given the passage of time.

In general, the habitat in which extant populations are found is flooded swamp forest. However, the existence of two recent camera trap photographs and a skin from higher altitude marshes and streams in evergreen forest indicates that future surveys should consider this as another potential habitat to cover.

DIET

In Thailand, otter hunting behaviour was reported in the melaleuca forest. The otters swim fast, frightening fish into the roots of plants, where they easily can be caught. They have been caught on camera traps raiding fish traps so skilfully that the fishermen never know they have been there (Kanchanasaka, 2007). In the dry season, they forage mainly in canals and remaining pools.

In Viet Nam, Nguyen Xuan Dang (2005) found that the otters forage in all the habitat types, but are more often observed foraging in the secondary melaleuca forest, especially in the canals and swamps

In Thailand, the main prey selected were three-spot gourami (*Trichogaster trichopterus*), common climbing perch (*Anabas testudineus*), and snakeheads (*Channa* sp) with some water snakes: fish were in >80% of scats and snakes in >10% (Kanchanasaka, 2001, 2007). This remained constant all year.

In Viet Nam, in U Minh Thuong, they mainly took walking catfish (*Clarius macrocephalus*), which are farmed, and snakeheads (*Channa* sp.) in the dry season. If no other fish are available, they will also take climbing perch and snakeskin gourami (*Trichogastor pectoralis*), which are scaly and less liked (Nguyen Vu Khoi et al., 2007, 2008). According to interviews with local people, this area used to have abundant fresh-water crabs, but now due to salt water incursions, the crabs are no longer present; during surveys in U Minh Ha National Park, the same author's team did not observe any freshwater crabs in canals or forest. The local people commented that both Short-Clawed and Hairy-Nosed Otters ate fish and snakes, which they considered to be a change in diet resulting from the loss of the crab population.

In both locations, they will also take small numbers of frogs, lizards, crabs, insects, birds and small mammals, as was found historically (see references in Sivasothi and Nor, 1994).

In Cambodia studies of prey species have not yet been carried out. However, given the proportion of water snakes in the diet of *L. Sumatrana* in Thailand it could be speculated that the large off-take of water snakes from Tonle Sap Lake (Stuart et al. 2000) could impact on the otters there.

PREDATORS AND COMPETITORS

Most of the animals that could prey on this species, e.g. leopards and tigers, have been reduced to extinction in its range by illegal hunting and habitat degradation. The hairy-nosed otter is probably the only large predator left in the areas where it is found.

In Thailand's Tao Daeng peat forest, it is possible that cubs particularly may fall prey to birds of prey such as the Grey-headed Fish-eagle (*Ichthyopaga ichthyaetus*), which is known to take other water-dwelling animals such as turtles (Maheshwaran, 1994). Stray dogs may also be a problem as they penetrate the forest regularly. There may still be Reticulated Pythons in the area which may take cubs.

In Viet Nam, eagles and Burmese Pythons (*Python molurus*) might prey on otters, but again all the major predators are gone.

In the Tonle Sap Lake, Cambodia, the highly endangered Siamese Crocodile (*Crocodylus siamensis*), and and hybrids between it and *C. porosus* or *C. rhombifer* (frequently deliberately encouraged in crocodile farms with the inevitable escapes into the wild according to Jelden et al, 2005), which pose, which pose a potential risk to

the otters. Large birds of prey (*I. ichthyaetus* is particularly common, with one of its most important surviving world populations centred on the lake; Davidson, 2006) and pythons are also found here, and could potentially prey on otters.

In the area of Sumatra where the single road kill animal was found (Lubis, 2005), the only likely animal predator are feral dogs.

In Thailand, in Tao Daeng, it may be in competition with the Flat-Headed Cat (*Prionailurus planiceps*), the Fishing Cat (*Prionailurus viverrinus*) and the Grey-headed Fish-eagle (*Ichthyopaga ichthyaetus*), as these animals also prey on the same fish as the hairy-nosed otter.

In Viet Nam and Cambodia, Fishing Cats (*Prionailurus viverrinus*) might compete with otters for food. Again, all the big predators that could exploit the same food source are gone.

At Tonle Sap Lake, Cambodia, the many water snakes and fish-eating water birds will compete with the otters for fish.

This species is sympatric throughout its range with Asian Small-Clawed otter, *Aonyx cinerea*, but the two species live entirely different lives and so do not compete. *A. cinereus* is a small otter, living in large family groups around an alpha breeding pair, evolved as crustacean predators, and making use of shallow water, marshes, areas of mud, ditches and swamps, contrasting with what we know of *L. sumatrana*. Kruuk et al., (1993) describes the separation and overlaps in resource use between *L. lutra*, *Lutrogale perspicillata* and *Aonyx cinereus* in Thailand; it would be very interesting to extend this to include *L. sumatrana*. The hairy-nosed otter is also sympatric with the Smooth-Coated Otter, *Lutrogale perspicillata*, but there is no information on how these interact. Since the smooth-coated otter is a larger animal, it may well be that it targets larger size prey than the hairy-nosed otter.

There is evidence that in the past, *L. sumatrana* inhabited areas where it would have shared its range with *Lutra lutra* in northern Myanmar (Duckworth, 2008) – we have no information about how they interacted or partitioned resources. Than Zaw et al. (2008) indicate that there are still otters in Myanmar - if the two species are still extant in the same area, the relationship between these apparently similar animals could be investigated.

GEOGRAPHIC DISTRIBUTION

The authors experience many difficulties in compiling this section. We are pretty sure of the accuracy of the “today’s known population” information.

We suspect there are more undiscovered populations out there but

a) We need to know where to look, so that when we can get people interested, we can
b) Indicate the most important areas to survey.

The historical range is incredibly hard to establish. We can either trust the peer review process and the literature it generates, or assume we can know nothing from the past except that some skins were found from some locations (and even then the collectors might have been inaccurate about exactly where they were found).

We believe that:

a) The six known populations did not evolve in isolation *in situ* parallel to each other.
b) It therefore follows that there must have been some population contiguity in the past.
c) Before the relatively recent human population growth and habitat development/degradation, there was a great deal more habitat available for the species.
d) From the literature accounts, we also suspect it can use more kinds of habitat than the flooded lowland peat swamp where it is found today.
e) Again from the literature, we also feel that there were likely to have been a lot more of these animals around when there was more suitable habitat and less population fragmentation

On our map (Fig. 7) we have indicated where we know the species exists today, and the area that the literature states was former range. This may well be inaccurate, but the historical range is offered mainly for interest.

The important point is that there are some areas that the literature implies is part of the historical range that still contains potential habitat and where nobody has recently (or ever) surveyed for the species. Absence of evidence of hairy-nosed otters is not evidence of absence of the animal if nobody has actually been to look for it.

We have therefore also marked on the map the areas where we feel that surveys should be done as a matter of priority.

What the Literature Says about Historical Range

Some of these accounts could be pure speculation, but the readers are free to decide for themselves whether they are reliable.

Historically, this species was considered fairly common in the first part of the twentieth century. Harrison, 1966, quoted in Nguyen Xuan Dang, 2005, says that in Malaya, 'It is abundant in the sea off Penang Island. It is also recorded from Singapore, but not from the sea there.' (p. 223); '... have been recorded from time to time, and one suspect that they visit here from the mainland.' Medway, (1977), quoted in Nguyen *opus cit*: observes that '... specimens indicate that this otter occurs throughout mainland Borneo, from the coast to small streams of the far interior' (p. 133), and Davies and Payne (1982) say: ‘most information come from chance sightings and published works; large otters (*L. sumatrana* and *L. perspicillata*) are seen along the Kinabatangan river. The otters are not regarded as sufficiently rare or threatened by development to warrant special conservation methods now’ (p. 141-146). Sivasothi and Nor (1994) say that the species was relatively common in Malaysia and Singapore, in Borneo (it is recorded from scattered localities in the N and W of Borneo in Payne et al. (2005), although the quality of the identification illustrations of all species shown is very poor, but the text is accurate) and particularly in Sarawak in the early part of the twentieth century, and that it is also recorded from most of Indochina south of the 16th parallel, Sumatra and Java. The British museum of Natural History holds a skin (specimen # 50.587) from far northern Myanmar (Gam Majaw N26.43 E97.58), which is far outside the known ecological and geographic range. This skin collected in 1939 seems to have never been referred to in print, but the skin has been checked and the identification confirmed as correct (Duckworth and Hills, 2008). This species is believed to be extremely rare in peninsular Malaysia. Since the 1960s there are only two records (from early 1990s) from Peninsular Malaysia, and further surveys are needed to confirm the continued presence here

(Sebastian, 1995). It is possible that there are populations in Lao People's Democratic Republic (which has given it legal protection despite having no records of its occurrence), and elsewhere in Indonesia.

Current Geographical Range

At present, the Hairy-Nosed Otter is definitely known to exist in seven locations:

Country	Location	Evidence	References
Thailand	Toa Daeng peat swamp, Narathiwat province	Live capture, camera trapping, observation	Kanchanasaka (2001)
Thailand	Khao Banthad wildlife Reserve, Trang Province	Observation, camera trapping	Kanchanasaka et al. (2003)
Vietnam	U Minh Thuong National Park	Observation, camera trapping	Nguyen Xuan Dang et al (2001)
Vietnam	Vo Doi Nature Reserve	Observation, camera trapping	Nguyen Van Nhuan et al. (2008)
Cambodia	Tonle Sap lake	Skins, observation, camera trapping	Olsson et al. (2007)
Cambodia	Cardamon Mountains	Skins, observations, camera trapping	Simpson (2007); Olssen et al. (in prep)
Sumatra	Sekayu District, Southern Sumatra	Road kill	Lubis (2005)

Recommended High Priority Areas of Research

- Northern Myanmar: this area should be surveyed even though it is so far out of the known historic range because of the existence of the skin described by Duckworth (2008).

- A corridor along the Tonle Sap river between the known ranges in Cambodia (Tonle Sap) and Vietnam (Mekong Delta)

- The former range in Malaysia, because there are no recent records as nobody has been surveying for this species.

- A second area in Sumatra that was formerly part of the historic range, but which has not been recently surveyed for these animals, plus any suitable habitat linking it to the known location.

- The island of Borneo should be surveyed wherever this is possible as suitable habitat still exists, it was part of the historic range, and there are some (not very reliable) recent anecdotal reports. On Borneo particularly, there is much misidentification of otters as the standard reference used (Payne and Frances, 2005) is very poor in distinguishing the species – the illustrations for *Aonyx, Lutra lutra* and *Lutrogale* appear identical except in scale, and there is no illustration

given of *L. sumatrana* at all, but museum specimen collection locations indicate that the latter species was historically present.

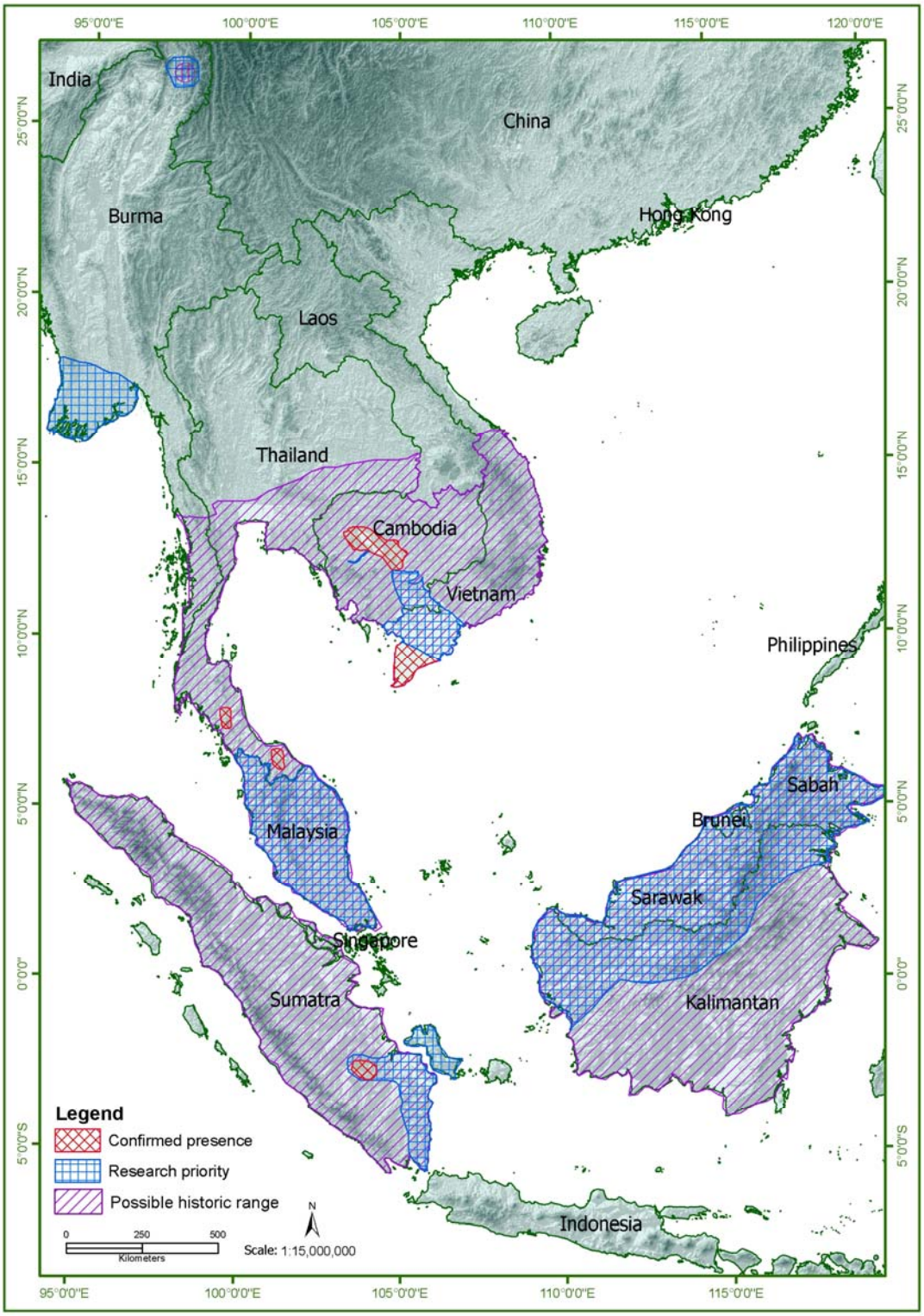

Figure 7: Historic and current distribution of *Lutra sumatrana* with suggested future survey sites

TAXONOMIC POSITION

The taxonomic position of this species has gone through a great deal of confusion. It was probably first referred to (but not formally describe) by Raffles in 1822, who called it Barang. The IUCN-accepted formal description was made by Gray, in 1865, who called it *Barangia sumatrana* (Harris, 1968).

For a while, there was debate based on physical measurements as to whether *L. sumatrana* was not actually a species, but a subspecies of the Eurasian Otter (Koepfli et al., 2008), although this was further complicated by the suspicion that the subspecies of *Lutra lutra* inhabiting the same range was itself a new species, *Lutra barang* (van Bree, 1998). As a subspecies, the hairy-nosed otter would have a lower conservation priority than a species.

Fortunately, DNA work has untangled this web, and established that *Lutra sumatrana* is a true species (Koepfli et al., 2008). Bininda-Emonds et al. (1999) give it as a recent divergence from *Lutra lutra* and their results have since been reinforced by workers using different markers (Koepfli, pers. comm.).

CONSERVATION STATUS

Up until the middle of the Twentieth Century, this species seems to have been generally considered common, and Cantor (1846) reports that it was one of the species tamed and used in fishing by people.

By the time of this species' CITES listing in 1977, this species was considered to be reducing in number and placed on Appendix II; the IUCN/SSC Red List Authority have mainly listed it as Data Deficient, which is not a helpful rating in terms of assessing conservation need, but reflects the lack of knowledge about the status of this animal.

The literature widely reports that it was believed to be extinct in 1998 as there had been no sightings at all for more than ten years (we have not been able to track down the source of this statement but it is referred to in the CITES entry at http://www.cites.org/eng/resources/species.html), but in 1999, the first sighting of the hairy nosed otter for many years was made in the peat swamp forest in Narathiwat province, southern Thailand (Kanchanasaka et al., 2003), and a handful of tiny populations in Vietnam, Cambodia and Sumatra have been found since then.

There is currently only one hairy-nosed otter in captivity in a zoo. Phnom Tamau Wildlife Rescue Center (PTWRC), Cambodia, received a young male in late 2007, from an illegal zoo that was being closed down; it previously held another animal in 2005, but this did not survive. PTWRC successfully keep and breed Smooth-Coated Otters, so hopes are high that they will succeed in obtaining a mate for this animal and establishing a breeding colony. Fishermen around Tonle Sap often keep otter cubs as pets (Poole, 2003). However, according to interviewees, they often die after short time in captivity (probably due to inappropriate care), or they are eventually killed and skinned. The local authorities are now passing such animals when discovered on to PTWRC.

The IUCN Otter Specialist Group currently considers *Lutra sumatrana* and *Lontra provocax* to be the species in most need of urgent *in situ* and *ex situ* conservation (J.W.H. Conroy, Chairman OSG, 2008, pers. comm.)

Legal Protection

Lutra sumatrana is formally legally protected in all the countries where it is known to still survive – however, the passing of law and the upholding of that protection are two different things.

All otters in Thailand have been protected since 1961, being listed under Protected Wild Animals in the Wild Animals Preservation and Protection Act and were listed as endangered species in Thailand Red Data: Mammals, Reptiles and Amphibian (Nabhitabhata and Chan-ard, 2005). The Tao Daeng peat forest in Thailand is RAMSAR site no. 1102. It was given Wildlife Sanctuary status in 1991 after two-thirds of the forest was lost to rice cultivation (which only lasted for two years due to soil acidification, leading to more areas being cleared). It is now managed by the Department of National Park, Wildlife and Plant Conservation.

In Viet Nam, otters are listed by Government Decree No. 32/2006/ND-CP, dated 30 March 2006 as Group IB – hunting and use is strictly banned. In 2003, Nguyen (2005) conducted a census of hairy-nosed otter in U Minh Thuong National Park based on direct observation, which indicated a population of around 50– 230 animals, which may be the largest population in the country.

In Cambodia, Ministry of Agriculture Forestry and Fisheries (MAFF) is responsible for the implementation of the Law on Forest Management, which was revised and passed in August 2002. It includes a chapter on wildlife conservation, which, for the first time, provides a legal framework for national wildlife conservation. In early 2007, the national species list was finally passed, listing the Hairy-nosed otter as 'Rare', giving it full protection. However, although Cambodia's laws are strict, limited capacity often leads to insufficient enforcement of them. The largest population of Hairy-nosed otters in Cambodia is at the Tonle Sap Lake. This is a UNESCO Biosphere Reserve. One of the core zones of the Biosphere Reserve is furthermore a RAMSAR site. The lake contains many fishing lots, sold to private individuals to harvest fish. Conservation practices are being introduced step by step as public acceptance is gained which is necessary in this very poor area still recovering from the past troubles. Surrounding the open water part of the lake is large area of flooded forest, scrub, grasslands, and agricultural land. Rice, lotus and mung beans are among the crops being farmed there. Traditional fishing communities living on and around the lake are very poor and fully dependent on fish and other natural resources from the lake area for their livelihoods. Conservation initiatives are in their early stages here.

In Sarawak, they are totally protected by the First Schedule [Section 2(1)] PART II on Protected Animals from the Wild Life Protection Ordinance, 1998 (Chapter 26). We could not trace any peer-reviewed records of them having been seen there for at least ten years, but the Sarawak Forestry Commission makes the claim on its website that "Hairy-nosed otter are sometimes seen early in the morning around the mangroves at Telok Assam" in Bako National Park (http://www.forestry.sarawak.gov.my/forweb/np/np/bako.htm)

THREATS FACING THE HAIRY-NOSED OTTER

The Hairy-nosed otter faces many threats to its survival. Chief amongst these is the illegal fur trade, fuelled by high demand and prices in China (including Tibet, where otter skins form part of the traditional chupa costume (Yoxon and Yoxon, 2007 and Figure 8).

Figure 8: Otter skin forming part of traditional Chupa constume in Tibet. Photo courtesy of Paul Yoxon, Furget-Me-Not campaign (http://www.furgetmenot.org.uk) and Environmental Investigation Agency (EIA)

In Viet Nam, otter populations have crashed: "Otters are hunted mostly for illegal national and trans-border wildlife trade, and to a lesser extent for meat and medical use. During the 1990s there was an illegal nationwide campaign to catch otters for the illegal export of their skins to China. The hunters used large numbers of strong metal leg-hold traps and snares to catch the animals. This campaign greatly reduced the otter numbers in the country. Otter hunting is much reduced now due to the low number of animals in the wild and better enforcement of wildlife management laws and regulations. However, hunting still remains a significant threat to otters, especially in Viet Nam's Mekong Delta where the wildlife trade is still out of control" (Nguyen Xuan Dang, 2005).

Figure 9: Hairy-nosed otter skin plus six typical traps, Tonle Sap lake, Cambodia.

In Cambodia, especially at the Tonle Sap Lake, massive hunting is taking place as commercial traders provide fishermen with traps and a guaranteed market for the furs, which are then exported to China (see Fig. 9). The entire trade is illegal, but the instigators, i.e. the middle men, are very hard to catch, and police often end up only being able to arrest desperately poor fishermen who have taken part in the trade to augment their pitifully low incomes. Large areas at the lake are divided into fishing lots. The owners of these sites, protect the sites astonishingly well from intruders. However, otter hunters are often welcome in the lots, as otters oppose threat to the fish stocks and are seen as a pest species.

The second major threat throughout Southeast Asia is habitat destruction. In Thailand, the main threat to this otter is further destruction of its peat forest habitats. Although Tao Daeng is now heavily legally protected, it is also in an area where there is a great deal of insurgency, making law enforcement and monitoring work very difficult and dangerous (Kanchanasaka, pers. comm.).

According to Nguyen Xuan Dang (2005), in Viet Nam, the otter habitat is still recovering from the bombing and defoliation of the Vietnam War. Subsequent development is draining and polluting wetlands, and logging for commerce and to clear land for more agriculture is putting intense pressure on the swamps, and only the two reserves in which the hairy-nosed otter are found represent significant swamp forest left in the country. However, even these areas are under threat, and burning has recently destroyed a large proportion.

In Cambodia, villagers living in and around the Tonle Sap Lake, cut and collect firewood from the flooded forest there. Some areas are also illegally being cleared for agricultural (paddy field) purposes.

In Sumatra, the sole animal recently found was a road traffic casualty, so it could be expected that as their habitat is developed for human use, this could be an increasing danger.

In Sarawak, 500,000 ha of peat swamp forest have been earmarked for oil palm plantations (Sebastian, pers. comm.).

In Viet Nam, water pollution due to runoff from agriculture is starting to have an effect (Nguyen Xuan Dang, 2005). No thorough studies on water pollution and its effect on wildlife have been carried out in Cambodia.

In Viet Nam, fishermen are over-exploiting fish, reducing the otters' prey base (Nguyen Xuan Dang 2005). In Cambodia and Thailand, they are directly persecuted as raiders of fish traps, and for damaging the nets that confine fish in aquaculture (Hotta and Yahaya, 1985, Kanchanasaka, 2007, A. Olsson pers. Comm.).

In Cambodia, parts of the otters are sometimes used in traditional medicine. Skin, gall-bladders and foetuses have been recorded for use in medicine, curing symptoms like fever and making you stronger. Normally the meat will be eaten, but bones are useless and will be thrown away.

In Sumatra, and in Java too, there is a belief that otters possess stones embedded under their skins that let them swim very fast and hold their breath underwater, and people try to acquire these stones (Lubis, 2005).

In Viet Nam, there is no tradition of using otter skins or meat – they do not have any special status.

In addition to these the closer encroachment of human populations and their attendant companion animals means there is a growing risk of exposure of otters to rabies and distemper transmitted by feral dogs.

In Thailand, Cambodia and Vietnam, invasive foreign waterplants *Eichhornia crassipes* (Global Invasive Species Database) and *Pistia stratiotes* (Waterhouse,

1993) are spreading and altering the ecology of waterways and lakes for over twenty years; however, Nguyen Vu Khoi (2007) records *L. sumatrana* making use of habitat colonised by the latter, so it may not have a significant effect on these otters.

In Cambodia, the invasive snail *Pomacea canaliculata* is present in the otters' habitat (Olsson, Pers. Obs.). This was deliberately introduced into south-east Asia from its original South American range as a potential gourmet food item, but no market developed, and the snails have since spread to become a major crop pest on rice; they have a voracious appetite for many water plants and can transform wetland ecologies. As it is also a potential food source for otters, it is as yet unclear whether it will be a net threat or benefit for the Hairy-Nosed Otter.

CONCLUSION

The hairy-nosed otter is under great pressure and may soon be extinct for good unless concerted and effective conservation measures take place. It is the opinion of the authors that suppression of the illegal fur trade, protection of habitat and establishment of a healthy, genetically viable captive population are the three biggest steps that can be taken toward this species' survival. Further research is very important, but practical and immediate protective actions are vital if we are not to simply chart the disappearance forever of another species of otter.

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EXIRPTS

The following excerpts are those given in Sivasothi and Nor (1994); they are quoted here by permission of the authors as they are valuable historical reference material which are hard to obtain. They are given in date order.

Cantor, 1846: [as *L. barang* Raffles] "Mumrang' or 'Amrang' of the Malays of the Peninsula.' 'The Malayan individuals appear to attain to a greater size than the Sumatran, described by Raffles'; Distr. - Malayan Peninsula, Borneo (p. 195).
'This [*Aonyx leptonyx*], as well as the two preceding species *(L. perspicillata & L. sumatrana)*, inhabits numerously the banks of the Malayan rivers, and all are at times used by the Malays in river fishing.'; Distr. – Malayan Peninsula, Singapore" (p. 196).

Lydekker, 1894: 'The hairy-nosed otter *(L. sumatrana)* is a very well-marked species from the Malayan region (p. 96).

Ridley, 1895: Two species of otter have been met with in Singapore, viz., *Lutra sumatrana and L. leptonyx;* but they seem to be rare, and little is known about them. The Malays often call them 'Anjing Ayer' (water dogs) (p. 94).

Flower, 1900: 'Recorded from the Malay Peninsula by Cantor, and from Singapore by Ridley. A specimen caught in Selangor is in the Museum at Kuala Lumpur.'; Distr. - Malay Peninsula and Islands (p. 334).

Kloss, 1908: included in the provisional list of mammals of the peninsular region.

Kloss, 1909: Distr. - The Peninsula, Singapore and Langkawi Island. (p. 33).

Chasen, 1924: listed in checklist of mammals of Singapore; 'Otters of any species are either not common in Singapore or adepts at concealment, possibly the latter.' (p. 84).

Chasen, 1925a: included in the true Singapore land fauna (p. 88).

Banks, 1931: occurs in Sarawak (p. 60).

Chasen, 1940: Distr. - Malay States, Sumatra, Banka, Borneo (p. 93).

Davis, 1958. Reporting on Harrisson's collection between Sept. 1945 and Dec. 1949: One male, Pa Umur, 3900 feet. Collector's note. - 'In small rocky brook. The animal also goes into jungle. Food: crabs and small fish.' (p. 133).

Tate, 1947: 'The range includes the whole of the Malay Peninsula ... It also occurs on Sumatra ... and on Borneo' (p. 157).

Banks, 1949: listed as a mammal of Borneo (p. 40).

Harrison, 1969: 5 animals collected by IMR between 1947- 1957 (p. 175); family in river seen in an area of disturbed rainforest at Sg. Buloh, Selangor (p. 176).

Harrison, 1964: recorded from North Borneo (Sabah) (p. 22).

Wayre, 1974: 'Medway told us that in 1964 a Hairy-nosed Otter had been caught by Aborigines near Janda Baik in the Bentong division of Pahang at approximately 550 metres in a torrent stream' (p. 37).

Harrison, 1966: 'It is abundant in the sea off Penang Island. It is also recorded from Singapore, but not from the sea there.' (p. 223); '... have been recorded from time to time, and one suspect that they visit here from the mainland.' (p. 6); present in Penang (p. 7); known from Malaya (p. 332).

Medway, 1977: '... specimens indicate that this otter occurs throughout mainland Borneo, from the coast to small streams of the far interior' (p. 133).

Davies & Payne, 1982: most information come from chance sightings and published works; large otters *(L. sumatrana & L. perspicillata)* are seen along the Kinabatangan river. The otters are not regarded as sufficiently rare or threatened by development to warrent special conservation methods now (p. 141-146).

Foster-Turley & Santiapillai, 1990: '... the current existence of ... the Hairy-nosed otter ... is unconfirmed', in Peninsular Malaysia. 'In Sabah and Sarawak, ... at least three species of otter occur', including the Hairy-nosed otter (p. 58-9).

Foster-Turley & Santiapillai, 1990: Not reported in Peninsular recently, possibly still present in remote areas, in scattered localities in East Malaysia; believed extirpated in Singapore.

Yang et al., 1990: In Singapore, current status unknown.

Nor, 1990a: Only the Smooth Otter and the Small-clawed Otter found during survey of northern Malaysian states. No other species observed.

RESUME

UN EXAMEN DE LA LOUTRE DE SUMATRA

La loutre de Sumatra (*Lutra sumatrana*) est l'une des treize espèces les plus rares et les moins connue de la sous-famille des Lutrinés. L'état des nos connaissances sur sa biologie, sa distribution historique et actuelle et les menaces pour sa survie sont présentées ici, basées sur la littérature et sur de nouvelles recherches sur le terrain. L'avenir de cette espèce est problématique, en effet la dégradation très étendue de son habitat et la chasse pour le commerce illégale de ses peaux, ont tout deux un effet catastrophique sur la distribution très fragmentée des petits effectifs de sa population. Des actions urgentes et immédiates seront nécessaires pour sauvegarder cette espèce d'une extinction imminente.

RESUMEN

UNA REVISION DE LA NUTRIA DE SUMATRA

La nutria de Sumatra o de nariz peluda (*Lutra sumatrana*) es una de las más raras y menos conocidas de las 13 especies de nutrias. Presentamos una revisión del esado actual de conocimeinto sobre esta especie, su área de distribución histórica y actual, y las amenazas a las que se enfrenta según la bibliografía publicada y las investigaciones en curso. Consideramos que el futuro de esta especie es preocupante, con una degradación de su hábitat a gran escala y una caza ilegal para el comercio de su piel, llevando a las escasas y fragmentadas poblaciones hasta niveles insostenibles. Recomendamos una acción una inmediata y urgente para salvar a esa especie de su extinción en un futuro muy cercano.

Khmer:

ភេរោមច្រមុះគឺជាប្រភេទមួយដែលកំរកហើយមានពត៌មានតិចតួចបំផុតក្នុងចំណោមប្រភេទភេទាំង១៣ នៅលើពិភពលោក។ យើងសូមបង្ហាញថាយោងទៅតាមការសិក្សា និងពិនិត្យឡើងវិញលើពត៌មានបច្ចុប្បន្នអំពី ប្រភេទសត្វនេះ ជីវប្រវត្តិ របាយនាពេលបច្ចុប្បន្ន និងកត្តាគំរាមកំហែងចំពោះមុខ ដោយបានដកស្រង់ចេញពី ឯកសារដែលបានបោះផ្សាយរួច និងការបន្តសកម្មភាពតាមដានស្រាវជ្រាវនាពេលបច្ចុប្បន្ន។ ដូច្នោះយើងជឿជាក់ ថានៅពេលអនាគតភេប្រភេទនេះនឹងកាន់តែខ្សត់ទៅ។ ប្រសិនបើវាជួបប្រទះនឹងការបាត់ទីជំរកដែលមានទ្រង់ ទ្រាយធំ និងការប្រមាញ់សំលាប់ដើម្បីធ្វើអាជីវកម្មស្បែកដោយខុសច្បាប់ ព្រមទាំងចំនួនដែលមានតិចតួចស្រាប់ ផង វានាំអោយកិរិតនៃការបាត់បង់មានកិរិតកាន់តែខ្ពស់ឡើង។ យើងសូមផ្តល់អនុសាសន៏ថា ត្រូវចាត់វិធាន ការណ៏ជាបន្ទាន់ក្នុងការការពារ និងសង្គ្រោះភេប្រភេទនេះអោយជៀសផុតពីការបាត់បង់ផុតពូជនាពេលអនាគតដ៏ខ្លី។

Vietnamese:

Rái cá lông mũi (*Lutra sumatrana*) là một trong 13 loài rái cá hiếm và rất ít thông tin về chúng. Trong cuốn sách này, chúng tôi giới thiệu những thông tin được tổng hợp gần đây về loài rái cá này, về phân bố hiện nay và trước đây của loài và những đe dọa đến sự tồn tại của loài, các thông tin này trích dẫn từ các tài liệu đã xuất bản cũng như các điều tra hiện đang tiến hành. Chúng tôi cho rằng loài rái cá này đang gặp nhiều nguy hiểm do môi trường sống bị hủy hoại nghiêm trọng trên diện rộng và do việc săn bắt bất hợp pháp để lấy da đã gây áp lực liên tục lên những quần thể nhỏ, rải rác còn sót lại. Chúng tôi đề xuất những hành động trực tiếp và ngay lập tức để cứu lấy loài rái cá này trước hiểm họa tuyệt chủng của loài trong tương lai gần.

Thai:

นากใหญ่จมูกขนเป็นนากชนิดที่หายากที่สุดและมีข้อมูลอยู่น้อยที่สุดในจำนวนนากทั้ง 13 ชนิด บทความนี้ได้นำเสนอข้อมูลที่มีอยู่ในปัจจุบันและในอดีต รวมทั้งข้อมูลการแพร่กระจายและปัจจัยคุกคามต่อนาก ข้อมูลเหล่านี้ได้มาจากการรวบรวมเอกสารอ้างอิงและจากการสำรวจที่ยังดำเนินการอยู่ เราเชื่อว่าสถานภาพของนากใหญ่จมูกขนในอนาคตกำลังถูกคุกคามเนื่องจากถิ่นอาศัยในภาพรวมทั้งหมดกำลังเสื่อมโทรมและผลจากการล่าเพื่อการค้าหนัง เป็นเหตุให้เกิดเป็นประชากรขนาดเล็กในพื้นที่อาศัยที่เสมือนเป็นเกาะที่จึงไม่มีความยั่งยืน เราจึงสนับสนุนให้มีมาตราการเร่งด่วนในการอนุรักษ์นากใหญ่จมูกขนก่อนที่มันจะสูญพันธุ์ไปในอนาคต

REPORT

A SPECIMEN OF HAIRY-NOSED OTTER *Lutra sumatrana* FROM FAR NORTHERN MYANMAR

Authors' photos to be added later

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Abstract: A skin of a Hairy-nosed Otter *Lutra sumatrana* collected in northern Myanmar (at 26°43′N, 97°58′E; altitude *c*.900 m) on 6 April 1939 and held in the Natural History Museum, London, has remained unpublished. The species's ecology and distribution remain poorly known: this is the first record for Myanmar, was collected *c*.1800 km from the generally accepted range, and is from hill evergreen forest, a very different habitat from the species's current known localities. There is no plausible alternative explanation for the skin at this location other than the species inhabiting the area. Validating the species's presence there may now be impossible, because of massive recent trade-driven declines of all otters there, as are occurring widely in mainland South-east Asia.

Keywords: habitat use, hill evergreen forest, historical record, range extension

INTRODUCTION

The Hairy-nosed Otter *Lutra sumatrana* is a little-known resident of South-east Asia. Standard sources describe its range as southern Thailand, Cambodia, southern Vietnam, peninsular Malaysia, Borneo, Sumatra and associated islands (Pocock, 1941; Medway, 1978; Corbet and Hill, 1992; Wozencraft, 2005). Some sources also list Java (Lekagul and McNeely, 1977; Payne et al., 1985; Foster-Turley et al., 1990), although we know of no primary record from the island, and one lists Laos (Foster-Turley et al., 1990: 111, but *contra* p. 58). Although the species has been predicted to be a possible inhabitant in Laos (Deuve, 1972; Duckworth et al., 1999), there is no published record from that country and we know of no unpublished indications. Surprisingly, given the proximity of southernmost Myanmar (= Burma) to the known Thai range, there has been little published speculation of the species's occurrence there: all that we have traced is the coding on a range map in Foster-Turley et al. (1990: 63) of "no information", the implication being that the species can be expected potentially to occur, or to have occurred, in the country.

The species is currently internationally red-listed as Data Deficient (IUCN, 2007). There were very few records of the species during the 1970s–1980s, and Foster-Turley et al. (1990) wrote that "the distribution of this species is very poorly known, and it is thought to have disappeared from wide areas where it was formerly recorded". This grim assessment has been borne out by the subsequent very few records. Tiny relict populations have recently been discovered in south Thailand

(Kanchanasaka, 2001) and at three sites in the Mekong delta of Vietnam (Nguyen Xuan Dang et al., 2001; Reuther 2003). There are a number of records from Cambodia but little information on distribution or population (Poole, 2003). Records from peninsular Malaysia in 1991 and 1994 were the first since the 1960s (Sebastian, 1995) and the species was rediscovered in Sumatra in 2005 (Lubis, 2005). All these recent authors have testified to the species's current rarity; it is, for example, listed as nationally Critically Endangered in Thailand (Nabhitabhata and Chanard, 2005). There is little or no recent published information on the current status in Borneo, where past records (Payne et al., 1985; Kool and Yakup Nawi, 2005) indicate a wide distribution, at least formerly.

While consolidating information on the carnivore holdings in the Natural History Museum, South Kensington, London (NHM), D.M.H. noticed a specimen of *L. sumatrana* from northern Myanmar, which has remained unpublished under this name: it had been initially identified as Eurasian Otter *Lutra lutra*. Given the current timely resurgence of interest in the species, and the great expansion of known geographic range that this specimen provides, we here place it on record.

THE SPECIMEN

The specimen, BMNH 50.587, was collected at Gam Majaw, in today's Kachin state, Myanmar, on 6 April 1939 by Ronald Kaulback (personal collection number 712). Assigned to this site in the field were co-ordinates of 26°43′N, 97°58′E and an altitude of 3000′ (*c*.900 m). A male, it had been "shot and skinned by native [and taken from a] large jungle stream". There are no measurements, nor was the skull preserved. The Kaulback collection, which contains much vital material (e.g. the most impressive series of the little-known Stripe-backed Weasel *Mustela strigidorsa* from anywhere in the world; Abramov et al., in press) has never been written up as a whole, although the primates and carnivore specimens were referred to in Pocock (1941). We have not traced a collector's log from Kaulback in NHM, but the written correspondence between R. I. Pocock and Kaulback (and some between Pocock and Kaulback's mother) are on file, and give background to the specimens. In August–September 1933, Kaulback had passed through this part of Myanmar, returning from a biological expedition in Tibet in winter 1932–1933 where he had been the map-maker (Kaulback, 1934). A few incidental mammals were collected, and Pocock urged Kaulback to return to the area and collect more, specifically requesting Carnivora "of all sorts from Tigers and Bears to small Cats and Weasels". It seems, from the letters, that Kaulback's return to the area, from mid 1938, had objectives additional to the collection of mammals (he was able to spend only three days per week hunting, and referred to apparently external factors setting his duration in northern Myanmar). The Second World War terminated his visit, intended to last until the end of 1940, in late 1939.

In October 2007 the specimen was carefully investigated for both identity and provenance.

IDENTIFICATION

Most of the rhinarium retains hair, to an extent comparable to the other (n = 11) skin specimens of the species at NHM. On this feature alone, even though many hairs seem to have been lost, the specimen is readily distinguished as a Hairy-nosed Otter from the other three species of otter in Asia (Smooth-coated Otter *Lutrogale perspicillata*, Eurasian Otter and Oriental Small-clawed Otter *Aonyx cinerea*). Most of the specimen's pelage is rich dark brown, similar to other Hairy-nosed Otters,

whereas the other three species are colder in tone. All Asian otters have a pale area on the foreneck, extending to a greater or lesser extent back through the venter. The Gam Majaw specimen has a restricted pale brown foreneck, diffusely demarcated from the darker pelage. The upper lip is extensively pale, up to a line from the nose pad to the eye. The foreneck pattern is not typical of Hairy-nosed Otter, which usually has a patch creamy- or even off-white, relatively sharply demarcated from the surrounding brown and often rather irregular in outline (e.g. Lubis, 2005: Fig. 1). However, the specimen is more similar to other specimens of Hairy-nosed Otter held at NHM in this respect than it is to any specimen of the other species, and other Hairy-nosed Otters have been documented with a similar pattern, e.g. Poole (2003: fig. 3). The pelt (including the whiskers) may have been darkened by the smoking of the skin (presumably for drying it). The other otter collected the same day at Gam Majaw, a Small-clawed Otter (BMNH 50.593), is far darker than it would have been in nature, and has singed muzzle hair and vibrissae.

Pocock (1941) listed this skin as "*Lutra lutra* subsp.?" stating that its fur (which would be atypically dark for *L. lutra*) was "artificially discoloured, apparently by smoke, which blackened the throat". He was preparing his book under time pressure during the war years, may not have had time critically to examine all specimens which came in, and, perhaps most importantly, would have had no prior expectation of finding *L. sumatrana* in northern Myanmar and therefore might have confined his examination to the (easy) exclusion of Smooth-coated and Small-clawed Otters, accounting for oddities in the appearance through the unusual smoke-darkening so instantly apparent on the companion specimen of Small-clawed Otter.

PROVENANCE

The specimen has good data and is part of a large batch, allowing firm deductions over the likelihood of the origin being as stated. Kaulback provided excellent specimen tags, giving site, co-ordinates, altitude, date, origin and field collector's number, in his own hand (verified by comparison with his signature on his letters). The specimen has Kaulback's label, itself a pre-printed NHM tag, and a second label added by the NHM when the skins were catalogued in 1950. Hand-writing on the field tag is original, except the NHM specimen number. There is no taxonomic identification on the field tag, but the NHM label has "Lutra lutra" added, at a different time from the basic information; the ink and hand look the same as that of the specimen number, "50.587". Kaulback generally left the identification blank on his tags, and this specimen's field tag is absolutely typical of the series.

Kaulback visited only far northern Myanmar on this trip, and NHM holds no specimens from him, which demonstrably originated from anywhere else. There seems no possibility that he collected this otter elsewhere and somehow muddled it with a specimen of another species from Gam Majaw. Pocock (1941) examined the specimens as each batch came in, and referred to a specimen of *Lutra* with an unusually dark throat from Gam Majaw. The collection lacks any other *Lutra* specimen from Gam Majaw, so an inadvertent label substitution after arrival at the museum but before formal cataloguing is unlikely. That this specimen came, already prepared, from a local hunter does, however, raise a potential question mark over its origin.

There is now a rapacious trade in wild mammals from Myanmar into China (e.g. Rabinowitz and Saw Tun Khaing, 1998; Davidson, 1999; Martin and Redford, 2000; Shepherd and Nijman, 2007). Trade routes are poorly resolved in Myanmar, but elsewhere in South-east Asia China-bound wildlife travels huge distances, often

crossing multiple international borders (e.g. Nooren and Claridge, 2001; Bell et al., 2004; Karesh et al., 2005). However, it seems inconceivable that a specimen from a remote location in far northern Myanmar in 1939 came from far away. Then, no international laws or treaties drove a clandestine trade route through remote areas, and northern Myanmar is not on any practical route from known Hairy-nosed Otter range to China. There were already sizeable wildlife markets in southern China (e.g. Mell, 1922) but contemporary narratives (e.g. Stanford, 1946) give no suggestion of a bulk, long-distance, route through Myanmar. An otter skin in possession of a rural hunter at this time and place must have been hunted locally. Kaulback found hunting very challenging in the area, and in order to amass specimens, procured them widely from local hunters: all his Stripe-backed Weasels (six skins), Yellow-bellied Weasels *M. kathiah* (five) and other otters (two *L. lutra*, two *Lutrogale* and seven *Aonyx*) were procured, skinned and presented by local hunters. We found no other Kaulback specimens that would suggest non-local origin, i.e. species that do not occur in north Myanmar or, for species showing prominent geographic variation (e.g. various civets), specimens of races inhabiting areas other than north Myanmar. A full analysis of the Kaulback specimens has not yet been made, however, although one is certainly warranted.

THE GAM MAJAW AREA

Kaulback recorded latitude and longitude meticulously, giving his four Stripe-backed Weasels from the river Nam Tamai different, specimen-specific, co-ordinates. Hence, it is unlikely that the specimen originated more than a day's walk from Gam Majaw. The given co-ordinates are only a few miles from the Mali Hka stream, on a ridge above the smaller Hkrang Hka stream. The area is evergreen forest on rugged terrain and, although the Mali Hka is a big stream, there is no flood-plain or swamp-land. A recent visit to the area about ten miles to the north (Khaunglanhpu) found some otter signs, although hunting in the area is doubtless high (Than Zaw et al., 2008; Zaw Win and Saw Htoo Tha Po, *in litt*., 2007). The area apparently remains well forested (image on Google earth, viewed on 12 December 2007). The given altitude is probably reliable: discussions were evidently held with hunters about each specimen, because annotations on the back of field tags describe habitat and collection method. A Stripe-backed Weasel from Gam Majaw on the same day is, for example, has a given altitude of 4000′, while both the day's otters have an altitude of 3000′.

SIGNIFICANCE OF THE RECORD

This record lies *c*.1800 km from the conventionally accepted geographic range of Hairy-nosed Otter, and occurrence in northern Myanmar contrasts with currently known habitat use in mainland South-east Asia: peat-swamp forest (peninsular Malaysia; Sebastian, 1995); *Melaleuca* and evergreen swamp forests (Phru Toa Daeng, southern Thailand; Kanchanasaka 2001); and *Melaleuca* swamp forest with flooded grasslands (U Minh, Vietnam; Nguyen Xuan Dang et al., 2001). Recent Cambodian records, all of animals in captivity or trade, plausibly come from the level lowlands with inundated forests around the Great Lake of Tonle Sap and adjacent coastal plain (Poole, 2003). The recent road-kill in Sumatra was from flooded swamp forest (Lubis, 2005). Historical Vietnam records lack habitat information; there are only three, from two regions (Thomas, 1928), despite Delacour's (1940) statement that the species was "probably common" in central Annam. Two 1977 records came from provinces in the Mekong delta (Nguyen Xuan Dang et al., 2001), which comprise entirely level lowlands, extensively seasonally inundated. Thus, wildlife

surveyors and conservationists currently active in South-east Asia perceive Hairy-nosed Otter as a species of lowland plains, often coastal areas, and especially swamp forests (e.g. Poole, 2003), although records suggest use of interior, hill, habitats in at least Borneo (Medway, 1977; Payne et al., 1985; H. Sasaki, *in litt*., 2007). The record from Gam Majaw indicates occurrence in rugged mid-altitude hill forest, far from lowland plains, and begs the question why the species would not be widespread across mainland South-east Asia. There are so few historical otter records for Laos, Vietnam and Cambodia that absence of records does not imply a historical absence of the species, but there are enough otter specimens from Thailand and Myanmar to suggest that Hairy-nosed Otter was genuinely not widespread in these countries.

There have also been unpublished reports that around 2003 a foreign visitor to the museum of natural history at the Yangon zoo saw an old specimen of Hairy-nosed Otter. A June 2007 examination of all otter specimens at Yangon Zoological Gardens (one stuffed mount on public display and four skins in the private collection) found no Hairy-nosed Otter. The zoo staff explained that specimens that have deteriorated severely are thrown away at an annual stock-check, so it cannot be excluded that previously there was a Hairy-nosed Otter specimen there. A specimen at this zoo would not of itself indicate a Myanmar origin: the museum contained various specimens of other small carnivore species that do not occur in Myanmar.

CONSERVATION CONSIDERATIONS

It will never be possible to establish Hairy-nosed Otter's pre-exploitation mainland range. Otter populations are under rapid decline almost across mainland South-east Asia, through trade-driven hunting. Field records are now rare (e.g. Duckworth, 1997; Roberton, 2007; Than Zaw et al., 2008) and animals (or their parts) move huge distances in trade. Resurveys in 2003–2007 of several parts of Laos surveyed in the mid 1990s show major declines in otters (e.g. Timmins and Robichaud, 2005), and recent surveys of rivers and associated pools found minimal otter populations in north-east Cambodia (Timmins and Men Soryun, 1998) and northern Laos (the Nam Ou; W. G. Robichaud, verbally, 2004). Otters were considered in recent national-level analyses of small carnivores in Vietnam and Myanmar to be the most severely threatened species (Roberton, 2007; Than Zaw et al., 2008), and Poole (2003) expressed grave concern for their future in Cambodia. Regional extinction of one or more otter species in South-east Asia is a real possibility.

Several areas of Myanmar could, on the basis of remaining habitat, potentially support large otter populations, although uncertainty over Hairy-nosed Otter habitat use makes it unclear, which, if any, might support the species. The large Hukaung valley lies west of Gam Majaw, and supports impressive populations of other trade-threatened animals such as Tiger *Panthera tigris* (Lynam et al., 2006, in press). Its extensive network of streams and pools on gentle terrain at 180–320 m might, on current information, be ideal for Hairy-nosed Otter. A large conservation area, the Hukaung Wildlife Sanctuary (6300 km²), was declared in 2004 and a gigantic extension (potentially up to 15,250 km²) is under consideration (Lynam et al., in press). However, otters are almost eradicated from the area (Than Zaw et al., 2008) which faces massive hunting pressure and large-scale habitat conversion. Lower down the Chindwin catchment, the Htamanthi area of forested rivers on plains may still hold relatively good otter numbers (Rabinowitz et al., 1995; Than Zaw et al., 2008), but is scheduled soon to be inundated by a large dam (Su Su et al., in prep.). More conventional Hairy-nosed Otter habitat probably occurs in the Irrawaddy delta, close

to the known range in Thailand. Otters remain unsurveyed in this area, which holds relict populations of much-declined species such as Estuarine Crocodile *Crocodylus porosus* (Thorbjarnarson et al., 2006), so might well also hold otters. These areas warrant priority action to conserve otter habitats, reduce hunting and explode wildlife trade networks.

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RESUME

Un spécimen de loutre de Sumatra (*Lutra sumatrana*) aux confins de la région nord du Myanmar

La loutre de Sumatra (*Lutra sumatrana*) est l'une des treize espèces les plus rares et les moins connue de la sous-famille des Lutrinés. L'état des nos connaissances sur sa biologie, sa distribution historique et actuelle et les menaces pour sa survie sont présentées ici, basées sur la littérature et sur de nouvelles recherches sur le terrain. L'avenir de cette espèce est problématique, en effet la dégradation très étendue de son habitat et la chasse pour le commerce illégale de ses peaux, ont tout deux un effet catastrophique sur la distribution très fragmentée des petits effectifs de sa population.

Des actions urgentes et immédiates seront nécessaires pour sauvegarder cette espèce d'une extinction imminente.

RESUMEN

Un ejemplar de nutria de Sumatra *Lutra sumatrana* del norte de Myanmar

Una piel de nutria de Sumatra *Lutra sumatrana* capturada en el norte de Myanmar (26º 43' N, 97º 58' E; 900 m. de altitud) el seis de abril de 1939 y depositada en el Museo de Historia Natural de Londres ha permanecido sin ser publicada. La ecología y distribución de la especie es poco conocida: este es el primer dato para Myanmar, capturada a unos 1.800 km. de la distribución conocida y aceptada y procede de un bosque perennifolio montano, un hábitat muy diferente al de las localidades de su distribución actual. No existe otra explicación verosímil para este ejemplar que la presencia de la especie en la zona. Validar la presencia de la especie en la actualidad puede ser imposible debido al reciente declive masivo de las otras especies de nutrias de la zona como consecuencia de su comercio, como está sucediendo extensivamente en el sureste del continente asiático.

Myanmar language:

အကျဉ်းချုပ်

၁၉၃၉ ခုနှစ်တွင် မြန်မာနိုင်ငံ မြောက်ပိုင်း (မြောက်လတ္တီတွဒ် ၂၆º၄၃′ ၊ အရှေ့လောင်ဂျီတွဒ် ၉၇º ၅၈′ နှင့် ပင်လယ်ရေမျက်နှာပြင်အထက်အမြင့် ၉၀၀ မီတာ) မှ စုဆောင်းခဲ့သော ဆူမာတြားဖျံ* တစ်ကောင်၏ သားရေကို လန်ဒန် သဘာဝသမိုင်းပြတိုက်တွင် သိမ်းဆည်းထားရှိပြီး ယခုအချိန်ထိ ပုံနှိပ်ထုတ်ဝေထားသောမှတ်တမ်း မရှိခဲ့သေးပါ။ ၄င်းဖျံမျိုးစိတ်၏ ပတ်ဝန်းကျင် ဆက်နွယ်မှုနှင့် ပြန့်နှံ့တည်ရှိမှုကို အနည်းငယ်သာ သိရှိကြပြီး ယေဘူယျအားဖြင့် လက်ခံထားသော ပင်လယ်ရေမျက်နှာပြင်အထက်အမြင့် ၁၈၀၀ ကီလိုမီတာနှင့် ၄င်းဖျံမျိုးစိတ်၏ လက်ရှိပြန့်နှံ့တည်ရှိသောဒေသများနှင့် ကွဲပြားခြားနားသော ကျက်စားရာဒေသ တောင်ပေါ်အမြစိမ်းသစ်တောမှ စုဆောင်းခဲ့ခြင်းဖြစ်ပြီး ၄င်းမှတ်တမ်းမှာ မြန်မာနိုင်ငံအတွက် ပထမဆုံးမှတ်တမ်းဖြစ်ပါသည်။ ဖော်ပြပါ သားရေသည် ၄င်းဒေသတွင် ဤဖျံမျိုးစိတ် ပြန့်နှံ့ကျက်စားခဲ့သည်ကို သက်သေပြနိုင်ခဲ့ပြီး ထိုထက် ပို၍ခိုင်လုံသော အခြားရှင်းလင်းချက်မရှိပါ။ အရှေ့တောင်အာရှတွင် ကျယ်ပြန့်စွာ ပြန့်နှံ့ကျက်စားခဲ့သော်လည်း လက်ရှိတွင် တောရိုင်းတိရစ္ဆာန် အစိတ်အပိုင်းများ အလွန်အကျွံကုန်သွယ်မှုကြောင့် ဖျံမျိုးများ အားလုံး လျော့နည်းလာလျက်ရှိရာ ယခုအချိန်တွင် ၄င်းဖျံမျိုးစိတ်၏တည်ရှိမှုကို အတည်ပြုနိုင်ရန် ခက်ခဲပါသည်။

* မြန်မာနိုင်ငံရှိ မှတ်တမ်းများတွင် အထက်ပါဖျံမျိုးစိတ်၏ မြန်မာအမည်မရှိသဖြင့် ဆူမာတြားဖျံဟူ၍ သားငှက်ထိန်းသိမ်းရေးအဖွဲ့၊ မြန်မာနိုင်ငံအစီအစဉ်မှ အမည်ပေးထားခြင်း ဖြစ်ပါသည်။

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NEW BOOKS

NO RASTRO DA LONTRA BRASILEIRA
(ON THE TRACK OF THE BRAZILIAN OTTER)
CARVALHO JUNIOR

ISBN 978-85-87444-35-6
INSTITUTO EKKO BRASIL
35 REAIS, 112PP

The author is the coordinator of the River Otter Project at the Ekko Brazil Institute. The book is in Brazilian Portuguese.

To obtain a copy, go to the **www.ekkobrasil.org.br**.

Review by Marcelo Rheingantz:

Oldemar Carvalho Jr is one of the most experienced researchers working with the Neotropical Otter *Lontra longicaudis*. This book describes his great work developed in the long term study focusing the species at Lagoa do Peri, Santa Catarina, Brazil. Nowadays, he coordinates the "Instituto Ekko Brasil", with a project for the otters.

His book has a very easy style, suitable for amateurs as for specialists. It is certainly an obligatory book for anyone that is interested in knowing something about this almost unknown and incredible animal, and for anyone who is interest in environmental conservation, specially aquatic.

The most interesting aspect of the book is understanding how to work with *Lontra longicaudis*, explaining the techniques used in his study; and to compare his results in Lagoa do Peri with others developed in other regions. He describes in detail the environment in which he works looking for signs and sightings of Neotropical ottesr.

This book will certainly increase knowledge and interest in studying *Lontra longicaudis*.

C O N G R E S S A N N O U N C E M E N T S

GEWÄSSERENTWICKLUNG UND LEBENSRAUMKORRIDORE FÜR UND MIT DER LEITTIERART FISCHOTTER

March 6-7 2008
Mauth, Germany

The “Wildland - Stiftung Bayern” and the “Ökologische Bildungsstätte Oberfranken” invite you to the Workshop "Gewässerentwicklung und Lebensraumkorridore für und mit der Leittierart Fischotter" (Wetland Development and Corridors with and for Otters as the Key Species) into the Bavarian Forest. The workshop will take place from 6th to 7th of March 2008 at the “Otterhaus” in Mauth.

Please contact the organisation if you want to participate, as the number of participants is limited due to available space.

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ASSOCIATION FOR TROPICAL BIOLOGY AND CONSERVATION (ATBC) SYMPOSIUM

June 9-13, 2008

Paramaribo, Suriname, South America

Dear colleagues,

The next congress of the Association for Tropical Biology and Conservation (ATBC) will be held in Paramaribo-Suriname-South America in June 9-13, 2008. Registrations

are open at **www.atbc2008.org/register/** or **http://www.bayceer.uni-bayreuth.de/atbc2008/**.
We (Pia Parolin and Florian Wittmann) are organizing a symposium on "Tropical wetlands: Diversity, ecophysiological processes and conservation"

Hoping to see you soon in our symposium in Suriname.

Pia

Title: Tropical wetlands: Diversity, ecophysiological processes and conservation

Organizers:

- PIA PAROLIN, University of Hamburg, Biozentrum Klein Flottbek, Dept. Plant Systematics, Germany; **pparolin@botanik.uni-hamburg.de**
- FLORIAN WITTMANN, Max Planck Institute of Chemistry, Biogeochemistry, Mainz, Germany;**F-Wittmann@web.de**

Abstract and goals

Tropical wetlands cover huge areas and belong to the most diverse ecosystems worldwide. They are the habitat for many partially endemic plant and animal species and they are indispensable for hydrological cycles, water resources management, etc. Whether fringed by grasslands or forests, wetlands are the source of many valuable timber and non-timber products and represent the main food source for many fish and mammal species, which in turn are the main protein base for large part of the rural population.

In spite of their ecological importance, wetlands belong to the most threatened ecosystems worldwide as they underlie a severe use conflict by human demands on water supply, timber, agriculture and pasture area, fish and wildlife, wastewater disposal and leisure activities. Biodiversity is especially affected in wetlands, among other reasons because of the recently drastic reduced area of undisturbed sites.

Wetlands are characterized by a high organismic and functional diversity. The occurring gradients (e.g. flood duration and amplitude, sedimentation and erosion, etc.) cause the need for a series of morphological, physiological and anatomical adaptations of the biota inhabiting them. Inundation dynamics create a mosaic of environmental conditions, which are closely linked to the diversity and distribution patterns of wetland species at different spatial and temporal scales. In past and recent scientific research, efforts dealt with the basic understanding of functioning and processes in wetland ecosystems.

The present symposium aims at highlighting the status quo of organistic and functional diversity research, understanding traits of species composition and diversity, ecophysiological processes and adaptation strategies of plant and animal species, and discuss the possibilities of implementation of scientific results into sustainable management and conservation schemes in wetlands.

Some potential topics of the proposed symposium are:

- Organistic, functional and structural diversity: Which databases can be used or created?
- How do wetlands create favourable or adverse conditions for biodiversity?
- Which species traits make organisms successful in wetlands?

- Plant life in oxygen-deficient environments: ecological, physiological and molecular perspectives
- Does biodiversity influence organic matter exchange between aquatic and terrestrial systems?
- Modelling of wetland dynamics
- Interactions between plants and geochemical processes
- Interaction between nitrogen enrichment and global change in wetland ecosystems
- Palaeoecology and long-term wetland function dynamics
- Wetlands for Wastewater Treatment and Pollution Control
- Which are the most important threats to biodiversity and wetland ecosystem services?
- Which conception approaches aid prediction of diversity changes?
- Science-based conservation and social needs: How to combine them in practice?

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26th MUSTELID COLLOQUIUM

28-31 August 2008
Eötvös Loránd University
1117 Budapest, Pázmány Péter s. 1/C
Hungary

The colloquium will include plenary and poster sessions; workshops for special topics also can be organised. Traditionally, a poster competition will be organised for students, the winners will be awarded.
Proposed major topics concerning with the target taxa, Mustelidae:

- Methodology: new aspects for the field work and data evaluation
- Land use dynamics and its changes
- Effects of increasing urbanisation on carnivore communities
- Evaluation of the molecular investigations
- Biogeographical patterns and phylogenetical connections
- Conservation biology and ecology
- Behavioural studies
- Parasitology and diseases of mustelid species.

Organizer and contact person:
Mária Tóth-Ronkay, e-mail: **maria.ronkay@gmail.com**
Web: **http://mustelid2008.elte.hu**

CALLS FOR INFORMATION

DNA OF ASIAN OTTERS

Dear Colleagues

A student at Exeter University has been looking at the genetics of otters from an area of Britain where the population has been substantially augmented from captive breeding stock. It appears that their mitochondrial DNA includes a sequence which is not recorded elsewhere in Britain and that this may help determine the origin of some of these animals. There is a widespread belief that some of the founders may have come from Asia (in particularly the subspecies Lutra lutra barang) and we would be grateful for help in testing this hypothesis.

a) Does anyone know of studies which have been carried out on the mitochondrial DNA of Asian otters in general or L lutra barang in particular. Reference to any published studies or a contact name would be helpful.

b) Can anyone provide tissues from such otters? A hair sample (pulled not cut) is all that is needed.

Replies to me at mammals@chaninweb.co.uk would be very much appreciated.

Thank you very much

Paul
****
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