NOTE FROM THE EDITOR

NOTE FROM THE EDITOR

Dear Friends, Colleagues and Otter Enthusiasts!

This is for many reasons a very special editorial note!

You may have noticed that the website of the IUCN OSG Bulletin has completely changed and is now very much alike the layout, colours, fonts etc. of the website of the IUCN OSG. However, the real difference is that we have now two technically independent websites. The reason for this is very simple – security. As the two websites serve different purposes, have a different target public and therefore have a different security architecture it was simply more secure to have them separated. A loss of all the online available information would have been a disaster. Actually, one of my next projects to be explored is on how the long-term availability via open-source data repositories may be secured.

Lesley has digitalized all remaining issues and now you have free access to all previous issues since the first one published in 1986. As mentioned in a previous editorial our journal is now indexed by Scopus and currently all articles published in 2013 or later are already available and are also counting for your metrics. More of the older issues will be included in the future.

Last year we had for the first time ever 4 issues published in one year and I want to express my sincere thanks to all reviewers and translators of the abstracts. I will put them into the spotlight in one of the later issues of 2019.

Furthermore, I would like to draw your attention to the first manuscript in this issue of Dave Rowe-Rowe, with which he exceeds 50 years of publishing on otters. I think this is a remarkable milestone! Congratulations!

I would like especially to thank Lesley who had a tremendous workload over the last months as she kept the old website alive while already working on the new one behind the scenes.

S H O R T N O T E

DOES THE AFRICAN (CAPE) CLAWLESS OTTER EAT MAMMALS?

David T. ROWE-ROWE

97 Frances Staniland Road, Pietermaritzburg, 3201, South Africa.
dtr.rowe@gmail.com

(Received 20th September 2018, accepted 2nd October 2018)

Abstract: In studies done in southern Africa on the diet of African (Cape) clawless otters *Aonyx capensis* in freshwater habitats, using faecal analysis, the incidence of mammal remains was < 1% to 2% (relative per cent occurrence), and at four localities no traces of mammals were recorded. In a detailed study on the predatory behaviour of *A. capensis* mammals were never killed or eaten, which was also found to be the case in observations on many *A. capensis* by a wildlife rehabilitator. It is suggested that *A. capensis* does not naturally prey on or eat mammals, and that the presence of mammal remains in scats (spraints) can attributed to incidental ingestion by the otter, or the inadvertent inclusion of water mongoose *Atilax paludinosus* scats, similar in appearance to those of the otter, in the sample. As otters in South Africa are often blamed for killing sheep or goats, the information that *A. capensis* does not kill mammals should be used to prevent unnecessary persecution.

Keywords: *Aonyx capensis*, diet, mammal avoidance, southern Africa.

Eleven southern African diet studies done on the African (Cape) clawless otter *Aonyx capensis* in freshwater habitats, using faecal analysis, were reviewed (Rowe-Rowe, 1977a; Butler and du Toit, 1994; Ligthart et al, 1994; Purves et al, 1994; Somers and Purves, 1996; Purves and Sachse, 1998; Perrin and Carugati, 2000; Somers and Nel, 2003; Watson and Lang, 2003; Okes, 2017; Shabel, in litt.). Remains of mammals were recorded in seven of the studies. In six of the seven samples the relative per cent occurrence (RPO) of mammals was < 1% to 2% (Rowe-Rowe, 1977a; Purves et al, 1994; Butler and du Toit, 1994; Somers and Nel, 2003; Watson and Lang, 2003; Okes, 2017), and in the other it was 16% (Ligthart et al 1994). However, during a 19-month period in which I made observations on a captive adult female *A. capensis*, no feeding on mammals was recorded (Rowe-Rowe, 1977b). Numerous prey-capture and food-selection tests were done, and in all instances involving mammals, dead or alive, none were eaten or killed. Neither would the otter eat meat (beef, mutton, pork) or tinned commercial pets' food made from mammal products. I concluded that whereas the fixed action patterns involved in the capture, killing, and eating of crabs, frogs, fish, and birds were released by certain stimuli, the sight or movement of mammals did not provide the stimuli, which released chasing, capture, or killing behaviour. Just as it was found that the African weasel *Poecilogale*

albinucha preyed and fed only on warm-blooded vertebrates (small mammals and small birds on the ground), and even when hungry, would not kill or eat cold-blooded vertebrates or invertebrates (Rowe-Rowe, 1978).

In the field studies done by me (Rowe-Rowe, 1977a) 1361 scats (spraints) were examined. I recorded mammal remains in four scats (< 1% RPO). All were from the same study area in which 863 scats were collected. On one of my visits to this area I came across the posterior half (very fresh) of an olive house snake *Lamprophis inornatus* (non-poisonous constrictor) on the shore of an oxbow lake. At the point at which the snake had been bitten through, there was portion of an adult vlei rat *Otomys irroratus* in its gut. On the same day, at an *A. capensis* holt 200 m away, where I had collected all scats on the previous day, there were two scats which contained remains of both the snake and the vlei rat. So my conclusion was that the vlei rat had been ingested incidentally.

In the other two scats in which I recorded small-mammal remains, I believe that the scats might have been those of a water mongoose *Atilax paludinosus*. Their scats are similar in appearance to those of *A. capensis* (Rowe-Rowe, 1992, 2011), and in the study area there were some spraint sites that were used by clawless otters, spotted-necked otters *Hydrictis maculicollis*, and water mongooses (Rowe-Rowe, 1992). Furthermore, mammals comprise on average 17% (RPO) of the water mongoose's diet at freshwater habitats in southern Africa (Rowe-Rowe and Somers, 1998). Perhaps other researchers have made the same error that I probably did, and included water mongoose scats in their samples.

In January 2018 I made an appeal to all Otter Specialist Group members, asking whether anyone was able to provide conclusive proof that *A. capensis* feeds on mammals; or whether *A. capensis* had ever been seen killing or eating a mammal. The response was that mammal predation had not been witnessed. Michael Somers (in litt.) agreed that it was very likely that the very low occurrence of mammals in the samples was owing to misidentification of scats, for the reasons given above: both species using the same spraint site, the similar appearance and size of the scats, and furthermore he believes that contamination of otter scats with hairs from scats of water mongoose is also a possibility. The 16% RPO of mammals in the investigation done by Ligthart et al (1994) is an anomaly. My opinion is that it is the result of misidentification of scats, possibly owing to the investigators' a lack of field experience with otters and water mongooses at the time.

OSG member Nicci Wright (in litt.), an experienced wildlife rehabilitator, found that both hand-reared and wild *A. capensis* ate all of the natural foods offered (crabs, frogs, fish, birds, reptiles, insects), but never ate mice; agreeing with my hypothesis that mammals do not elicit feeding responses.

My conclusion is that there is no evidence that *Aonyx capensis* preys on or eats mammals, and that all of the records of mammals in the diets referred to above are either the result of incidental ingestion or misidentification of the faecal samples.

In South Africa predation by wildlife on domestic livestock (sheep and goats) is a very emotional issue. The main predators on these farm animals have been shown to be mainly black-backed jackals *Canis mesomelas*, caracal *Felis caracal*, and domestic dogs *Canis familiaris*. However, farmers blame many other carnivores, including clawless otters. In some of the diet studies referred to in the first paragraph, above, scats were collected on farms, and no evidence of predation on sheep or goats was found. A detailed study of predation on livestock on farms in western KwaZulu-Natal, South Africa, was undertaken by Roberts (1986). This is a highland region which receives a high rainfall and is well watered by four major rivers, numerous streams,

and impoundments (farm dams), therefore providing much suitable otter habitat: clawless otters being rated as fairly common in the area. Roberts's investigation involved examining all reported predation casualties and conducting post-mortem examinations. Predators responsible for the deaths were identified from their killing and feeding patterns, as well as the distance between canine punctures in the skin. In total Roberts examined 395 sheep carcases. Deaths were attributed to black-backed jackals (13%), caracals (2%), and domestic dogs (83%), with no evidence of predation by otters.

I believe that Roberts's findings, considered together with my conclusion that *A. capensis* does not kill or eat mammals, has important implications for the conservation of this otter. Nature conservation officers, and both wildlife and agricultural extension officials should take note of this information, and use it to inform livestock farmers, thus helping prevent unwarranted persecution of otters.

There are, however, some farm animals that *A. capensis* occasionally preys on, namely domestic fowls, ducks, and geese (Stuart, 1981; Lynch, 1983). These raids usually occur during dry periods when stream levels are low and the otters then visit farm dams and farmyards.

Acknowledgements - I thank all of the OSG members that responded to my request; and special thanks to Nicola Okes, Michael Somers, and Nicci Wright for information, discussion, and suggestions; as well as Alan Shabel for the detail from his Malawi study.

REFERENCES

Butler, J.R.A., du Toit, J.A. (1994). Diet and conservation status of Cape clawless otters in eastern Zimbabwe. *S. Afr. J. Wildl. Res*. 24: 41-47.

Ligthart, M.F., Nel, J.A.J., Avenant, N.L. (1994). Diet of Cape clawless otters in part of the Breede River system. *S Afr. J. Wildl. Res*. 24: 38-39.

Lynch, **C.D. (1983).** The mammals of the Orange Free State. *Mem. nas. Mus., Bloemfontein* 18: 1-218.

Okes, N.C. (2017). Conservation ecology of the Cape clawless otter, *Aonyx capensis*, in an urban environment. PhD thesis, University of Cape Town.

Perrin, M.R., Carugati, C. (2000). Food habits of coexisting Cape clawless otter and spotted-necked otter in the KwaZulu-Natal Drakensberg, South Africa. *S. Afr. J. Wildl. Res*. 30: 85-92.

Purves, M.G., Sachse, B. (1998). The utilization of freshwater crabs by coexisting otter (*Aonyx capensis* Schinz) and water mongoose (*Atilax paludinosus* Cuvier) in the Drakensberg, South Africa. Unpublished report.

Purves, M.G., Kruuk, H., Nel, J.A.J. (1994). *Potamonautes perlatus* in the diet of otter *Aonyx capensis* and water mongoose *Atilax paludinosus* in a freshwater habitat in South Africa. *Z. Säugetierk*. 59: 332-341.

Roberts, D.H. (1986). Determination of predators responsible for killing small livestock. *S. Afr. J. Wildl. Res*. 16: 150-152.

Rowe-Rowe, D.T. (1977a). Food ecology of otters in Natal, South Africa. *Oikos* 28: 210-219.

Rowe-Rowe, D.T. (1977b). Prey capture and feeding behaviour of South African otters. *Lammergeyer* 23: 13-21.

Rowe-Rowe, D.T. (1978). Comparative prey capture and food studies of South African mustelines. *Mammalia* 42: 175-196.

Rowe-Rowe, D.T. (1992). Survey of South African otters in a freshwater habitat, using sign. *S. Afr. J. Wildl. Res*. 22: 49-55.

Rowe-Rowe, D.T. (2011). Otter surveys: a simple and quick method. 3 pp. africanotternetwork.wordpress.com

Rowe-Rowe, D.T., Somers, M.J. (1998). Diet, foraging behaviour and coexistence of African otters and the water mongoose. *Symp. Zool. Soc. Lond*. 71: 215-217.

Somers, M.J., Nel, J.A.J. (2003). Diet in relation to prey of Cape clawless otters in two rivers in the Western Cape Province, South Africa. *African Zoology* 38: 317-326.

Somers, M.J., Purves, M.G. (1996). Trophic overlap between three syntopic carnivores: Cape clawless otters, spotted-necked otters, and water mongooses. *Afr. J. Ecol*. 34: 158-166.

Stuart, C.T. (1981). Notes on the mammalian carnivores of the Cape Province, South Africa. *Bontebok* 1: 1-58.

Watson, L.H., Lang, A.J. (2003). Diet of Cape clawless otters in Groenvlei Lake, South Africa. *S. Afr. J. Wildl. Res.* 33: 135-137.

RÉSUMÉ

LA LOUTRE À JOUES BLANCHES D'AFRIQUE (CAPE) MANGE-T-ELLE DES MAMMIFÈRES ?

Dans le cadre d'études menées en Afrique australe sur le régime alimentaire des loutres à joues blanches (*Aonyx capensis*) d'Afrique (Cape) des habitats d'eau douce, à l'aide d'analyses des matières fécales, l'incidence de restes de mammifères était de <1% à 2% (pourcentage relatif d'occurrence), et dans quatre localités aucune trace de mammifères n'a été retrouvée. Dans une étude détaillée sur le comportement prédateur d'*A. Capensis*, les mammifères n'ont jamais été tués ou consommés, ce qui a également été constaté lors des observations sur de nombreuses *A. capensis* réalisées par un gestionnaire de la faune. Il est suggéré qu'*A. Capensis* ne s'attaque pas naturellement aux mammifères et ne les mange pas, et que la présence de restes de mammifères dans les excréments (épreintes) peut être attribuée à une ingestion accidentelle par la loutre ou à l'occasion, par inadvertance, la présence d'excréments de mangouste des marais *Atilax paludinosus*, en apparence similaires à ceux de la loutre, dans un échantillon. Comme les loutres d'Afrique du Sud sont souvent accusées d'avoir tué des moutons ou des chèvres, l'information selon laquelle *A. capensis* ne tue pas de mammifères devrait être utilisée pour éviter toute persécution inutile.

RESUMEN

LA NUTRIA SIN GARRAS AFRICANA (DEL CABO) ¿COME MAMÍFEROS?

En estudios hechos en el sur de Africa, sobre la dieta de nutrias sin garras Africanas (del Cabo), *Aonyx capensis*, en hábitats de agua dulce, utilizando el análisis fecal, la incidencia de restos de mamíferos fue entre menos de 1% y 2% (ocurrencia relativa porcentual), y en cuatro localidades no se registraron restos de mamíferos. En un estudio detallado del comportamiento de predación de *A. capensis* nunca se observó que fueran matados ó comidos mamíferos, lo que tampoco se observó nunca por parte de un rehabilitador de fauna que trató con muchas *A. capensis*. Se sugiere que *A. capensis* no preda ni come mamíferos naturalmente, y que la presencia de restos de mamíferos en fecas puede atribuirse a la ingestión incidental por parte de la nutria, ó a la inclusión inadvertidamente de fecas de la mangosta acuática *Atilax paludinosus*, simmilares en apariencia a los de la nutria, en la muestra. Como las nutrias en el Sur de Africa son a menudo culpadas de matar ovejas o cabras, la información de que *A. capensis* no mata mamíferos debería utilizarse para prevenir la persecución innecesaria.

R E P O R T

CITIZEN SCIENCE IN EURASIAN OTTER (*Lutra lutra*) RESEARCH SIGHTING REPORTS AND FINDINGS OF DEAD OTTERS

Katarina LOSO*, Anna ROOS

Department of Environmental Research and Monitoring, Swedish Museum of Natural History, Box 50007, SE-10405 Stockholm Sweden
**Corresponding author: Katarina.Loso@nrm.se*

(received 2nd August 2018, accepted 30th December 2018)

ABSTRACT: Since 2003 the Swedish Museum of Natural History (SMNH) has administered a web page where the general public can report sightings of otters and otter tracks. Between 2003 and 2014 the Museum received 1142 reports. The reports were divided into season and type of sighting: live animals, tracks and group size. Most reports of live animals were received during spring (35%) and only originated near human populations; the data therefore does not represent the whole country. Nevertheless, this type of citizen science provides a great source of information about the elusive otter and increases public awareness of otters, thus helping to support otter conservation.
In Sweden, otters found dead are sent to the SMNH for necropsy and sampling for the Museum's Environmental Specimen Bank. A total of 701 dead otters were sent to SMNH between 2003 and 2014. Most otters were killed in traffic (80%) and some were bycaught in fishing gear (8%). Traffic casualties were more common during autumn and winter, whereas bycatches in fishing gear were most common during summer.
Reports of live otters or otter sign, together with the information about the dead otters, suggest patterns of distribution and reproduction status of otters in Sweden. The reports give interesting additional information on the status and behavior of otters and are valuable complements to scientific otter surveys.

Keywords: *Lutra lutra*, public reports, survey, seasonality, group size, cause of death
Citation: Loso, K and Roos, A (2019). Citizen Science in Eurasian Otter (*Lutra lutra*) Research Sighting Reports and Findings of Dead Otters. *IUCN Otter Spec. Group Bul*l. **36 (1): 7 - 16**

INTRODUCTION

The otter (*Lutra lutra*) in Sweden decreased dramatically in numbers and distribution range during and after the 1950s, due to a combination of intense hunting over a number of years and elevated concentrations of environmental contaminants (Olsson and Sandegren, 1991a, 1991b; Roos et al., 2001). It was protected against hunting in 1969 and still is. PCBs and DDT were banned in the country in the 1970s,

and twenty years after the bans an increase in otter numbers as well as an improved reproductive health among females was observed (Roos et al., 2012). For the last several decades, otters have been surveyed every 5-6 years in various parts of the country, most often by different county boards. The otter is an elusive species, and is often difficult to observe in the wild, which is why surveys are frequently based on otter sign (e.g., scats) and not actual sightings of live animals. The otter does not seem to be too afraid of humans and can be found also in cities in Sweden, *i.e.* close to humans, for example in medium sizes cities like Mora, Linköping, Strängnäs, Kristianstad, Norrtälje and occasionally also in the capital, Stockholm). While otters can be active during the day, they are possible more active at night. Currently, the species is found in most parts of Sweden: in arctic northern Sweden with 24 hours of daylight during summer and darkness during winter, as well as in the most southern parts of the country.

Some people have the privilege of observing otters from their home, others when taking the dog for a walk, or when hunting or birdwatching. Many people realize that they have seen something special and wish to report the sighting. The Swedish Museum of Natural History (SMNH) has been studying otters since 1970s and has received an increasing number of reports by telephone from people who have seen otters once their population began to increase. Therefore, a webpage has been set up by SMNH for documenting sightings by the general public of live otters and tracks of otters. The reports are published on a map on the museum´s webpage (www.nrm.se/utter). The data gives information on where and when otters are seen.

The otter belongs to the State according to a game law from 1974 and, if found dead, should be sent to SMNH for necropsy and sampling. The police as well as the general public help by sending carcasses to SMNH. Information on where and when the carcasses were found is published on the webpage together with the reports of live animals, and is compiled in this study.

MATERIAL AND METHODS

Reports of otters are received via an online web page at SMNH´s homepage, and occasionally via telephone and mail. The required information includes name and contact information of the observer, if the otter is live or dead, tracks of otter, date, location and if live sightings: from what distance, how many individuals, size of the otter(s) and a description of the circumstances and the otter(s) behavior. Some observers also included photos or films with the report (see Figures 2 - 9). Each sighting has been reviewed to exclude other animals, for example mink or beaver, and sometimes several emails back and forth are needed before a report is accepted.

Dead otters are sent, most often frozen, to SMNH via post, with the help of the police, and sometimes private persons, county board, etc. The reports of live animals and information on dead otters are divided into different seasons; winter: December-February, spring: March-May, summer: June-August and autumn: September-November. The information of dead otters are divided into three categories: killed by traffic, drown in fishing gear, found dead from other causes (for example trapped/shot, sick, or unknown).

RESULTS

The museum webpage for reporting sightings of live otters and tracks of otters began in 2003. In the first 2 years (2003-2004) only 15 sightings were reported. Since then, the number of reports has steadily increased, as information about the webpage has spread and as the numbers of otters has increased. Altogether 1142 sightings of

live otters or tracks were reported between 2003 and 2014 and were divided into number of live individuals or signs, as well as by season (Figure 1). In addition to the live sightings, this study also includes information from 701 dead otters that have been found in Sweden and sent to the SMNH between 2003 and 2014 (Figure 1).

Most reports of live otters were received in spring (n=323, 35%), and the lowest number in autumn (n=103, 11%, Table 1). Observations of tracks (Table 2) were highest in winter (n=139, 67%), and lowest in summer (n=3, 1.4%). In contrast, dead otters were mainly found in autumn (n=261, 37%) in decreasing numbers until summer (n=130, 19%, Table 3). The most common cause of death was traffic (n=558, 80%), but some otters were accidentally drowned in fishing gear (n=58, 8%). Most traffic-killed otters were found during autumn and winter, and least number during summer. Instead, in summer the largest number of bycaught otters were found (n=21, 36%). Two juvenile otters were accidently killed in traps for mink, and one subadult otter was shot, all of them during winter.

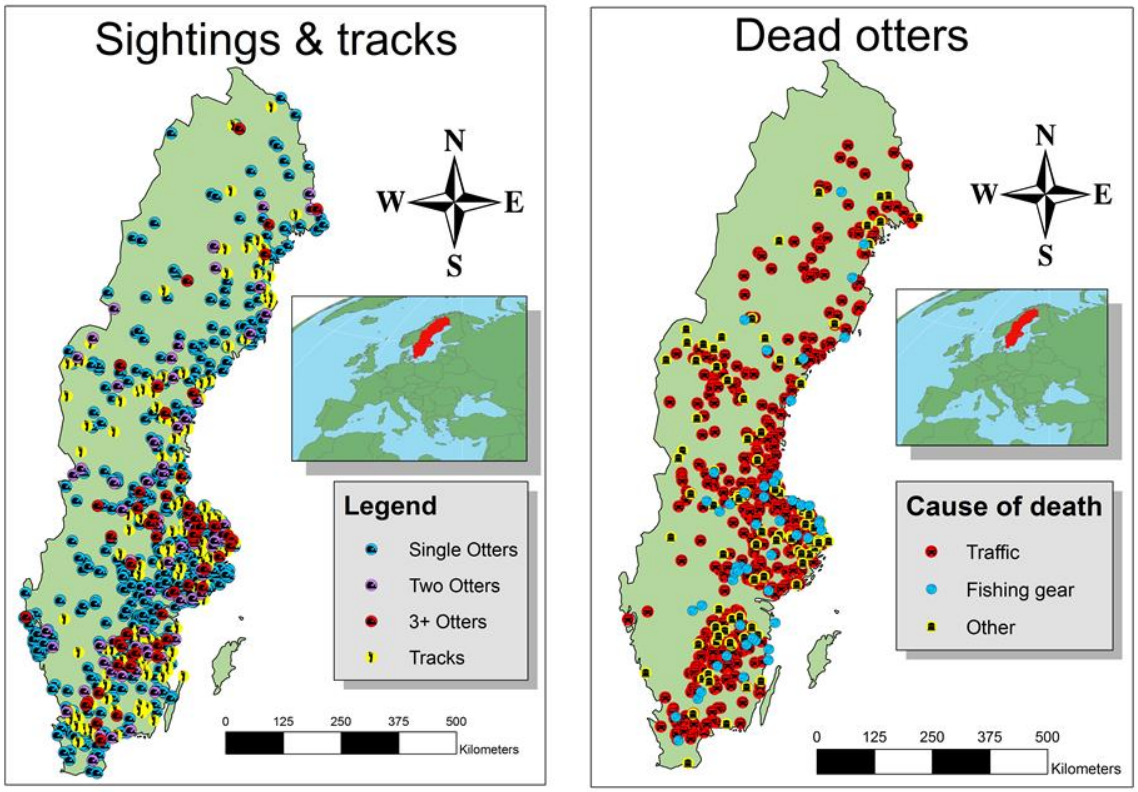

Figure 1. Map of Sweden, showing sightings of live (left) and dead otters (right).

Table 1. Numbers of reports of live otters, 1-5 individuals, during different seasons, altogether 934 reports.

Number live otters	Winter	Spring	Summer	Autumn
1 individual	193	288	214	82
2 individuals	44	26	13	8
3 individuals	30	8	5	12
4-5 individuals	7	1	2	1
Total amount	274	323	234	103

Table 2. Number of observed otter tracks (tracks and scats) divided into different seasons.

Season	Number of tracks
Winter	139
Spring	57
Summer	3
Autumn	9

Figure 2: Otter looking for food, in southern Sweden, in the Baltic, south of Kristianopel. January 16, 2017© Percy Christiansson

Figure 3: otter in Perstorp, Skåne (southern Sweden) February 26, 2018. © Lothar Franke

Figure 4: Abandoned otter cub in Höör, Skåne (Southern Sweden), February 10, 2018. A young male of 1.1 kg. He was rescued the day after by a local zoo (Skånes Djurpark). © Jesper Björk Rengbrandt

Figure 5: Otter in South-Eastern Sweden January 20, 2016© Ingrid Johansson-Hjortvid

Figure 6: Otter mother with two cubs in Lake Solgen, Southern Sweden, March 22, 2018. © Morgan Nilsson

Figure 7: Otter scats with a fishing hook, South-Eastern Sweden. © Ingrid Johansson-Hjortvid

Figure 8: Otter tracks in the snow. © Jasmine Zetterman

Figure 9: Otter tracks in the snow in Aneby, Southern Sweden, January 30, 2018 © Emil Brangenfeldt

DISCUSSION

Citizen science stimulates engagement and interest for a species and can be a useful method in monitoring otters as a complement to standardized surveys. It has been used successfully in, for example, California (Black, 2009; Black et al., 2016), New Mexico (Savage and Klingel, 2015), Ireland (White et al., 2013) and Sweden (Kindberg et al., 2009). Depending on the species and the design of the study, it is possible to collect interesting data through citizen science at a low cost and effort. However, a number of problems must be overcome before the data is usable. For example, one problem is determining if a reported observation is the correct species, and another is the bias that comes with opportunistic data collected often in urban areas and scarcely in remote areas.

Table 3. Causes of death of 701 otters sent to the SMNH, 2003-2014.

Cause of death	Winter	Spring	Summer	Autumn	Total
Traffic	126	105	98	229	558
Fishing gear	10	14	21	13	58
Unknown or sick	22	30	11	19	82
Shot	3	0	0	0	3
Total	161	149	130	261	701

In the present study, most sightings of live otters were reported during spring and winter. The reason for this is probably attributed to the fact that otters are easier

to see during this period due to snow cover; a dark body is easier to spot against a light background. In addition, the otter needs open water to forage and it is therefore easier to observe otters in a limited area when most lakes are covered with ice. The otter in Sweden seems to be more mobile during autumn, since the number of traffic killed otters increase during that time compared to the other seasons. Grogan et al. (2013) point out that rush hour is an important reason for the seasonality of road-killed otters in the UK. In spring and autumn, rush hour traffic occurs around dawn or dusk, while in winter rush hour is after dark and in summer, it is in daylight. They argue that a dip of traffic casualties during winter could be the result of observers travelling in the dark. However, our data only partly support this hypothesis. We recorded a dip in traffic casualties during spring and summer. Most otters in the present study were killed in traffic during autumn and winter. A somewhat different pattern was found in a study on otters in Israel: 64% of otter roadkills occurred in winter and spring (Guter et al., 2005) compared with 41% in the present study. Nevertheless, traffic was by far the predominant cause of death among otters sent to SMNH, and in other studies as well (citations?). However, traffic is probably an overestimated cause of death, since otters that die from natural causes are not as likely to be found. The percentage of traffic-killed otters in this study (80%) is higher, for example, than in Denmark (45,5%, Madsen et al., 1999) and Germany (69,9%, Hauer et al., 2002) but efforts to collect otter carcasses vary between countries and data are not comparable.

A small peak of the numbers of otters found dead in fishing gear during the summer is observed, probably due to the fact that people fish more during summer. Otters were predominantly found as bycatch in fyke nets, but occasionally also in gillnets. One otter was shot, which is illegal in Sweden. Although this otter may have been mistaken for a mink, a few otters are illegally shot at in Sweden (Ågren et al., 2015).

A weak pattern in numbers of individuals killed can be seen during different seasons. Throughout the year most reports consist of single otters (83%). Reports of two individuals are highest during winter and spring, but groups of 3-4 individuals are most common during winter. Groups of 5 individuals have only been reported two times, once during the summer and once in autumn. Groups of two otters could consist of breeding pairs or a mother with her cub. A group of 3-5 individuals is probably a mother with cubs. Groups of 2-5 individuals were reported throughout the year. This is consistent with signs of year-round reproduction, such as placenta scars, lactatation or pregnancies, observed from necropsies of otters at SMNH (Elmeros and Roos, 2011). In a study from England and Wales, otter pregnancies were also observed during most of the year and lactation during the whole year (Chadwick and Sherrard-Smith, 2010). Watt (1993) suggests that in areas where cubs have a longer dependence period, females have longer periods between mating (more than 12 months). If this is the case, it is important for the female to be able to reproduce during the whole year, as seen in Sweden, and not only during a short period.

It is difficult to see differences in mortality in patterns of gender and age among otters. This restricts speculation about the main period for mating and family constellations from this type of data. However, there is a pattern in the reports concerning numbers of individuals and season, which provides a good start to which raises new questions for further research. Data collected through citizen science, together with other observations such as signs of gestation from necropsies, can give a better picture about otter in Sweden.

It is important to keep in mind that these reports are correlated to the density of interested observers and does not accurately represent otter occurrence in the whole country. This makes it difficult to know if absence of data in certain areas is due to a lack of observations or because otters are not present. Therefore, standardized surveys are very important and cannot be replaced by opportunistic reports from the public. But when the public gets the opportunity to report their sightings and receive a response, it is possible to create an engagement and interest in otters and simultaneously to collect valuable data.

ACKNOWLEDGEMENTS - We wish to thank all the numerous people who have reported sightings of otters and those who have sent in carcasses to us. The police have been very helpful, as well as the taxidermists at the museum who first received the carcasses. We also want to thank Professor Sven O. Kullander who has helped with the web page and Douglas Jones who helped us check the language, both at SMNH. Finally, we want to thank Francisco Perera Rider for drawing the maps.

REFERENCES

Ågren, E.O., Bröjer, C., Roos, A. (2015). Evidence of shotgun wounded otters (*Lutra lutra*) in Sweden. *European Otter Workshop, Stockholm, Sweden June 8-10.*

Black, J.M. (2009). River otter monitoring by citizen science volunteers in Northern California: Social groups and litter size. *Northwestern Naturalist* **90**:130-135.

Black, J.M., Wampole, E., Myer, J.E. (2016). Fifteen Years of River Otter Monitoring by Citizen-Science Volunteers in Northern California: Litter Size. *Northwestern Naturalist* **97**:226-236. https://doi-org.ezproxy.its.uu.se/10.1898/NWN16-02.1

Chadwick, E.A., Sherrard-Smith, E. (2010). Pregnancy among otters (*Lutra lutra*) found dead in England and Wales: Foetal Development and lack of seasonality. *IUCN Otter Specialist Group Bulletin* **27**: 33-41.

Grogan, A., Green, R., Rushton, S. (2013). The impacts of roads on Eurasian otters (*Lutra lutra*). *IUCN Otter Spec. Group Bull.* **30**: 44-58.

Guter, A., Dolev, A., Saltz, D., Kronfeld-Schor, N. (2005). Temporal and spatial influences on road mortality in otters: Conservation implications. *Israel Journal of Zoology* **51**: 199-207. DOI: 10.1560/3TF7-7B74-QWKC-6WV1

Elmeros, M., Roos, A. (2011). Reproductive timing in Eurasian Otter *Lutra lutra* along a climate gradient. *Hystrix, the Italian Journal of Mammalogy* 22 Special issue: Proceedings of the IUCN XI International Otter Colloquium.

Hauer, S., Ansorge, H., Zinke, O. (2002). Mortality patterns of otters (*Lutra lutra*) from eastern Germany. *Journal of Zool., London*. **256**: 361-368.

Kindberg, J., Ericsson, G., Swenson, J.E. (2009). Monitoring rare or elusive large mammals using effort-corrected voluntary observers. *Biological Conservation* **142**: 159-165.

Madsen, A.B., Dietz, H.H., Henriksen, P., Clausen, B. (1999). Survey of Danish free living otters *Lutra lutra* – a consecutive collection and necropsy of dead bodies. *IUCN Otter Spec. Group Bull.* **16**: 65-76.

Olsson, M., Sandegren, F. (1991a). Is PCB partly responsible for the decline of the otter in Europe? In: **Reuter, C., Röchert, R.** (Eds.). *Habitat, Hankensbüttel, Germany*, 223-227.

Olsson, M., Sandegren, F. (1991b). Otter survival and toxic chemicals – implication for otter conservation programmes. In: **Reuter, C., Röchert, R.** (Eds.). *Habitat, Hankensbüttel, Germany:* 191-200.

Roos, A.M., Bäcklin, B.-M., Helander, B.O., Rigét, F.F., Eriksson, U.C. (2012). Improved reproductive success in otters (*Lutra lutra*), grey seals (*Halichoerus grypus*) and sea eagles (*Haliaeetus albicilla*) from Sweden in relation to concentrations of organochlorine contaminants. *Environmental Pollution* **170:** 268-275.

Roos. A., Greyerz. E., Olsson. M., Sandegren. F. (2001). The otter (*Lutra lutra*) in Sweden - population trends in relation to ΣDDT and total PCB concentrations during 1968–99. *Environmental Pollution* **111**: 457-469.

Savage, M., Klingel, J. (2015). Citizen monitoring after an otter restoration (*Lontra canadensis*) in New Mexico, USA. *IUCN Otter Spec. Group Bull.* **32**: 21-24.

Watt, J.P. (1993). Ontogeny of hunting behavior of otters (*Lutra lutra*) in a marine environment. *Symposia of Zoological Society of London*, **65**: 87-104. In Kruuk. H., 1995: Wild Otters – Predation and Populations.

White, S., O´Neill, D., O´Meara, D.B., Shores, C., O´Reilly, C., Harrington, A.P., Weyman, G., Sleeman, D.P. (2013). A non-invasive genetic survey of otters (*Lutra lutra*) in an urban environment: a pilot study with citizen scientists. *IUCN Otter Spec. Group Bull*, **30** (2).

RÉSUMÉ

LA «SCIENCE CITOYENNE» DANS LA RECHERCHE SUR LA LOUTRE EURASIENNE (*Lutra lutra*), RAPPORTS D'OBSERVATIONS ET DÉCOUVERTE DE LOUTRES MORTES

Depuis 2003, le Musée d'Histoire Naturelle Suédois (MHNS) gère une page du site internet où le public peut signaler des observations et des traces de loutre. Entre 2003 et 2014, le musée a reçu 1142 rapports d'observations. Ces observations ont été répertoriées suivant la saison et le type d'observation : animaux vivants, traces et taille du groupe. La plupart des observations d'animaux vivants ont eu lieu au printemps (35%) et provenaient uniquement de sites proches de populations humaines; Ces données ne concernent donc pas l'ensemble du pays. Néanmoins, ce type de « science citoyenne » constitue une excellente source d'informations sur l'insaisissable loutre et sensibilise davantage le public aux loutres, contribuant ainsi à soutenir la protection de l'espèce.

En Suède, les loutres trouvées mortes sont envoyées au MHNS pour autopsie et échantillonnage destiné à la banque de données environnemental des spécimens du musée. Au total, 701 loutres mortes ont été envoyées au MHNS entre 2003 et 2014. La plupart des loutres ont été tuées dans des accidents de la route (80%) et certaines ont été capturées dans des engins de pêche (8%). Les accidents de la route étaient plus fréquents en automne et en hiver, alors que les captures dans les engins de pêche l'étaient davantage en été.

Les rapports d'observations de loutres vivantes ou d'indices de présence, ainsi que les informations sur les loutres mortes, suggèrent des schémas de répartition et un statut de reproduction des loutres en Suède. Ces rapports fournissent des informations complémentaires intéressantes sur le statut et le comportement des loutres et constituent des compléments appréciables aux suivis scientifiques des loutres.

RESUMEN

CIENCIA CIUDADANA EN LA INVESTIGACIÓN DE NUTRIAS (*Lutra lutra*) REPORTES DE AVISTAJES Y HALLAZGOS DE NUTRIAS MUERTAS

Desde 2003 el Museo Sueco de Historia Natural (SMNH) ha administrado una página web en la cual el público general puede reportar avistajes de nutrias y huellas de nutrias. Entre 2003 y 2014 el Museo recibió 1142 reportes. Los reportes fueron divididos entre estaciones, y tipo de avistaje: animales vivos, huellas y tamaño de grupo. La mayoría de los reportes de animales vivos fueron recibidos durante la primavera (35%) y se originaron solamente cerca de poblaciones humanas; los datos, por lo tanto, no representan a todo el país. Sin embargo, este tipo de ciencia ciudadana provee una gran fuente de información acerca de la elusiva nutria, e incrementa la sensibilidad pública hacia las nutrias, por lo tanto ayudando a apoyar su conservación.

En Suecia, las nutrias encontradas muertas son enviadas al SMNH para necropsia y toma de muestras para el Banco de Especímenes Ambientales del Museo. Entre 2003 y 2014 fueron enviadas un total de 701 nutrias muertas. La mayoría fue muerta por tráfico automotor (80%) y algunas fueron capturadas incidentalmente en artes de pesca (8%). Las muertes por tráfico automotor fueron más comunes durante el otoño e invierno, mientras que las capturas incidentales en artes de pesca fueron más comunes durante el verano.

Los reportes de nutrias vivas y de signos, junto con la información sobre nutrias muertas, sugieren patrones de distribución y status reproductivos de las nutrias en Suecia. Dan una interesante información adicional sobre el status y el comportamiento de las nutrias y son valiosos complementos de los relevamientos científicos.

R E P O R T

NEOTROPICAL OTTERS AS PROMOTERS OF ENVIRONMENTAL AWARENESS

Sofia V. DIAS[1], Luciano M. VERDADE[2], Bárbara PRADO[3], Victor ZANETTI[4,5], Nain ALMEIDA[5], Margarida SANTOS-REIS[1], Nuno M. PEDROSO[1,2]

[1] *cE3c – Centre for Ecology, Evolution and Environmental Changes, Faculty of Sciences, University of Lisbon. Ed. C2, Campo Grande, 1749-016 Lisbon, Portugal.*
e-mail: ana.sofia.dias@campus.ul.pt
[2] *CENA – University of São Paulo, Piracicaba, SP, Brazil*
[3] *São Paulo Forestry Institute – Angatuba Ecological Station, Angatuba, SP, Brazil*
[4] *Orestes Oris de Albuquerque and Ivens Vieira State Schools, Angatuba, SP, Brazil*
[5] *NGO Ecoroad, Angatuba, SP, Brazil*

(Received 10th February 2018, accepted 30th December 2018)

Abstract: Otter species can be used as flagship to promote the protection of aquatic environments in regions where they are known or regularly seen. In a previous study on the perceptions of local communities about the Neotropical otter (*Lontra longicaudis*) in Central-South São Paulo State, Brazil, we identified knowledge gaps and population groups with potential for conflict with the species. We also assessed the species local distribution and found that habitat quality was deteriorating, due to aquatic contamination by urban waste and antibiotics and destruction of the riparian vegetation. To tackle this situation, with financial support from the National Geographic Society, we designed and implemented an awareness campaign having the Neotropical otter as a flagship species ("Projeto Neolontra"). The project goals were to: i) raise awareness on aquatic species and habitats valuing the previews information given by the population; ii) prevent the intensification of human-otter conflicts; and, additionally, iii) complete the assessment of otter distribution in the region, building on local knowledge and field campaigns. For that we conducted 27 talks to 1337 attendees between August and October 2017 and produced awareness materials (posters, t-shirts, handouts), informally delivering science-based information to local populations. With this project we were able to link societal challenges, biodiversity conservation principles, and education actions, involving local partners and institutions, contributing to empower their role within the community and influencing decision makers on issues such as water use, riparian habitats preservation, urban waste effects, and medications disposal needs.

Keywords: awareness campaigns, local knowledge, *Lontra longicaudis*, Projeto Neolontra, Brazil, aquatic environments
Citation: Dias, SV, Verdade, LM, Prado, B, Zanetti, V, Almeida, N, Santos-Reis, M and Pedroso, NM (2019). Neotropical Otters as Promoters of Environmental Awareness *IUCN Otter Spec. Group Bull*. **36** (1): 17 – 27
https://www.iucnosgbull.org/Volume36/Dias_et_al_2019.html

INTRODUCTION

The knowledge on resource use and practices by local populations can be an important input for scientific or educational studies (Crepaldi and Peixoto, 2010). Their active involvement in these studies can help researchers and conservation practitioners to adapt conservation programs to benefit both biodiversity and local communities (Conway et al., 2015).

The participation of local communities in conservation actions has become increasingly important over the years (Borrini-Feyerabend, 1997). Environmental education actions are growing, seeking development of critical thinkers with knowledge, skills and attitudes necessary for long-term responsible behaviours towards biodiversity (Short, 2010). In most cases, educational actions are species or taxa-specific, these being used as symbols or "flagship", to stimulate conservation awareness and actions from selected audiences **(**Bowen-Jones and Entwistle, 2002). Generally, those flagship species are charismatic and benefit from international recognition - e.g., the lion (*Panthera leo*) or the giant panda (*Ailuropoda melanoleuca*) but may not be perceived as such at a local scale. This is the case of species that have a restricted distribution/abundance, are inconspicuous or negatively affect local communities (e.g. destruction of crops, competition for resources) (Bowen-Jones and Entwistle, 2002; Stevens et al., 2011). In such cases, the use of a species, locally perceived as important, is recommended for the effectiveness of conservation efforts (Bowen-Jones and Entwistle, 2002).

Otters are semi-aquatic mammals, occurring in a wide variety of water bodies such as rivers, lakes, streams, coastal areas or even in the open sea (Kruuk, 2006). They are strictly dependent of aquatic environments, especially because of their diet (composed mainly by fish and crustaceans) (Kruuk, 2006).

Due to the importance of water as an essential resource to mankind, otters, in areas where they are well known or regularly seen, can be used as a flagship species to promote the protection of aquatic environments, as they usually generate positive reactions from people (e.g. Bright and Morris, 2000; Bath and Farmer 2002), being considered playful, cute and attractive animals (Chanin, 1985; Cohn, 1998; Kruuk, 2006). However, in areas where fishing or fish farming activities are significant, and otters are abundant, public opinion diverges due to predation upon fish and shellfish species (Freitas et al., 2007; Václavíková et al., 2011). Differences in perception between regions or population groups, indicate that the assessment of otter species as a proper flagship species is a necessary step before the implantation of environmental or awareness actions (e.g. Norris and Michalski, 2009).

The use of otters as flagship species can be exemplified in different parts of the world. In Peru, Schenck et al. (1999) and Groenendijk and Hajek (2004) reported on the use of the giant otter (*Pteronura brasiliensis*) as a flagship species to highlight importance of water bodies, also using educational material (e.g. posters, handouts and educational slide packs). In Europe, the Eurasian otter (*Lutra lutra*) is extensively used as a flagship species (Bifolchi and Lodé, 2005; Kruuk, 2006; Stevens et al., 2011) and many biodiversity action plans include the use of otters as flagship species to promote protection of aquatic environments (Stevens et al., 2011).

In a previous study, conducted during 2015 and 2016 in the São Paulo State, Brazil (Dias 2016), we focused on the Neotropical otter, *Lontra longicaudis*, considered "Near Threatened", both by the International Union for Conservation of Nature (IUCN) (Rheingantz and Trinca, 2015) and the Brazilian government (Rodrigues et al., 2013). The São Paulo State is the most densely populated and developed state of Brazil, where ecosystems face serious pressures such as deforestation, water pollution and riverine vegetation degradation (Lyra-Jorge et al., 2008). We collected information about the species combining interviews to locals (mostly fishermen and small pond users) and field surveys (foot or boat transects for otter sign detection in rivers, streams and ponds). Besides evaluating the knowledge on and attitudes towards the otter, interviews provided us complementary and opportunistic information on the species distribution and revealed anthropic threats

for the aquatic environments. Local communities described several interactions with the Neotropical otter (e.g., direct observations of individuals, including predation of fish in nets), and revealed knowledge on the species habits, but also misconceptions such as the amount of fish consumed by individual otters or its protection status. A potential conflict emerged with fishermen and small pond users, since these are stocked with fish and act as attraction points for otters. We also identified local threats to the species, namely aquatic contamination by urban waste and riparian degradation (Dias, 2016). Additionally, we proved the presence of antimicrobial resistant bacteria in otter faeces, resulting from aquatic contamination by local cattle and poultry (Semedo-Lemsaddek et al., 2018).

The need of changing attitudes towards the otter and the aquatic environments motivated us to write a project proposal ("Projeto Neolontra – Otter in human-altered environments: changing attitudes"), submitted for funding to National Geographic Society - Early Career Grants, with three main aims: raise awareness on aquatic species and habitats, valuing the information previously given by the population; prevent the intensification of human-otter conflicts; and complete the assessment of otter distribution in the region. This project was developed with the communities of the same geographical area of the previous study (Dias, 2016).

METHODS

Projeto Neolontra, conducted between August and October 2017, focused on awareness and educational actions, to promote the conservation of the Neotropical otter and its habitat in Angatuba, Guareí and Campina do Monte Alegre municipalities (São Paulo, Brazil) (Fig. 1).

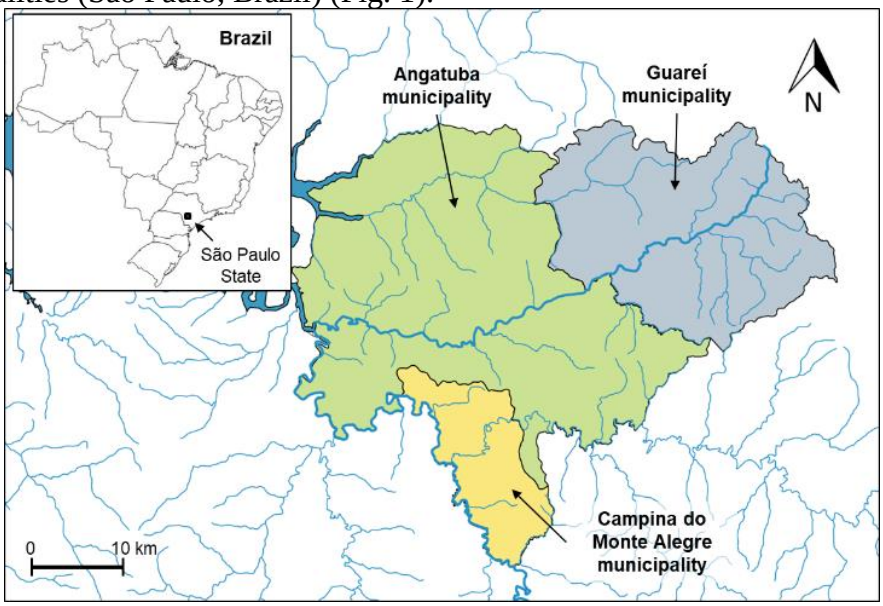

Figure 1. Municipalities in São Paulo State, Brazil, included in the project actions. The blue lines represent the river basins.

The approach followed consisted of a series of talks to a diverse audience and population sectors of the local communities (e.g. fishermen and small pond users). Detailed information was provided about the Neotropical otter, targeting in particular the previously identified misconceptions about the species (e.g. that the otter is not a protected species and that it consumes around 4-6kg of fish per day, when in fact consumes about 10% of its body-weight (Kruuk, 2006) (otters weigh between 7kg to 14kg – Almeida and Pereira, 2017). We disseminated scientific information about

aquatic species and habitats that most of the local population do not have access (e.g. importance of water quality, consequences of deforestation caused by agriculture, and effects of antibiotics diffusion in the aquatic systems) and promoted good practices related to waste management, aquatic and riparian preservation, and management of small ponds.

The talks were organized in the main locations where previous interviews were conducted, but also in schools and local universities (Table 1).

Table 1. Audience and number of project talks

Audience	Number of talks
Elementary schools (7th grade students)	7
High schools (High school students)	10
Universities (Bachelor and Master students)	2
Villages (general public, fishermen and users of small ponds)	8
TOTAL	27

Stakeholders meetings were conducted with the support of Angatuba Ecological Station (henceforth EEcA, based on the Portuguese acronym of "Estação Ecológica de Angatuba"), with the presence of representatives of local governments.

Each of our educational actions were adapted to the specific audience (Table 1), including showing maps of otter presence in the area and nearby focus of aquatic contamination, which resulted from their contribution to our research (data obtained during previous interviews) plus results from our field campaigns.

In addition, we produced posters, handouts about the Neotropical otter and aquatic environments, and otter t-shirts (Fig. 2), to be freely distributed in the end of the talks.

Figure 2. Some team members with otter t-shirt (picture in the left - left to right: Luciano M. Verdade, Sofia V. Dias, Victor Zanetti and Nuno M. Pedroso; picture in the right - left to right: Victor Zanetti, Sofia V. Dias, Attendee of the lecture, Nuno M. Pedroso and Bárbara Prado).

Three informative banners were also designed for graphical support in our talks (acting as source of information for the attendees during and after the talk) and outdoor events (acting as a way to attract the public and encourage some further questions about the otter) (Fig. 3).

Figure 3. Banners (from left to right: The Neotropical otter, Otter habitat, Good practices towards aquatic environments).

The distributed handouts indicated a list of actions to mitigate further water contamination and pollution, riparian degradation and encourage the recycling of urban waste and the collection of medications and drugs that are no longer used by the population.

In small villages with high prevalence of fishing activities, we also addressed strategies for fishing net placement to avoid otter predation and to prevent the development of conflicts with the otter.

To determine how many attendees had incorrect knowledge about the otter ecology, we conducted a survey about the amount of food ingested per day and the protection status of the species during our lectures. Additionally, we collected additional otter sightings among the attendees of our events and used that information to address new field campaigns in the region to search for otter signs of presence (spraints, burrows, claw marks, footprints) and complement our previous otter distribution data.

A Facebook page was created (https://www.facebook.com/ProjetoNeolontra/), where we posted information about the Neotropical otter, the support material for the talks, dates of events and new records of the species in the area collected by inhabitants.

All the produced education materials and presentations (including their digital versions) were provided to our local partners to be used in future environmental actions and events.

RESULTS

A total of 27 talks were conducted, involving 1337 attendees, a number almost doubling the predicted in the project proposal (Fig. 4 and 5). This result was a consequence of several invitations from teachers, public and private schools and neighbourhood communities along the project implementation. This unexpected attendance also led to the necessity of increasing the number of handouts (1500 instead of 1000 predicted in the project proposal) and t-shirts (120 instead of 100) produced.

Figure 4. Project members and attendees of a talk in Leites village, near Angatuba city.

Figure 5. Talk in Ivens Vieira State School, Angatuba.

In each event, attendees also provide us information about specific areas were the riparian vegetation is decreasing and new threat factors such as the appearance of non-native species of fish that are competing with native ones, unbalancing fish communities.

Regarding the percentage of attendees with incorrect knowledge of the species ecology, in all our lectures at least 50% of the audiences thought that the otter was an important species, but not legally protected and that it ingests up to 6 kg of food per day. Both these aspects are not correct as previously mentioned.

From our field surveys conducted on the basis of otter sightings referred to by the attendees of our events, we were able to confirm 12 (11%) new otter locations (Fig. 6). In two of these we had the opportunity to spot, photograph and film the species (Fig. 7), material used in the following events.

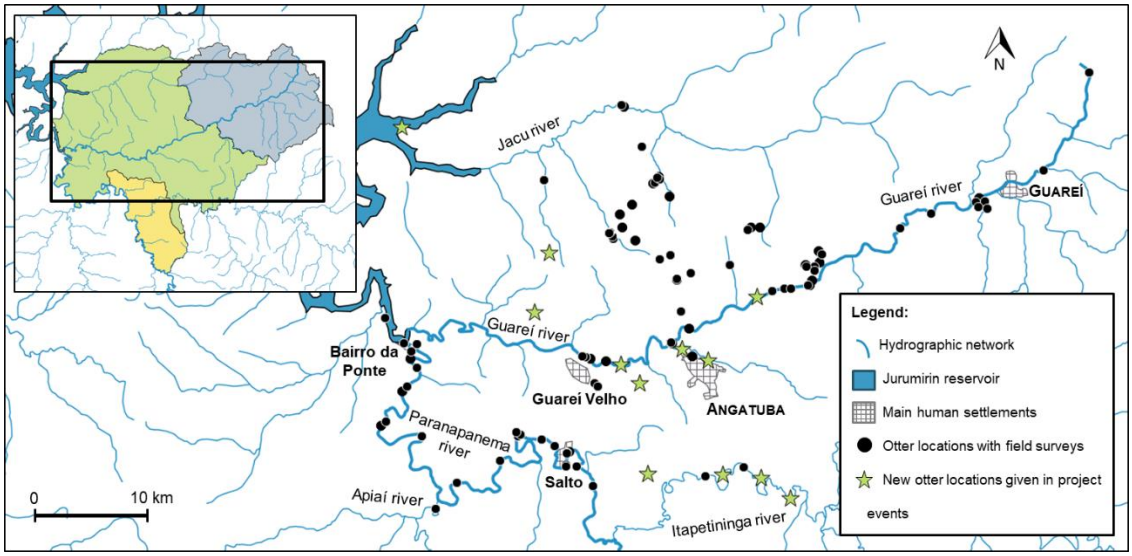

Figure 6. Distribution map of the Neotropical otter in the study region. Green stars represent the new records obtained in the frame of the "Projeto Neolontra".

Figure 7. Neotropical otter observed in Paranapanema river.

Besides talks, six meetings were promoted with stakeholders and local decision makers including mayors, city councilmen and Federal deputies. In the course of these, they were informed about the environmental concerns identified during the course of our work and discussions followed on possible future actions to diminish environmental degradation in the region. Occurrence of antimicrobial resistance in aquatic environments is an important concern of public health, since aquatic environments are used by local inhabitants in their daily tasks (e.g. fishing, transport, leisure, urban use). Several stakeholders and representatives of local governments became especially interested in this matter as they have been informed about how the use of not only antibiotics, but also insecticides and fertilizers may affect aquatic environments and human health by excessive use, runoff from facilities and cattle defecation in rivers. Interest was also shown on further discussions on how to

implement an after-use medication collecting system to mitigate further contamination.

DISCUSSION

This project illustrates how a targeted science-based awareness campaign, involving multiple actions and stakeholders can contribute for the promotion of aquatic environments, explaining how they are very sensitive to anthropic induced changes, but also home of important biodiversity, including the Neotropical otter.

The unexpected increase in the number of invited talks and attendees reflects the success of both using the Neotropical otter as a means for educational campaigns and of our willingness to share the research developed in the region, both welcomed by local partners and the whole community. The percentage of attendees with incorrect knowledge of the species ecology was high (50% in average), before the events, so now around 600 people have a corrected perspective, and in the overall the members of the local communities have access to scientific sound information.

The meetings with stakeholders, including the mayors of Angatuba and Guareí municipalities, city councilmen and Federal deputies from Campina do Monte Alegre and Itapetininga municipalities, resulted not only in possible future actions regarding aspects like urban waste, rational use of water, riparian preservation and medications/drugs disposal, but concretely in the inclusion of some of these issues in the local political programs.

We have contributed for the empowerment of local partners (Ecoroad - local NGO that acts on environmental awareness, teachers and Forest Institute technicians) and promoted their role among local communities, capacitating them to act independently to promote otter conservation and aquatic protection after the end of this project. Our project promoted some immediate agreements and actions from of our local partners: i) inclusion of otter and water systems conservation in school syllabus by teachers (biology classes of 7th graders and high school students); ii) otter monitoring will be performed during the regular river cleaning activities of Ecoroad; and iii) the educational materials produced within the project will be replicated for future awareness campaigns by local partners.

The approaches used in this project revealed to be effective for the area, given the lack of similar awareness actions and the interest demonstrated by the local population (especially students). For example, we confirmed that some students had already transmitted the information at home to their family members, spreading the information of our project and the list of good practices towards aquatic environments and species. After the end of "Projeto Neolontra" the local interest in the Neotropical otter was maintained. For instance, in Angatubas's schools, the students painted walls dedicated to the local fauna, including an area dedicated to the otter and the aquatic environments in particular. An annual drawing contest with the otter as the central piece is also implemented. Additionally, the Neotropical otter became the mascot of the Annual Environmental Forum of Angatuba.

This project is an example on how, with limited funds (4980 USD) and time (one and a half months), it is possible to involve diverse (and sometimes antagonistic) stakeholders in an awareness campaign, contributing to the prevention of possible conflict situations with the Neotropical otter and improve the local knowledge about the species.

Acknowledgements – We would like to thank Caroline Leuchtenberger for providing the photos of the Neotropical otter and giant otter used in our educational material and to Angatuba and Guareí municipality offices for the printing of extra handouts. We acknowledge the logistic support of

Angatuba Ecological Station / São Paulo Forestry Institute (EEcA/IF) and its cooperation along with Ecoroad and Orestes Oris de Albuquerque and Ivens Vieira State Schools of Angatuba in all our events. We thank Ivan Prego Alonso for the Spanish abstract. SVD was supported by an Early Career Grant from National Geographic Society (#WW-073EE-17) and NMP was supported by grant #2014/08601-6, Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP). LMV holds a Productivity Scholarship from Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq, grant # 309468/2011-6).

REFERENCES

Almeida, L.R., Ramos Pereira, M.J. (2017). Ecology and biogeography of the Neotropical otter *Lontra longicaudis*: existing knowledge and open questions. *Mamm Res*. **62**:313–321.

Bath, A., Farmer, L. (2000). Europe's carnivores: A survey of children's attitudes towards wolves, bears and otters. WWF-UK Report. Surrey.

Bifolchi, A., Lodé, T. (2005). Efficiency of conservation shortcuts: an investigation with otters as umbrella species. *Biological Conservation* **126**:523-527

Borrini-Feyerabend, G. (1997). Beyond Fences: Seeking Social Sustainability in Conservation. IUCN, Gland.

Bowen-Jones, E., Entwistle, A. (2002). Identifying appropriate flagship species: the importance of culture and local contexts. *Oryx* **36**:189-195.

Bright, P.W., Morris, P.A. (2000). Rare mammals, research and realpolitik: priorities for biodiversity and ecology? In: **Entwistle, A., Dunstone, N.** (Eds.). Priorities for the conservation of mammalian diversity: has the panda had its day? Cambridge University Press, Cambridge, UK, pp.141-155.

Chanin, P. (1985). The natural history of otters. Facts on File Publications, New York.

Cohn, J.P. (1998). Understanding sea otters: Exxon Valdez oil spill engenders research that sheds light on these cute, cuddly creatures. *Bioscience* **48**:151-155.

Conway, A.L., Hernandez, S.M., Carroll, J.P., Green, G.T., Larson, L. (2015). Local awareness of and attitudes towards the pygmy hippopotamus *Choeropsis liberiensis* in the Moa River Island Complex, Sierra Leone. *Oryx* **49**:550-558.

Crepaldi, M.O.S., Peixoto, A.L. (2009). Use and knowledge of plants by "Quilombolas" as subsidies for conservation efforts in an area of Atlantic Forest in Espírito Santo State, Brazil. *Biodivers. Conserv*. **19**:37-60.

Dias, A.S.V. (2016). The Neotropical otter in southeast Brazil: a socioecological approach. Master Thesis. Faculty of Sciences, University of Lisbon, Lisbon, Portugal. (https://repositorio.ul.pt/bitstream/10451/25638/1/ulfc120619_tm_Ana_Dias.pdf).

Freitas, D., Gomes, J., Luis, T.S., Madruga, L., Marques, C., Baptista, G., Rosalino, L.M., Antunes, P., Santos, R., Santos-Reis, M. (2007). Otters and fish farms in the Sado estuary: Ecological and socio-economic basis of a conflict. *Hydrobiologia* **587**: 51-62.

Groenendijk, J., Hajek, F. (2004). Giant Otter Project in Peru: Field Trip and Activity Report - 2003. *IUCN Otter Spec. Group Bull*. **21(1)**:40-46.

Kruuk, H. (2006). Otters: ecology, behavior, and conservation. Oxford University Press, New York.

Lyra-Jorge, M.C., Ciocheti, G., Pivello, V.R. (2008). Carnivore mammals in a fragmented landscape in northeast of São Paulo State, Brazil. *Biodivers. Conserv*. **17**:1573-1580.

Norris, D., Michalski, F. (2009). Are Otters an Effective Flagship for the Conservation of Riparian Corridors in an Amazon Deforestation Frontier? *IUCN Otter Spec. Group Bull*. **26(2)**:73-77.

Rheingantz, M.L., Trinca, C.S. (2015). *Lontra longicaudis*. IUCN Red List Threatened Species 2017-3. http://dx.doi.org/10.2305/IUCN.UK.2015-2.RLTS.T12304A21937379.en. Last accessed 15 Dec 2017.

Rodrigues, L.D.A., Leuchtenberger, C., Kasper, C.B., Carvalho-Junior, O., Silva, V.C.F. (2013). Avaliação do risco de extinção da Lontra neotropical. *Biodivers. Bras.* **3**:216-227.

Schenck, C., Groenendijk, J., Hajek, F. (1999). Giant Otter Project in Peru: Field Trip and Activity Report - 1998. *IUCN Otter Spec. Group Bull.* **16(1)**:33-43.

Semedo-Lemsaddek, T., Pedroso, N.M., Freire, D., Nunes, T., Tavares, L., Verdade, L.M. Oliveira, M. (2018) Otter fecal enterococci as general indicators of antimicrobial resistance dissemination in aquatic environments. *Ecol. Indic*. **85**:1113-1120.

Short, P. C. (2010). Responsible Environmental Action: Its Role and Status in Environmental Education and Environmental Quality. *J. Environ. Educ.* **41**:7-21.

Stevens, S.S., Organ, J.F., Serfass, T.L. (2011). Otters as Flagships: Social and Cultural Considerations. *IUCN Otter Spec. Group Bull.* **28(A)**:150-161.

Václavíková, M., Václavík, T., Kostkan, V. (2011). Otters vs. fishermen: Stakeholders' perceptions of otter predation and damage compensation in the Czech Republic. *J. Nat. Conserv*. **19**:95-102.

RÉSUMÉ

LES LOUTRES À LONGUE QUEUE, DES PROMOTEURS DE LA SENSIBILISATION À L'ENVIRONNEMENT

Les espèces de loutres peuvent être utilisées comme espèce parapluie pour promouvoir la protection des milieux aquatiques dans les régions où elles sont connues ou régulièrement observées. Dans une étude précédente, sur les perceptions des communautés locales à propos de la loutre à longue queue (*Lontra longicaudis*) dans le centre-sud de l'État de Sao Paulo au Brésil, nous avons identifié des lacunes dans les connaissances et des groupes de population en conflit potentiel avec l'espèce. Nous avons également évalué la distribution locale de l'espèce et constaté que la qualité de l'habitat se détériorait en raison de la contamination des milieux aquatiques par les déchets urbains et les antibiotiques, et la destruction de la végétation rivulaire. Pour faire face à cette situation, avec le soutien financier de la National Geographic Society, nous avons conçu et mis en œuvre une campagne de sensibilisation faisant de la loutre à longue queue une espèce parapluie («Projeto Neolontra»). Les objectifs du projet étaient les suivants: 1) sensibiliser le public aux espèces et habitats aquatiques en valorisant les informations fournies par la population; 2) prévenir l'intensification des conflits entre l'homme et la loutre ; et, de plus, 3) compléter l'évaluation de la répartition de la loutre dans la région, en s'appuyant sur les connaissances locales et les campagnes sur le terrain. Pour cela, nous avons mené 27 entretiens devant 1.337 participants entre août et octobre 2017. Nous avons conçu du matériel de sensibilisation (affiches, t-shirts, documents distribués) et avons fourni de manière informelle des informations scientifiques aux populations locales. Grâce à ce projet, nous avons pu connecter les défis sociétaux, les principes de conservation de la biodiversité et les actions d'éducation, impliquant les partenaires locaux et les institutions, contribuant à renforcer leur rôle au sein de la communauté et influençant les décideurs face à des problèmes tels que la consommation d'eau, la préservation des habitats rivulaires, l'impact des déchets urbains et la nécessité d'éliminer les médicaments.

RESUMEN

NUTRIAS NEOTROPICALES COMO PROMOTORES DE CONCIENCIA AMBIENTAL

Las especies de nutrias pueden ser utilizadas como especies bandera para promover la protección de ambientes acuáticos en regiones donde se les conoce o ve regularmente. En un estudio previo sobre las percepciones de las comunidades locales sobre la nutria neotropical (*Lontra longicaudis*) en el centro-sur del estado de São Paulo (Brasil) identificamos lagunas de conocimiento y grupos de población con potencial conflicto con la especie. Evaluamos también su distribución local, y encontramos que la calidad del hábitat se estaba deteriorando debido a la contaminación acuática (desechos urbanos, antibióticos) y destrucción de vegetación riparia. Para hacer frente a esta situación, con financiación de National Geographic Society, diseñamos e implementamos una campaña de sensibilización con la nutria neotropical como especie bandera ("Projeto Neolontra"). Los objetivos fueron: i) crear conciencia sobre especies y hábitats acuáticos, valorando la información previamente proporcionada por la población; ii) prevenir la intensificación de conflictos hombre-nutria; y, adicionalmente, iii) completar la evaluación de la distribución de nutrias en la región,

aprovechando conocimiento local y campañas de campo. Para eso, realizamos 27 charlas con 1337 asistentes, entre Agosto y Octubre de 2017, y produjimos materiales de concienciación (carteles, camisetas, folletos), entregando informalmente información con base científica a las poblaciones locales. Con este proyecto fuimos capaces de establecer vínculos entre desafíos sociales, principios de conservación de biodiversidad y acciones educativas, involucrando a interlocutores e instituciones locales, contribuyendo así a empoderar su rol en la comunidad e influenciando a los tomadores de decisiones en temas como usos del agua, preservación de hábitats ribereños, efectos de los desechos urbanos y necesidades para la disposición final de medicamentos.

RESUMO

A LONTRA NEOTROPICAL COMO PROMOTORA DE MELHORIA AMBIENTAL

As lontras podem ser usadas como espécies-bandeira para a proteção de ambientes aquáticos em regiões onde sejam conhecidas ou regularmente vistas. Num estudo anterior sobre as perceções de populações locais do Centro-Sul do Estado de São Paulo sobre a lontra Neotropical (*Lontra longicaudis*), identificamos lacunas de conhecimento e grupos populacionais com potencial para o conflito com a espécie. Avaliamos igualmente a distribuição local da espécie e verificámos que a qualidade do habitat está a deteriorar-se, devido à contaminação aquática por resíduos urbanos e antibióticos e à destruição da vegetação ripária. Face a esta situação, com o apoio financeiro da National Geographic Society, idealizamos e implementámos um projeto de consciencialização com a lontra Neotropical como espécie-bandeira ("Projeto Neolontra"). Os objetivos deste projeto foram: i) aumentar o conhecimento sobre a espécie e habitats aquáticos, valorizando as informações previamente fornecidas pela população local; ii) prevenir conflitos entre as populações humanas e a lontra; e, iii) completar a avaliação da distribuição da lontra na região, com base em informação local e campanhas de campo. Para tal, efetuamos 27 palestras para 1337 participantes e produzimos materiais educativos (*posters*, t-shirts, folhetos), fornecendo informação científica simplificada às populações locais. Com este projeto, foi possível aliar desafios sociais, princípios de conservação da biodiversidade e ações de educação, envolvendo parceiros e instituições locais, contribuindo para a sua capacitação na comunidade e influenciando decisores locais em questões como uso da água, preservação dos habitats ripários, efeitos de contaminação por resíduos urbanos e necessidade de recolha de medicamentos usados.

S H O R T N O T E

OCCURRENCE OF SMOOTH-COATED OTTER *Lutrogale perspicillata* IN SANKARAPARANI RIVER, PUDUCHERRY, INDIA

Kothandapani RAMAN[1], Sivangnanaboopathidossvimal[2], Sakthivel KISHOREKUMAR[3], Bawa M. KRISHNAKUMAR[4], Kanagaraj M. SELVAN[5*]

[1]*No:4/739, Dr, Ambedhkar Street, Kandamangalam (Post), Villupuram, Tamil Nadu, 605012*
[2]*No:65, Second Cross Street, Kurunji Nagar Extension. Lawspet, Puducherry, 605008*
[3]*No:24, Seventh Cross Street, Bharathinagar, Karauvadikuppam, Lawspet, Puducherry, 605008*
[4]*Salim Ali School of Ecology & Environmental Science, Pondicherry University, R.V.Nagar, Kalapet, Puducherry 605014*
[5]*Scientist D/Joint Director, Project Elephant, Ministry of Environment Forest and Climate Change, Indhira Paryavaran Bhawan, New Delhi, 110003*
e-mail: tamildove@gmail.com

(Received 7th February 2018, accepted 30th December 2018)

Abstract: Lack of robust data has so far impeded a proper appraisal on the distribution of any taxa. In this article, we present a record of smooth-coated Otter (*Lutrogale perspicillata* Geoffroy Saint-Hilaire, 1826) in the Sankaraparani River, Union territory of Puducherry, India, an area where it has previously not been recorded. As otters have been preying on fish entangled in fishing nets, fishermen have been killing them in retaliation, which is a significant conservation issue for the otter population
Keywords: Smooth-coated Otter, Sankaraparani River, Puducherry
Citation: Raman, K, Sivangnanaboopathidossvimal, Kishorekumar, S, Krishnakumar, BM and Selvan, KM (2019). Occurrence of Smooth-Coated Otter *Lutrogale perspicillata* in Sankaraparani River, Puducherry, India. *IUCN Otter Spec. Group Bull.* **36** (1): 28 - 33

INTRODUCTION

Data on the distribution and ecology of many mesocarnivores are very limited. Three species of otters exist in India, of which smooth-coated Otter *Lutrogale*

perspicillata is largest. Adapted for a semi-aquatic life, with webbed feet and a strong tapering tail that aids in propulsion (Johnsingh and Manjrekar, 2013). Smooth-coated Otters prey readily on fish, shrimp, crayfish, crab, insects, and vertebrates, such as frog, mudskippers, birds, and rats, form a significant part of their diet (Prater, 1971; Foster-Turley, 1992; Hussain and Choudhury, 1998). Geographically, the smooth-coated Otter ranges from Indonesia in South East Asia , to Pakistan in the West with an isolated population of this species (*L. p. maxwelli*) in the marshes of Iraq; this is the westernmost end of its distribution (Hussain, 1993). It has been classified under Schedule II of the Indian Wildlife (Protection) Act 1972 and categorized as a Vulnerable by IUCN Red list (De Silva et al., 2015), furthermore, it is listed in Appendix II of CITES. Herein we present a new site locality with a few incidental observations of smooth-coated Otters (SCO) from the Puducherry on Coromandel Coast of southern peninsular India.

STUDY AREA

The Union territory of Puducherry (formerly known as Pondicherry) is located on the east coast of southern peninsular India. It consists of the districts of Karaikal, Yanam, and Mahe and Puducherry, the latter containing the capital; the union territories consist of adjacent collections of small enclave pockets in other states. One notable river in Puducherry originates on the western slope of Gingee hill in the Villupuram district of Tamil Nadu, and flows into the Bay of Bengal; it is known as the Sankaraparani river at Villianur in Puducherry district. Its ancient name was Varahanadi and Tondi (Figure 1). It splits off into separate branch at Ariyankuppam known as Chunnambaar (Vijayakumar et al., 2012). Bankside vegetation including *Borassus flabellifer*, *Prosopis juliflora*, *Leucaena leucocephala*, *Morinda tinctoria*, *Albizia lebbeck*, *Bombex ceiba* and *Bambusa* sp. grows along the bank of the river (Figure 2), and provides ideal refuge for SCO; it is also habitat for Golden Jackal (*Canis aureus*), Common grey mongoose (*Herpestes edwardsii*), Jungle cat (*Felis chaus*), common palm Civet (*Paradoxurus hermaphroditus*) and small Indian Civet (*Viverricula indica*).

RESULTS

On 28th August 2017, we sighted a group of SCO including a pup while we were engaged on a bird survey. They were sinuously swimming parallel to the water flow (Figure 3).. Upon sighting us, they bounded into narrow-leaf cattail (*Typha angustifolia*), which is ubiquitous in the river. SCO have not been recorded previously in he Union territory of Puducherry. Ssince then, we have visited the location occasionally and made observations, which are summarized in Table 1.

Threats

We interviewed a few residents and fishermen, who informed us that SCO have been depredating domestic fowl while they forage along the bank of the river and also catch and stealing the fish that are entangled in fishing nets. Because of this, fishermen have retaliated with the help of local hunters (*Narikuravar*). Also, indiscriminate sand mining in and along river bank destroy their habitat, holt being particularly vulnerable (Figure 4).

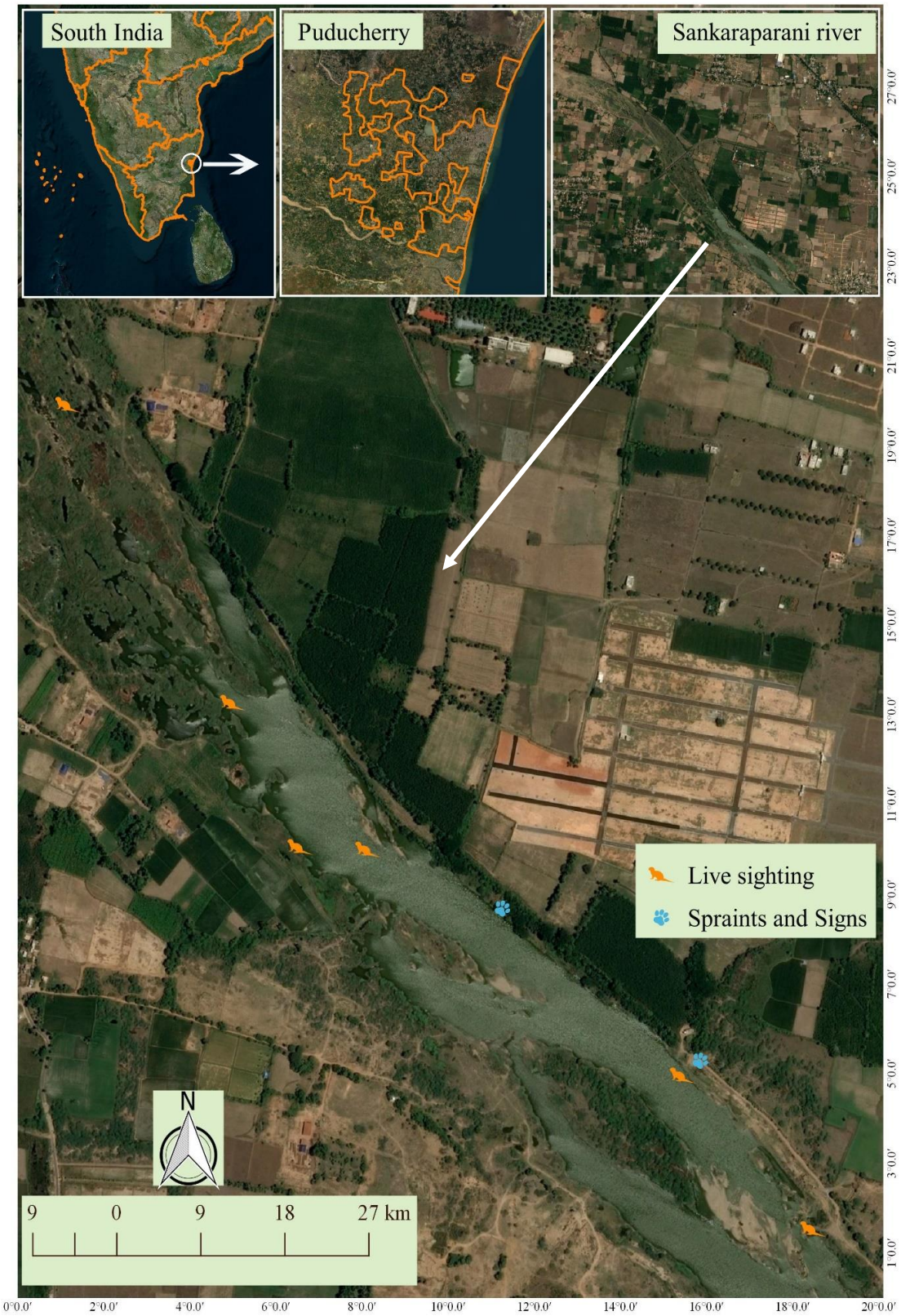

Figure 1. Sightings of *L. perspicillata* in Sankaraparani River, Puducherry

Figure 2. Typical habitat of *L. perspicillata* with natural vegetation

Figure 3. A group of Smooth-coated otter *L. perspicillata* (Photo credit: Aravindh)

Figure 4. Sand mining along the bank of the river

Table 1. Details of *L. perspicillata* records from Sankaraparani River.

Date of visit	No. of Ind.*	Time	Activity	GPS location
28.08.2017	3	1030	Couple of SCO were swimming parallel to water flow.	N11°54'46.857" E79°'44'5.917"
10.09.2017	1	1600	Foraging till 1800	N11°54'56.503" E79°43'51.92"
01.10.2017	2	1500 to 1630	Basking on a pile of sand that was covered with moss	N11°55'2.771" E79°43'45.911"
22.10.2017	9	1830		N11°54'56.613" E79°43'48.907"
05.11.2017			Foot-print	N11°54'40.307" E79°44'11.719"
26.11.2017	1	0600	Rushed towards observer (who was swimming to photograph) and then emerged out of the water while looking at him for few minutes, possibly to investigate.	N11°54'46.85" E79°44'5.91"
10.12.2017	2	0600	Both were feeding on fish that was entangled in a fishing net	N11°54'47.5" E79°44'06.7"
30.12.2017			Foot-print & spraints	N11°54'54.0" E079°43'57.9"

*Number of live individuals

CONCLUSION

Retaliatory killing of SCO adversely affects the population locally. Strict implementation of the law for species conservation, and educating local residents and fishermen about the importance of this species in the ecosystem is crucial for this isolated remnant population. This initial observation provides an important baseline for further research and evaluation of conservation initiatives.

Acknowledgments - Authors are thankful to, Mr. Iyappan and Mr. Sivashankaran for identifications of plants and Mr. Aravindh for photographs.

REFERENCES

De Silva, P., Khan, W.A., Kanchanasaka, B., Reza Lubis, I., Feeroz, M.M., Al-Sheikhly, O.F. (2015). *Lutrogale perspicillata*. The IUCN Red List of Threatened Species 2015.

Foster-Turley, P. (1992). Conservation ecology of sympatric Asian otters *Aonyx cinerea* and *Lutra perspicillata*. PhD thesis., University of Florida.

Johnsingh, A.J.T., Manjrekar, N. (2013). Mammals of South Asia, Vol. I. University Press, India.

Hussain, S.A. (1993). Aspects of the ecology of smooth-coated Otters *Lutraperspicillata* in National Chambal Sanctuary. Unpublished Ph.D Thesis. Center for Wildlife and Ornithology. Aligarh Muslim University. Aligarh, India.

Hussain, S.A., Choudhury, B.C. (1998). Feeding ecology of smooth-coated otter *Lutraperspicillata* in National Chambal Sanctuary. Proceedings of the Symposia of the Zoological Society of London. *Behav. Ecol. Riparian Mamm.* 71:229-250.

Prater, S.H. (1971). The book of Indian animals. 3rd edition. Mumbai: BNHS-OUP.

Vijaykumar, G., Sivasankaran, M.A., Murugaiyarn, V. (2012). Studies on the pollution levels in Ariyankuppam backwater, Puducherry region. *Int. J. Sci. Environ. Technol.* 1: 363-376.

RÉSUMÉ

PRÉSENCE DE LA LOUTRE À PELAGE LISSE *Lutrogale perspicillata* DANS LA RIVIÈRE SANKARAPARANI, À PUDUCHERRY, EN INDE

Le manque de données fiables a jusqu'ici empêché une évaluation adéquate de la distribution de tous taxons. Dans cet article, nous présentons les données d'observation de loutre à pelage lisse (*Lutrogale perspicillata* Geoffroy Saint-Hilaire, 1826) dans la rivière Sankaraparani, territoire de l'Union de Puducherry, en Inde, une région où elle n'avait pas encore été répertoriée. Lorsque les loutres maraudent des poissons emmêlés dans des filets de pêche, les pêcheurs à la ligne les tuent en représaille, ce qui constitue un problème de conservation important pour la population existante.

RESUMEN

PRESENCIA DE LA NUTRIA LISA *Lutrogale perspicillata* EN EL RÍO SANKARAPARANI, PUDUCHERRY, INDIA

La falta de datos robustos impide una apreciación adecuada de la distribución de cualquier taxón. En este artículo, presentamos un registro de nutria lisa (*Lutrogale perspicillata* Geoffroy Saint-Hilaire, 1826) en el río Sankaraparani, territorio de Puducherry, India, un área en la cual no había anteriormente registrada. Como la nutria merodea alrededor de los peces enredados en las redes de pesca, los pescadores las han venido matando en forma retaliatoria, lo que es un significativo problema de conservación para la población existente.

R E P O R T

NOTES ON THE BEHAVIOUR OF NEOTROPICAL RIVER OTTER (*Lontra longicaudis)* IN PALOMINO RIVER (LA GUAJIRA, COLOMBIA)

Oscar MEDINA-BARRIOS[1], Diana MORALES-BETANCOURT[2]

[1]Animal Care Coordinator, Fundación Botánica y Zoológica de Barranquilla, Cl. 77 #68-40 Barranquilla, Colombia, o.medina@zoobaq.org
[2]Project coordinator, Omacha foundation. Corresponding author e-mail: dianamoralesb@yahoo.com

(Received 8th October 2018, accepted 23rd January 2019)

Abstract: The Neotropical river otter is a semiaquatic mammal that occupies a large geographic distribution. It habitually defecates in conspicuous areas on land; these indirect indicators are the focus of most of the studies that involve them, but little is known about species' behaviour. In Colombia, the species is considered as Vulnerable and in the Northern area of the country (La Guajira) there are no studies focussed on it. In this paper, observations on *L. longicaudis* behaviour in the wild were made, as a first approach to it, while occurrence studies were carried out in the area. Observations were made in 2015 during the dry or non-raining season (February), in the middle and lower course of the Palomino River. Five observation sites were established along the river, and the observation method implemented was *ad libitum* sampling. As a result, a total of 31 different behaviours were recorded, from which immersion, breathing after immersion, superficial swimming and foraging were most frequent at 16%, 15.6%, 12.8%, and 10.7% respectively.

Keywords: Neotropical otter, otter behavior, Colombia endangered species, aquatic mammals.
Citation: **Medina-Barrios, O and Morales-Betancourt, D (2019)**. Notes on the Behaviour of Neotropical River Otter (*Lontra longicaudis*) in Palomino River (La Guajira, Colombia). *IUCN Otter Spec. Group Bull.* **36** (1): 34 - 47

INTRODUCTION

The Neotropical river otter *Lontra longicaudis* (Olfers, 1818), member of the Mustelidae family, is a semiaquatic mammal that occupies a wide geographical distribution, occurring from Mexico to the north of Argentina (Waldemarin and Colares, 2000; Arellano et al., 2012). The species is found in rivers and water bodies that can be fresh, marine or brackish water (Kasper et al., 2004). They are abundant in rivers where the riparian vegetation is dense and the root of the trees form galleries.

Rivers with this kind of vegetation are usually clear water, flanked by large rocky blocks (Parera, 1996; Lariviére, 1999; Casariego-Madorell et al., 2006). Recently non-invasive molecular approaches estimated a linear density of one otter per km from in an Atlantic Forest area in Southern Brazil (Trinca et al., 2013) and radio-telemetry in a mangroves area showed a movement of 2.6 km (Nakano-Oliveira et al., 2004).

In general, they have a habit of defecating in conspicuous places of the aquatic body, (Wemmer et al., 1996; Kasper et al., 2004) or in the adjacent terrestrial ecosystem. This behavior is the focus of most of the studies that involve them, and are being used for the definition of areas of occurrence (Chehébar, 1985; Chehébar et al., 1986; Blacher, 1987; Kasper et al., 2004) and diet studies (Beja, 1991; Brezinski et al., 1993; Passamani and Camargo, 1995; Pardini, 1998; Quadros and Monteiro-Filho 2000; Quadros and Monteiro-Filho, 2001; Kasper et al., 2004). However, the social behavior of this species has been slightly studied (Gorman and Trowbridge, 1989; Kasper et al., 2004).

This species is currently included in the Convention on International Trade in Endangered Species of Wild Fauna and Flora- CITES Appendix I (2017), it is catalogue as Vulnerable in the Red List of Threatened Species of Colombia (Rodriguez et al., 2006), and is Near Threatened on a global scale by the International Union for the Conservation of Nature - IUCN (Rheingantz and Trinca, 2015). Nevertheless, their populations have declined due to the influence of anthropogenic activities such as hunting (Morales-Betancourt and Medina Barrios, 2018), spilling of industrial, and urban waste, drainages, intensive water extraction, high concentrations of pollutants (Gallo-Reynoso 1989; Foster-Turley et al., 1990; Sierra and Vargas 2002; Cirelli, 2005; Arellano et al., 2012), legal and illegal mining (industrial and artisanal), that modify the physical and chemical conditions of the water, the riverbeds and increase of deposits of heavy metals (Trujillo et al., 2013). In addition, other risk factors such as parasites, diseases, natural deaths, among others exists (Arellano et al., 2012). In general, due to its strong dependency of an adjacent terrestrial environment to the water bodies, river otters can be affected for negative changes of the margins of the tributaries (Foster-Turley et al., 1990; Quadros and Monteiro-Filho, 2002; Kasper et al., 2004; Santos et al., 2012; Trujillo et al., 2013).

As a contribution to the species, La Guajira's Environmental Authority – Corpoguajira subscribe with Omacha Foundation the contract "Otter (*Lontra longicaudis)* conservation at the La Guajira department, with focus on Forest Protective Reserve Montes de Oca" that focused on studies on occurrence and specific threats to the species in the area, as well as implementation of community awareness activities. Final objective of these studies were, to serve as inputs for the elaboration of the Conservation management plan of the Neotropical otter (*L. longicaudis*) in La Guajira.

METHODOLOGY

Area of study

The Palomino River is located between Magdalena and La Guajira, the Northern region of Colombia. Palomino headwater is 4600 meters above sea level in the Sierra Nevada de Santa Marta and main course is about 70 km length until its mouth in the Caribbean Sea (Neuta et al., 2017). The river water is extremely transparent, and people use the river for different activities as recreational (tubing and swimming) (Figure 1), harpoon fishing, clothes watching and sand and gravel extraction. Palomino beach is one of the emerging destinations for millennial tourist

in Colombia since it has a snow mountain view and many trails that connect to the indigenous communities, in front of it the sea with surfing waves and hostels by the beach were the river ends. Although, no tourism development plan or tourism land use order had been implemented yet.

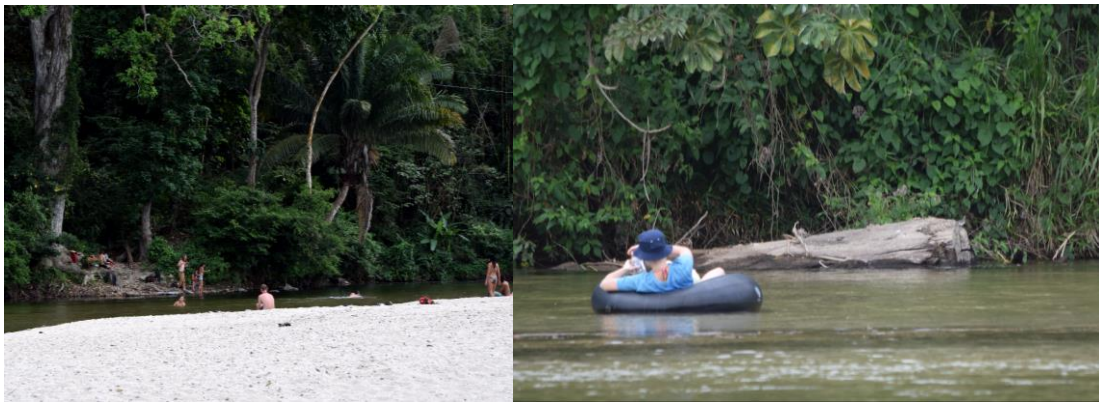

Figure 1. The left image shows the middle part of the Palomino River where tourists swim, and the right image shows leisure tubing activity; the log in the backkground is an otter latrine

During the dry season of the year 2015 (February), sampling was carried out in the middle and low areas of the Palomino River (municipality of Dibulla, La Guajira department) by the riverbeds and banks (Figure 2), for a total of 3 km segmented in six transects. Latrines were identified and those with fresh faeces were selected to locate, close by, sighting station to increase possibility of direct *L. longicaudis* observation. Methodology for detection through direct observation was implemented (Anguera, 1986), with an *ad libitum* method, annotating the behaviour observed over a designated period of time or frequency (Gras et al., 1990).

Figure 2. Lower part of the Palomino River where the type of shrub and arboreal vegetation on the bank can be seen.

Five sighting stations were established, from P1 to P5, where P1 was the closest one to the river mouth and P5 the farthest from the sea. GPS references are shown in Table 1.

Table 1: Observation stations in the Palomino River (Department of La Guajira, Colombia).

Designation	Geographic position	Metres above sea level
P1	N 11º 14’ 54.7”; W 073º 34’ 05.4”	16
P2	N 11º 14’ 46.6”; W 073º 34’ 04.1”	16
P3	N 11º 13’ 54.3”; W 073º 34’ 04.6”	181
P4	N 11º 13’ 02.8”; W 073º 34’ 50.9”	22
P5	N 11º 12’ 59.4”; W 073º 34’ 53.6”	22

The observation was made for a period of nine days, with a sampling effort 41 hours at not less than 20 meters from the latrines, with 143,07 minutes of behaviour observations.

An observational chart was made for each sighting of L. longicaudis, specifying time and activity executed and grouped the behaviours found in categories, as implemented by Duplaix (1980) for Giant river otter (Pteronura brasiliensis). There was more observation time at some points given the better accessibility.

RESULTS

Observation stations methodology for the direct observation using an *ad libitum* sample, made possible to register *L. longicaudis* four times, in four different days, three of them in the same latrine, observation station P1 located in the Global Positioning System- GPS Coordinates N 11º 14’ 54.7”; W 073º 34’ 05.4”. Fourth sighting occurred during the morning in observation station P2, GPS Coordinates N 11 º 14 ' 46.6 "; W 073° 34’ 04.1”, which is approximately 200 m from observation station P1.

The observation station methodology for the direct observation using an ad libitum sample resulted in recording L. longicaudis four times, on four different days. Three of the records were at the same latrine, at observation station P1, located at GPS Coordinates N 11o 14’ 54.7”; W 073o 34’ 05.4”. The fourth sighting occurred during the morning at observation station P2, GPS Coordinates N 11 o 14 ' 46.6 "; W 073° 34’ 04.1”, which is approximately 200 m from observation station P1.

In these four events, 31 different behaviours were recorded, of which immersion, respiration after immersion, surface swimming and foraging occupied the highest rate of frequencies with 16%, 15.6%, 12.8%, and 10.7% respectively (Figure 3). To group behaviors according to common characteristics (Table 2), variables described by Duplaix (1980) for *Pteronura brasiliensis* were used, since behavioural descriptors for *L. longicaudis* do not exist. Behaviors were clustered in groups and subgroups by Duplaix (1980) in order to facilitate the reading and to improve the understanding of the relations between behaviours.

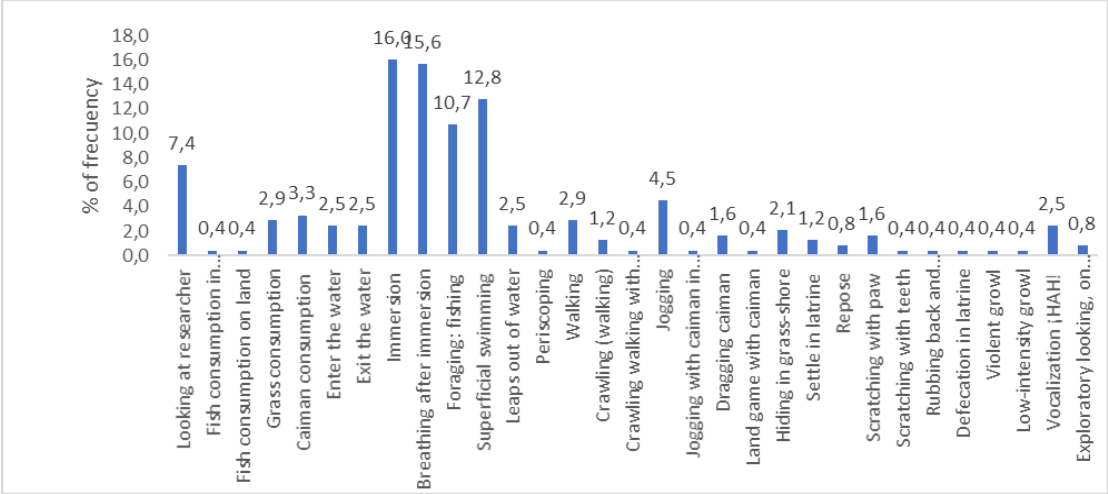

Figure 3. Behaviours observed in *L. longicaudis* in Palomino River, La Guajira, Colombia.

Table 3. Groups, subgroup and behaviour unit observed in wild *L. longicaudis* in Palomino river, La Guajira, Colombia.

Characteristics of the behaviours*		**Behaviour**	**% of frequency**
Group	**Subgroup**		
Senses	Observation	Looking at researcher (Figure 4)	7.4
Maintenance activities	Feeding	Fish consumption in superficial swimming	0.4
		Fish consumption on land	0.4
		Grass consumption	2.9
		Caiman consumption (Figure 5)	3.3
Locomotion	Aquatic locomotion	Enter the water	2.5
		Exit the water	2.5
		Immersion	16
		Breathing after immersion	15.6
		Foraging: fishing (Figure 6)	10.7
		Superficial swimming (Figure 7)	12.8
		Leaps out of water	2.5
		Periscoping	0.4
	Terrestrial locomotion and postures	Walking	2.9
		Crawling (walking)	1.2
		Crawling walking with caiman in mouth (Figure 8)	0.4
		Jogging (Figure 9)	4.5
		Jogging with caiman in mouth (Figure 10)	0.4
		Dragging caiman (Figure 11)	1.6
		Land game with caiman	0.4
		Hiding in grass-shore	2.1

		Settle in latrine (Figure 12)	1.2
Comfort Activities	Resting and sleeping postures - Rest	Repose (Figure 13)	0.8
	Cleaning - Scratching	Scratching with paw (Figure 14)	1.6
	Cleaning - Skin biting	Scratching with teeth	0.4
	Cleaning – Rolling and rubbing	Rubbing back and abdomen (Figure 15)	0.4
	Elimination - Defecation	Defecation in latrine	0.4
Social activities	Communication/Vocalization	Violent growl	0.4
		Low-intensity growl	0.4
	Communication/Investigation and alarm - Alarm	Vocalization ¡HAH! (Figure 16)	2.5
	Investigation and alarm - Investigation	Exploratory looking, on land (Figure 17)	0.8

*Based on groupings made by Duplaix (1980) for *P. brasiliensis*.

In Figures 4 to 17, images of behaviours referred to in Table 2 are shown with descriptions.

Figure 4. "Looking at the researcher" behaviour: after detecting the observer presence.

Figure 5. "Caiman consumption" behaviour: the ingestion of a juvenile spectacled caiman (*Caiman crocodilus fuscus*); feeding happened at the riverbank (Medina-Barrios and Morales-Betancourt, 2015).

Figure 6. "Foraging fishing" behaviour: the observed otters were swimming on the water surface and they dived at regular intervals. They lifted the chin, opening the mouth, taking in air, then lowered the chin, dipping the head, followed by curving the body into the water, finishing with the tail (Duplaix, 1980).

Figure 7. "Superficial swimming" behaviour: (in a similar way to a dog) (Duplaix, 1980): in shallow waters, when entering from bank, with the head out of water.

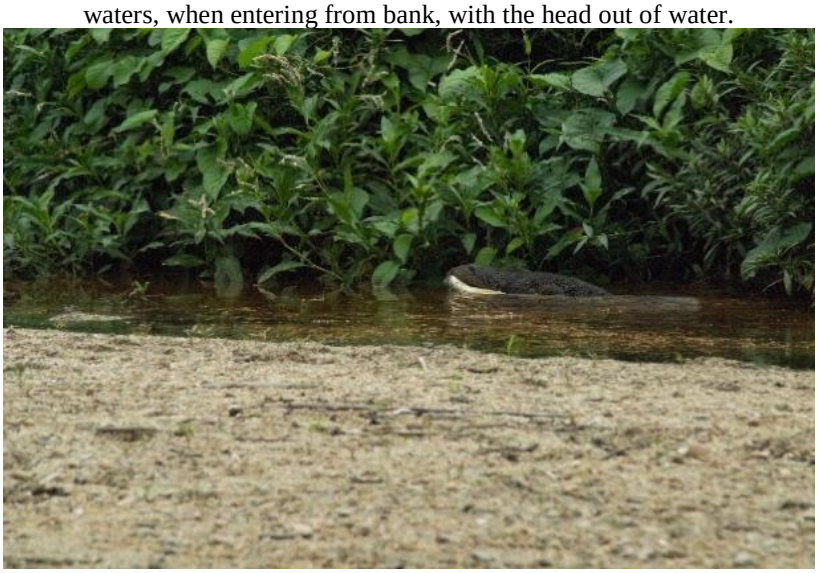

Figure 8. "Crawling walking with caiman in mouth" behaviour: movement with low body to avoid being seen.

Figure 9. "Jogging" behaviour: crossing exposed areas of river bed to enter deeper water

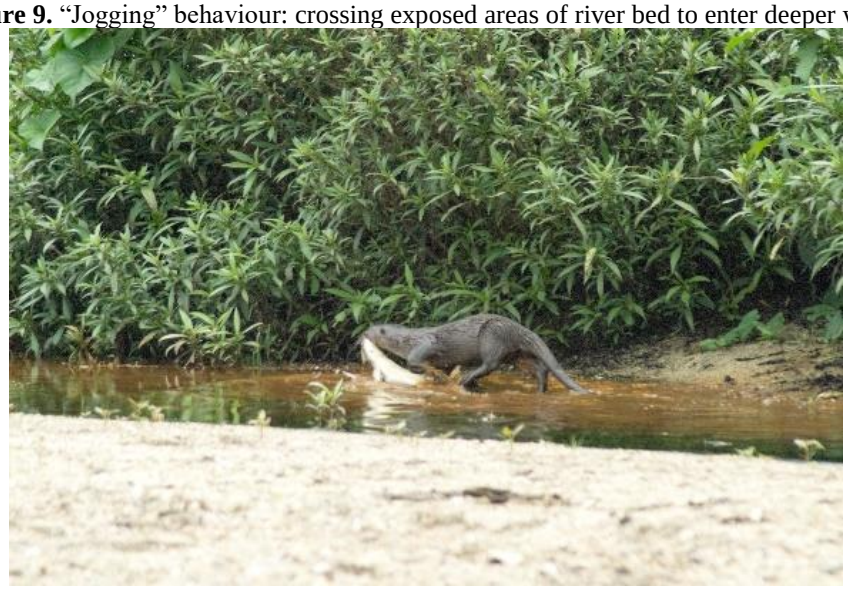

Figure 10. "Jogging with caiman in mouth" behaviour: seeking a safe refuge for prey consumption.

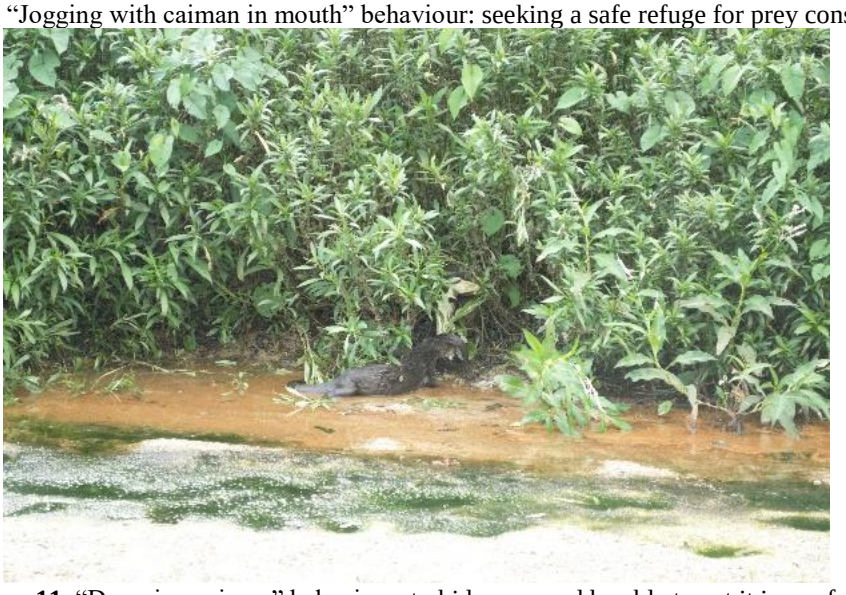

Figure 11. "Dragging caiman" behaviour: to hide prey and be able to eat it in a refuge.

Figure 12. "Settle in latrine" behaviour: possibly in order to improve visibility for detecting fish or threats.

Figure 13. "Repose" behaviour: Otter resting with flexed legs, ventral surface and tail resting on the substrate.

Figure 14. "Scratching with paw" behaviour: Otter N2 did this behaviour on the neck, right flank and belly, and on the same flank with its hind right paw.

Figure 15. "Rubbing back and abdomen" behaviour: when N2 was feeding on the juvenile caiman, N1 performed this activity by rubbing abdomen and back against substrate.

Figure 16. "HAH! Vocalization" behaviour: N1 vocalized an alert multiple times when the researcher was noticed (Lariviére, 1999; Parera, 1993; Harris, 1968).

Figure 17. "Exploratory looking, on land" behaviour: N1 raises its head leaving the neck exposed and looks forward, perhaps to locate sources of different sounds, to locate things that have attracted attention or to search for conspecifics lost from sight.

DISCUSSION

From the observed behaviours, it was possible to identify juvenile spectacled caiman (Caiman crocodilus fuscus) being taken in riparian egetaion on the riverbank (Medina-Barrios and Morales-Betancourt, 2015) and fish consumption in the water with the head raised out of the water, confirming that during the dry season in the lower Palomino river, this species behaves as an opportunistic predator, as had been previously documented in other areas of the continent.

In a 3 km length of river length, close to the active latrines, the most common behaviours were related to aquatic locomotion, and were only observed in the morning (from 6:58 am to 9:04 am). Tourist activity, such as tubing, occurs from 9 am to 6 pm. This could indicate that later in the day, the otters are engaged in other activities far from latrines, or it could be that human activities cause a reduction in activity, or temporal displacement to, for example, night time. Obviously, more behavioural studies are needed to complete the information on Neotropical otter habitat use in this type of rivers with the active presence of humans.

The environment of the latrine at which the four sets observations were made presented features that made it suitable (without being ideal) for the observing the activities of the otters, with bushes and herbaceous plants on the riverbank adjacent to water (Figure 2). This vegetation type was also reported by Santos and Reis (2012), and guaduales (Guadua angustifolia) vegetation was mentioned by Waldemarin (2004). For this reason, the conservation of bankside vegetation is crucial for the presence of the otter in the Palomino River.

Acknowledgements – *The authors want to thank all the colleagues at the Omacha Foundation and at Corpoguajira; and the local community of Palomino, specially to Ms. Patricia Muñoz, for her hospitality, also the Afro Descendent Group Negro Mandela, Horticulture woman group of the Sierra, Union of Forest Savers of the Sierra, Group of turtle conservation, and the communities of the Neighborhood Sierrita; to all of you, thank you for your collaboration. Special thanks to Mr. Miguel Barrios from Riohacha, a kind adviser that transported us in this beautiful land of La Guajira. Many thanks to the Dr. Arno Gutleb for all his work in the IUCN/SSC Otter Specialist Group Bulletin.*

REFERENCES

Anguera, M. T. (1986). La investigación cualitativa. *Educar*, **10**: 23-50. [In Spanish]
Arellano, E. Sánchez Núñez, E., Mosqueda Cabrera, M.A. (2012). Distribución y Abundancia De La Nutria Neotropical (*Lontra longicaudis annectens*) En Tlacotalpan, Veracruz, México. *Acta Zoológica Mexicana*, **28** (2): 270-279. [In Spanish]

Beja, P.R. (1991). Diet of otters (*Lutra lutra*) in closely associated freshwater, barckish and marine hábitat in south-west Portugal. *Journal of Zoology*, **225**: 141-152

Blacher C. (1987). Ocorrência e preservaçâo de *Lutra longicaudis (*Mammalia: Mustelidae) no litoral de Santa Catarina. *Boletim de fundaçâo brasileira para conservaçâo da natureza*, **22**: 105-117. [In Portuguese]

Brezinski, M., Jedrezejewski, W., Jedrezejewska, B. (1993). Diet of otters (*Lutra lutra*) inhabiting small rivers in the Bialowieza National Park, eastern Poland. *Journal of Zoology*, **230**: 495-501.

Casariego-Madorell, M.A., List, R., Ceballos, G. (2006). Aspectos básicos sobre la ecología de la nutria de río (*Lontra longicaudis annectens*) para la costa de Oaxaca. *Revista Mexicana De Mastozoología*, **10**:71-74. [In Spanish]

Cirelli, V.V. (2005). Restauración ecológica en la cuenca Apatlaco-Tembembe. Estudio de caso: Modelado de la distribución de la nutria de río, *Lontra longicaudis annectens*. Tesis de Maestría en Ciencias Biológicas. Instituto de Biología. UNAM. México. [In Spanish]

CITES (2017). Appendices I, II and III. http://www.cites.org/eng/app/appendices.php.

Chehébar, C.E. (1985). A survey of the southern river otter *Lutra provocax* Thomas in Nahuel Huapi National Park, Argentina. *Biological Conservation*, **32**: 299-307.

Chehébar, C.E., Gallur, A., Giannico, G., Gotelli, M.D., Yorio, P. (1986). A survey of the southern river otter *Lutra provocax* in Lanin, Puelo and los Alerces National Parks, Argentina, and evaluation of its conservation status. *Biological Conservation*, **38**: 293-304.

Duplaix, N. (1980). Observations of the ecology and behavior of the giant river otter *Pteronura brasiliensis* in Suriname. *Revue d'Écologie,*: **34** http://hdl.handle.net/2042/55014.

Foster-Turley, P., Macdonald, S., Mason, C.F., (1990). (eds.) Otters: An action plan for their conservation. IUCN/SSC Otter Specialist Group, Gland, Switzerland. 126p.

Gallo-Reynoso, J.P. (1989). Distribución y estado actual de la nutria o perro de agua (*Lutra longicaudis annectens* Major, 1897) en la sierra Madre del Sur, México. Tesis, maestría Facultad de Ciencias, Universidad Nacional Autónoma de México, México, D.F. 236 p.

Gorman, M. L., Trowbridge, B. J. (1989). The role of odour in the social lives of Carnivores, p. 57-88. In: **Gittleman, J. L. (Ed.)**. Carnivore behaviour, ecology and conservation. New York, Cornell University Press, 620 p.

Gras, J.A., Anguera, M.T., Gómez, J. (1990). Metodología de la investigación en ciencias del comportamiento. Universidad de Murcia, 310 p. [In Spanish]

Harris, C.J. (1968). Otters: a study of the recent Lutrinae. Weinfield and Nicholson, London, 397 pp.

Kasper, C.B., Feldens, M.J., Salvi, J., Zanardi Grillo, H.C. (2004). Estudo preliminar sobre a ecología de *Lontra longicaudis* (Olfers) (Carnivora, Mustelidae) no Vale do Taquari, Sul do Brasil. *Revista Brasileira de Zoología*. **21** (1): 65-72. [In Portuguese]

Lariviére, S. (1999). *Lontra longicaudis*. *Mammalian Species*, **609**: 1-5.

Medina-Barrios, O.D., Morales-Betancourt, D. (2015). Evento de depredación de Caimán *Crocodilus fuscus* por *Lontra longicaudis* (Carnivora: Mustelidae) en el río Palomino, departamento de La Guajira, Colombia. *Mammalogy Notes - Notas Mastozoológicas*, **2** (1): 19-21. [In Spanish]

Morales-Betancourt, D., Medina Barrios, O.D. (2018). Notes on Neotropical Otter (*Lontra longicaudis*) hunting, a possible underestimated threat in Colombia. *IUCN Otter Spec. Group Bull.* **35**(4): 196-202.

Nakano-Oliveira, E., Fusco, R., dos Santos, E.A.V., Monteiro-Filho, E.L.A. (2004). New information about the behavior of *Lontra longicaudis* (Carnivora: Mustelidae) by radio-telemetry. *IUCN Otter Spec. Group Bull*, **21**(1): 31 - 35

Neuta, I., Reyes, C., Romero, L., Serpa, L., Vasquez, S. (2017). Cuenca hidrográfica río Palomino. Universidad del Magdalena, Facultad de Ingeniería, Programa de Ingeniería Ambiental y Sanitaria, Hidrología. Santa Marta-Colombia. [In Spanish]

Pardini, R. (1998). Feeding ecology of the neotropical river otter *Lontra longicaudis* in an Atlantic Forest Stream, south-eastern Brazil. *Journal of Zoology* **245**:385-391.

Parera, A. (1993). The neotropical river otter *Lutra longicaudis* in Iberá lagoon, Argentina. *IUCN Otter Specialist Group Bulletin*, **8**: 13-16.

Parera, A. (1996). Estimating river otter *Lutra longicaudis* population in Iberá lagoon using a direct sightings methodology. *IUCN Otter Specialist Group Bulletin*, **13**:77-83.

Passamani, M., Camargo, S.L. (1995). Diet of the river otter *Lontra longicaudis* in Furnas Reservoir, soutu-eastern Brazil. *IUCN Otter Specialist Group Bulletin*, **12**: 32-34.

Quadros, J., Monteiro-Filho, L.A. (2000). Fruit occurrence in the diet of the Neotropical otter, *Lontra longicaudis* in southern Brazilian Atlantic forest and its implication for seed dispersion. *Mastozoología Neotropical*, **7**:33-36.

Quadros, J., Monteiro-Filho, E.L.A. (2001). Diet of the neotropical otter, *Lontra longicaudis*, in Atlantic Forest area, Santa Catarina State, Southern Brazil. *Studies on Neotropical Fauna and Environment*, **36** (1): 15-21.

Quadros, J., Monteiro-Filho, E.L.A. (2002). Sprainting sites of the Neotropical otter, *Lontra longicaudis*, in an Atlantic Forest area of Southern Brazil. *Mastozoologia Neotropical*, **9** (1): 39-46.

Rheingantz, M.L., Trinca, C.S. (2015). *Lontra longicaudis*. The IUCN Red List of Threatened Species 2015: e.T12304A21937379. http://dx.doi.org/10.2305/IUCN.UK.2015-2.RLTS.T12304A21937379.en.

Rodríguez-Mahecha, J., Alberico, M., Trujillo F., Jorgenson, J. (Eds). (2006). Libro rojo de los mamíferos de Colombia. Serie libros rojos de especies amenazadas de Colombia. Conservación Internacional Colombia & Ministerio de Ambiente, Viviendo y Desarrollo Territorial. Bogotá, Colombia. 433 pp.

Santos, L.B., Reis, N.R. (2012). Use of shelters and marking sites by *Lontra longicaudis* (Olfers, 1818) in lotic and semilotic environments. *Biota Neotropica*, **12** (1): 199-205 http://www.biotaneotropica.org.br/v12n1/en/abstract?article+bn02512012012

Santos, L.B., Dos Reis, N.R., Orsi Iheringia, M.L. (2012). Trophic ecology of *Lontra longicaudis* (Carnivora, Mustelidae) in lotic and semilotic environments in southeastern Brazil. *Série Zoologia*, **102** (3): 261-268.

Sierra-Huelsz, J.A., Vargas-Contreras, J.A. (2002). Registros notables de *Lontra longicaudis annectens* (Carnivora: Mustelidae) en el río Amacuzac en Morelos y Guerrero. *Revista Mexicana de Mastozoología* **6**:129-135

Trinca, C.S., Jaeger, C.F., Eizirik, E. (2013). Molecular ecology of the Neotropical otter (*Lontra longicaudis*): non-invasive sampling yields insights into local population dynamics. *Biological Journal of the Linnean Society*, **109**: 932–948.

Trujillo, F., Gärtner, A., Caicedo, D., Diazgranados, M.C. (Eds.). (2013). Diagnóstico del estado de conocimiento y conservación de los mamíferos acuáticos en Colombia. Ministerio de Ambiente y Desarrollo Sostenible, Fundación Omacha, Conservación Internacional y WWF. Bogotá, 312 p. [In Spanish]

Waldemarin, H.F., Colares E.P. (2000). Utilisation of Resting Sites and Dens by the Neotropical River Otter (*Lutra longicaudis*) in the South of Rio Grande do Sul State, Southern Brazil. *IUCN Otter Specialist Group Bulletin*, **17** (1): 14 – 19.

Waldemarin, H.F. (2004). Ecologia da Lontra neotropical (*Lontra longicaudis*), no Trecho Inferior Da Bacia Do Rio Mambucaba, Angra Dos Reis. Tesis doctoral Universidade Do Estado Do Rio De Janeiro, Instituto De Biologia Roberto Alcântara Gomes, Programa De Pós-Graduação Em Biología Área De Concentração Em Ecología. [In Portuguese]

Wemmer, C., Kuns, T.H., Lundie-Jenkins, G., Mcshea, W.J. (1996). Mammalian sign. In: **Wilson, D. E. Cole, F. R. Nichols, J. D. Rudan, R. Foster, M. S. (Eds)**. Measuring and monitoring biological diversity, standard methods for mammals. pp. 157-176. Washington, Smithsonian Institution Press.

RÉSUMÉ

NOTES SUR LE COMPORTEMENT DE LA LOUTRE À LONGUE QUEUE (*Lontra longicaudis*) SUR LA RIVIÈRE PALOMINO (LA GUAJIRA, COLOMBIE)

La loutre à longue queue est un mammifère semi-aquatique qui a une large répartition géographique. Elle a l'habitude d'épreindre dans des zones visibles en dehors des plans d'eau ; ces indices de présence indirects sont au centre de la plupart des études les concernant, mais le comportement des espèces reste mal connu. En Colombie, l'espèce est considérée comme vulnérable et dans le nord du pays (La Guajira), aucune étude n'a été menée. Dans ce schéma, des observations sur le comportement de *L. longicaudis* dans la nature ont été répertoriées, en tant que première approche, tandis que des études d'occurrence ont été réalisées dans la région. Des observations ont été effectuées en 2015 pendant la saison sèche ou en l'absence de pluie (février), dans les cours moyen et inférieur de la rivière Palomino. Cinq sites de repérage ont été définis le long de la rivière avec une méthode d'observation par échantillonnage ad libitum. En conséquence, 31 comportements différents ont été observés, parmi

lesquels l'immersion, la respiration après immersion, la nage superficielle et la recherche de nourriture qui ont obtenu le taux le plus élevé de fréquence, avec respectivement 16%, 15,6%, 12,8% et 10,7%.

RESUMEN

NOTAS SOBRE EL COMPORTAMIENTO DE NUTRIA NEOTROPICAL (*Lontra longicaudis)* EN EL RÍO PALOMINO (LA GUAJIRA, COLOMBIA)

La nutria neotropical es un mamífero semiacuático que ocupa una amplia distribución geográfica. Tiene el habito de defecar en áreas conspicuas fuera de los cuerpos de agua, por lo que este rastro indirecto es el foco de la mayoría de estudios sobre la especie, pero poco es conocido sobre su comportamiento. En Colombia es considerada Vulnerable y, en la zona norte del país (La Guajira), no se han realizado estudios. En este marco, se realizaron observaciones de comportamiento de *L. longicaudis*en vida silvestre, como una primera aproximación, mientras se llevaban a cabo estudios de presencia en el área. Las observaciones fueron realizadas en 2015 durante la estación seca o de no lluvias (febrero) en la parte media y baja del río Palomino. Cinco estaciones de observación fueron establecidas y se implementó el método de muestreo *ad libitum*. Como resultado, un total de 31 comportamientos diferentes fueron registrados, en los cuales inmersión, respirar tras la inmersión, nado y forrajeo tuvieron las frecuencias más altas con 16%, 15.6%, 12.8% y 10.7%, respectivamente.

R E P O R T

SPOTTED-NECKED OTTER (*Hydrictis maculicollis*) DISTRIBUTION AND DETERMINING FACTORS OF HABITAT OCCURRENCE IN THE LOWER *OUÉMÉ* VALLEY, SOUTHERN BENIN

Samson DOGNIMON[1]*, Chabi A.M.S. DJAGOUN[1]*, Sylvie DJEGO[1], Hugues A. AKPONA[1,2], Julien DJEGO[1], Jean Didier T. AKPONA[3], Brice SINSIN[1]

[1]*Laboratory of Applied Ecology, Faculty of Agronomic Sciences, University of Abomey-calavi, 01BP526 LEA-FSA, Cotonou, Benin*
[2]*Direction Générale des Forêts et des Ressources Naturelles, BP. 393 Cotonou, Bénin.*
[3]*Université d'Abomey-Calavi Faculté des Sciences Agronomiques, Laboratoire de Biomathématiques et d'Estimations Forestières, 05 BP 1752, Cotonou, Bénin*
**Corresponding author: e-mail: Samsondognimon@gmail.com*

(Received 29th October 2018, accepted 28th January 2019)

Abstract: Spotted-necked otters (*Hydrictis maculicollis*) are present in several major river systems in southern Benin, and their environmental requirements link them to food and water security issues as the region is so densely populated by humans. The lack of baseline data on their distribution and ecology is another major constraint that the species is facing in Benin. The present study aims to determine otter's distribution and factors affecting the habitat selection in a highly human impacted environment. We conducted a survey on Spotted-necked otter presence/absence in the localities in the lower Ouémé valley in Southern Benin using the non-probabilistic "snowball" sampling method. We then assess the habitat and environmental requirements of Spotted-necked otter from field observations. The spotted-necked otter has shown a wide distribution in southern Benin with the presence signs confirmed in 89% of recorded sites from local perception. According to variables explaining the presence only habitat characteristics such as vegetation cover was significant. The Spotted-necked otter did show a surprising flexibility in their environmental requirements. Our results demonstrate a high adaptability of a threatened carnivore to altered landscapes and show how this flexible behavior opens opportunities for recovery.

Keywords: Spotted-necked otter, Distribution, Habitat choice, *Ouémé* valley
Citation: **Dognimon, S, Djagoun, C.A.M.S., Djego, S, Akpona, H.A., Djego, J, Akpona, J.D.T. And Sinsin, B (2019)**.Spotted-Necked Otter (*Hydrictis maculicollis*) Distribution and Determining Factors of Habitat Occurrence in the Lower Ouémé Valley, Southern Beninn. *IUCN Otter Spec. Group Bull.* **36** (1): 48 - 60

INTRODUCTION

Increasing population growth and human activities have been shown to highly impact biodiversity worldwide (Vitousek et al., 1997). Due to dietary specialization, their large spatial requirements and low reproduction rate, carnivore species are considered to be especially sensitive to changes in land-use and to human disturbances (Ripple et al., 2014). Consequently, changes in these species behavior are very often adopted as means of adapting to habitat transformation and high levels of human disturbance as a means of surviving. Understanding the adaptability of a species to altered landscapes and its selection of habitats within them are promising to implementation of sustainable conservation measures.

Otters are largely distributed in heavily modified landscapes (Reed-Smith et al., 2015; Ayres and García, 2009). A major cause for the decline in their numbers is attributed to habitat deterioration and loss due to river regulations, dam construction, and modifications to the riparian landscapes (Kruuk, 1995). Additionally, potentially excessive hunting and the growing conflicts due to predation on commercial or subsistence fisheries is taking an unknown toll on all otter species. Changes in habitat structure often alter the availability of resources like food, which in turn requires behavioural plasticity in combination with altered habitat selection or acceptance of novel food resources (Contesse et al., 2004). This raises questions of what kind of habitats they select within anthropogenic altered landscapes.

Some pockets along the Ouémé river in Southern Benin harbour sizeable populations of spotted-necked otter (*Hydrictis maculicollis*) (S. Djagoun, pers. obs.) and may prove to be a critical area for otter conservation. The Spotted-necked otters is listed on CITES Appendix II (www.cites.org) and classified as a Near-threatened on the IUCN Red List (Reed-Smith et al., 2015) but endangered in Benin Red List (Djagoun et al., 2011). According to Akpona et al., (2011), this species is hunted primarily for food and for products such as skins and organs (for medicinal purposes). Although there is large literature base dealing with the conservation issues (Akpona et al., 2011; Urban et al., 2011; Angelici et al., 2005; Rowe-Rowe, 2016) and conflict aspects (Akpona et al., 2015; Kuhn, 2012; Al-Sheikhly et al., 2014) only a few studies have addressed the ecology of otters in modified landscapes (Bueno-Enciso et al., 2015; Pedroso et al., 2014). There is a lack of understanding on how otters are adapting to the transformation of rivers for human use through changes in riparian vegetation and increased pollution. An anthropogenic environment provides barriers that may limit distribution of the animal. Within the Southern Benin landscape, the lower Ouémé valley exhibits substantial variation in levels of human impact over a small geographic range, best fit to examine otter presence along a gradient of habitat transformation.

This paper aims first to provide a baseline of otter occurrence at the landscape scale and to evaluate the spatio-temporal dynamics of spotted-necked otter according to the local perception and second to characterize the determining factors of spotted-necked otter's occurrence along river banks the lower Ouémé valley. The hypothesis that modification of aquatic ecosystems severely impacts the distribution and the presence of otters was tested, with the prediction that transformation in the water quality, suitable riparian vegetation, human population density, proximity of the villages and fishing activities would have an adverse impact on otter survival and persistence. We are expecting through this study to generate some data to derive a long-term monitoring plan for the future conservation of the spotted-necked otter population in Benin.

METHODS

Study Area

The lower Ouémé valley is located in southern Benin between 6° 24' to 6° 52' latitudes north, and 2° 24' to 2° 38 ' longitude east (Attingli et al., 2016) (Figure 3). The climate is sub-equatorial; its hydrological regime is characterized by two rainy seasons and two dry seasons. Thus, there is a period of low water that usually covesr less seven months (November to June) and a flood period from July to October (Lalèyè et al., 2007). The temperature ranges from 25 °C to 30 °C and the annual rainfall ranges between 900 mm and 1500 mm (Ali et al., 2014). This valley covers an

area from Donoukpa in Aguégués municipality to Dame-wogon in Bonou municipality.

The Ouémé valley has large flood plains that ecologically favors many fish species leading to its characterization as a fishery zone (Attingli et al., 2016). The vegetation in the Ouémé valley is composed of herbaceous plants of low grassland with *Paspalum vaginatum, Thypha australis* and *Cyperus papyrus*. The vegetation is also composed of floating plants including *Eichhornia crassipes* (water hyacinth), *Pistia stratiotes* and *Lemne paucicostata* (water lettuce). The taxonomic groups of fauna encountered in the Ouémé valley are: mammals, birds, reptiles, amphibians and fish. Mammals include the sitatunga (*Tragelaphus spekei*), spotted-necked otter (*H. macullicolis*), mongoose (*Crossarchus obscurus*), the African manatee (*Trichechus senegalensis*) and the red-bellied monkey (*Cercopithecus erythrogaster erythrogaster*) (Kidjo and Guedou, 2001). Local residents are divided in two main ethnic groups: Fon and Weme. The last census of the population (2013) estimated 455,180 inhabitants (INSAE, 2013). This population is much denser in the municipality of Aguégué, which has 856/km² inhabitants followed by that of Dangbo, which is 284 inhabitants /km² and Adjohoun (244 inhabitants /km²). Bonou (161 inhabitants /km²) is the least populated. Fishing and agriculture are the main activities of local residents.

DATA COLLECTION

Firstly, presence/absence data were collected using a semi-structural questionnaire survey technique with the collaboration of the local fishermen living in the potential sites of spotted-necked otter presence according to the literature (Kidjo, 2000; Akpona et al., 2007; 2011; 2015). Local residents of the lower Ouémé valley were interviewed through the "snowball" approach. This non-probabilistic sampling method involved contacting a key person in the population (village chief or president of the fishermen's or hunters' association). This first respondent shows us other key persons who provide us information on the potential occurrence sites of spotted-necked otter in the village or proximate to the village. A total of 263 respondents were interviewed in 28 localities along the lower Ouémé valley in the municipalities of Bonou, Adjohoun, Dangbo and Aguégué as well as some villages along Hlan River in the municipalities of Toffo and Zogbodomè. The interviewees were men, mainly fishermen between 26 and 62 years old.

Secondly, additional data were collected about spatio-temporal dynamics of spotted-necked otter according to local perceptions. Five variables were collected: grouping size, period of observation of otter during the day: night (after 8pm); twilight (6-8 pm); morning (after 7am) dawn (5-6 am) and all time), period of abundance in the year: small dry season (August-September); great dry season (December-March); great rain season (September-November); small rain season (April-July); permanent abundance over the year and the trend of their population over the five last years.

Thirdly, Field observations were made from July to September 2017 in areas listed as having otters present as reported by local perception to confirm the presence of the animal. Indirect observations based mainly on hoop nets attacked (artisanal fishing equipment, Figure 1), footprints (Figure 2) were recorded. According to Akpona et al., (2015), spotted-necked otter actively destroyed the fishing equipment in the lower Ouémé valley. Absence of otter damage in the study localities, combined with the absence of footprints was used to confirm the true absence of the spotted-necked otter in some investigated localities. Additionally we collected some habitat

parameters such as: vegetation cover, average height of the vegetation, water depth, water pH, water temperature, population density, number of hoop nets laid per day and nearest distance from village to river bank (Perrin and Carranza, 2000; Anoop and Hussain, 2004) in all investigated sites to generate the drivers of distribution at a local scale within the lower Ouémé valley. The water pH and temperature were measured using HANNA Multimeter and we generated the nearest distance from village to river bank using the QGIS tool. Data on the number of hoop nets laid per day were generated from questionnaires and we used national human census report (INSAE, 2013) to generate the data on the human population density. The vegetation cover and height average were collected within a plot setup along the river bank.

Figure 1. Hoop net: an artisanal fishing equipment called “adja” in the local language (Photo: D. Samson, 2017)

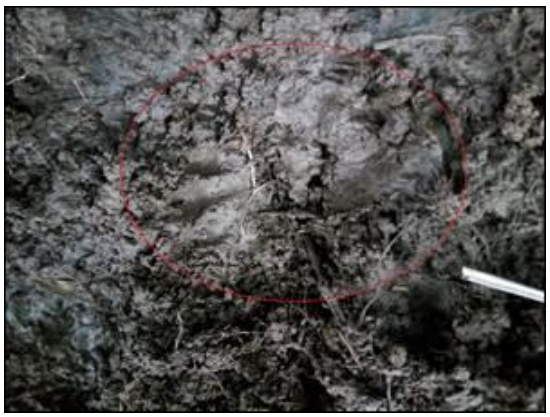

Figure 2. Footprints observed in Adjohoun (left) and in Zogbodomè (right) (D.Samson, 2017)

DATA ANALYSIS

Spotted-necked otter's presence data (GPS coordinates) collected during field surveys were recorded in the QGIS software. These data were projected on the study area map to establish the distribution map of the species.

A categorization of respondents according to age was made (Young: <40 years old; Adult: 40 years old and more). Correspondence Analysis (CA) was finally carried out with 'FactoMineR' package (Husson *et al.,* 2014) in order to describe graphically the relationships between ethnic group, age group and perceptions on spatial dynamic of the spotted-necked otter. This process helped to know the dynamic of otter population according to ethnic group and age.

The response data collected to determine the ecological and environmental factors affecting the presence of spotted-necked otter is binary. We tested the correlation between the variables with the test of Pearson. A Generalized Linear Model (GLM) based on the binomial distribution was adjusted by using Chi^2 adjustment test to the presence data of the otter with the logistic 'link' in order to test the influence of eight variables in otter's presence: vegetation cover, average height of vegetation, water depth, water pH, water temperature, population density, number of hoop net laid per day and nearest distance from village to river bank. The adjusted probabilities were calculated with the 'epicalc' package of R software (Chongsuvivatwong, 2012, RCoreTeam, 2017). In this model the response variable is the presence/absence of otter and the independent variables constitute habitat parameters. The result of Pearson's correlation shows a high correlation between water depth and vegetation (r=-64.79%), also between population density and hoop net laid per day (r=0.60). According to this result and the importance of variables in the explanation of habitat characteristics, we decided that vegetation cover was greater significance than water depth and population density than hoop net laid per day in the analysis. So for the analysis, we take account vegetation cover, height of vegetation, water pH, and water temperature and population density. The model was adjusted to the significant variables (P<0.05).

RESULTS

Distribution of Spotted-Necked Otter in Southern Benin

The spotted-necked otter has a wide distribution in the study area (Figure 3). A total of 89% of the surveyed areas show the presence signs of the species and hoop net damage was recorded in all sites (Figure 1).

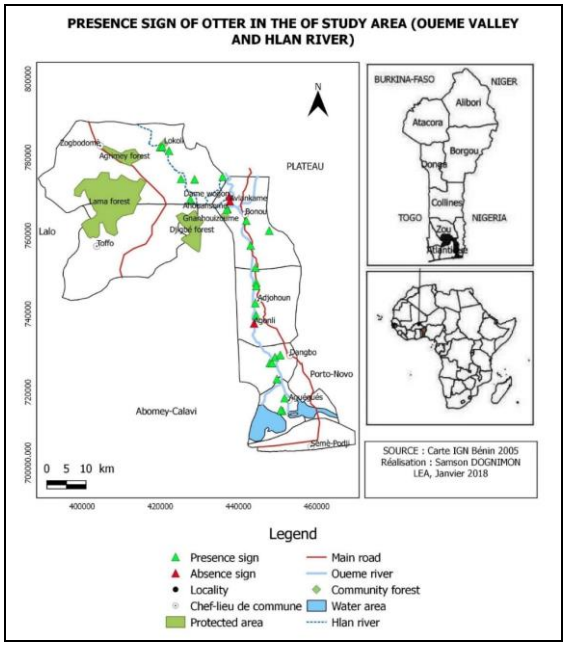

Figure 3. Signs of presence of spotted-necked otter in the villages along the Ouémé valley and Hlan river

Local Perceptions of Spatio-Temporal Dynamics of Spotted-Necked Otters

The perceptions of the habitat, seasons, group composition, and periods of occurrence of the spotted-necked otter are presented in Figure 4.

Spotted-necked otter was reported in marsh (62% of the respondents), in swampy forest (40%) and on crop land (9%). According to respondents, the animal is abundant especially during the great rainy season (80%), often in group (54%) or in pairs (42%) and rarely solitary (9%). The most reported occurrence periods were twilight (71%) and night (73%).

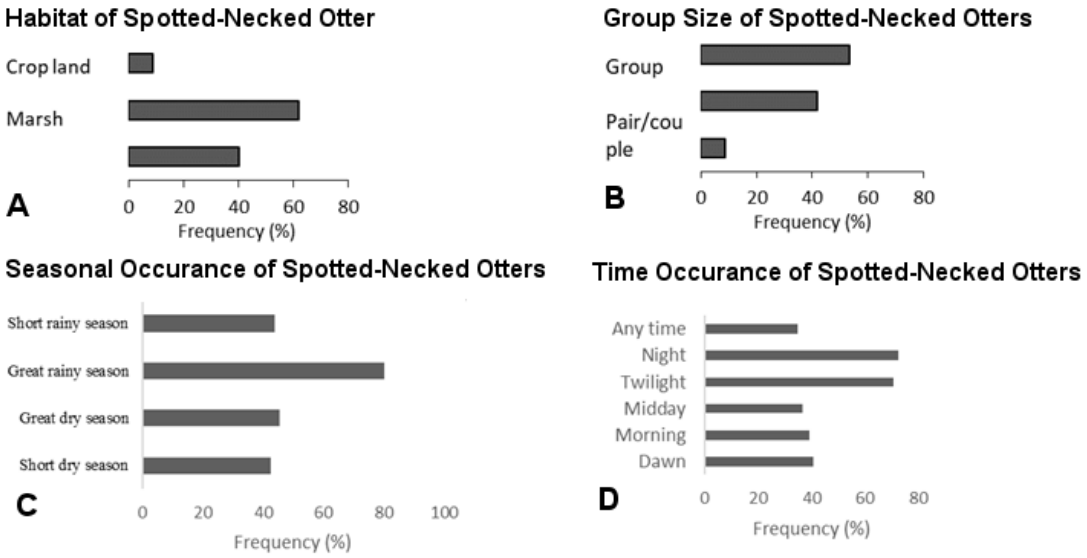

Figure 4. Perceptions of surveyed over the habitat (A), the seasons (B), the grouping size (C) and the periods (D) of occurrence of spotted-necked otter

Abundance of Spotted-Necked Otter according to Local Population

According to most respondents (Ouémé valley and Hlan river), is more abundant compared to the five previous years (Figure 5). As for trend, most

respondents said that spotted-necked otter population is abundant (74%) and others respondents (18%) thinks that it is the same in recent years (Figure 5). The results of the CA performed on respondents' perceptions of the spatio-temporal dynamics show that 99% of the distribution of perceptions within socio-cultural groups is summarized on the one axis. Projections of social groups in the main axis (Figure 6) show that the low abundance of spotted-necked otter is a perception mainly reported by Weme ethnic group while the abundance is reported by Fon ethnic group.

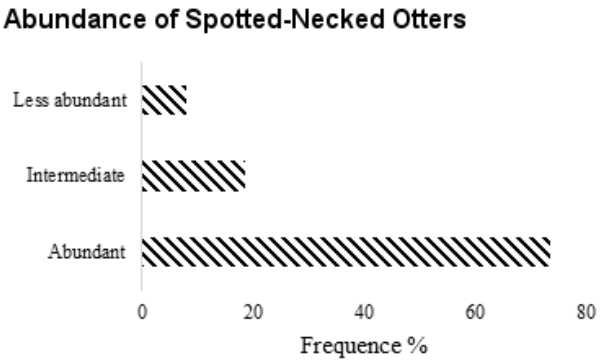

Figure 5. Abundance of spotted-necked otter according to local perceptions

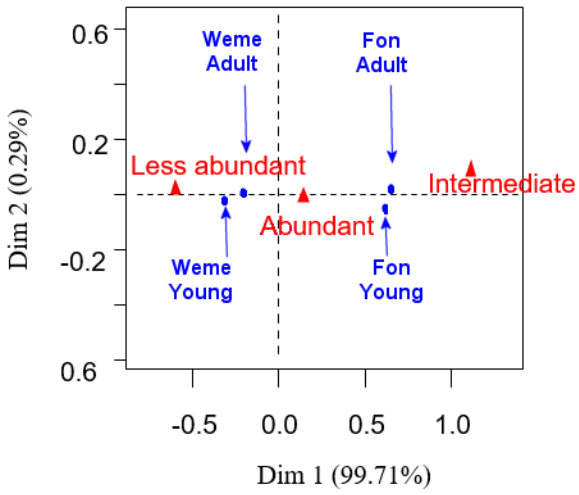

Figure 4. CA performed on the perceptions on the dynamics of the spotted-necked otter

Factors Affecting the Presence of Spotted-Necked Otters

The result(Table 1) of GLM performed on data collected to determine the ecological and environmental factors affecting the presence of spotted-necked otter results showed that only vegetation cover (P=0.036) influences significantly the presence of otter. The factors like average height of the vegetation (P=0.424), water pH (P=0.855), and water temperature (P=0.519) are not significant.

Table 1: Results of binomial GLM on the presence/absence sign

Terms	Coefficient	Standard error	z-value	*P*

(Intercept)	29.19	38.90	0.75	0.453
Vegetation cover	6.42	3.07	2.09	**0.036**
vegetation height	0.20	0.25	0.80	0.424
water_Ph	-0.93	5.11	-0.18	0.855
Population density	0.47	0.48	0.84	0.228
water Temperature	-0.98	1.52	-0.65	0.519

The Chi^2 adjustment test showed that the model fits well χ^2 (17) = 11.91, *P*= 0.806); R^2 = 55%

DISCUSSION

Our results showed otters' presence signs in most of the sites surveyed. The human populations of these localities have generally confirmed the presence of the species. According to local perceptions, spotted-necked otter is mostly observed in marsh and swampy forest but rarely in crop land. Correspondence analysis showed that the perception of the population trend varies according to the ethnic group. Weme ethnic group thinks that otter population is less abundant, however, the Fon ethnic group believe that this population is abundant. Habitat variables were subjected to logistic regression models to examine the factors associated with the occurrence of the spotted-necked otter. The logistic binary regression shown that only the vegetation cover influences significantly the presence of spotted-necked otter in the study area.

Several factors play a role in the habitat choice, and knowledge of these factors is crucial in the understanding of the behaviour and ecology of otters (Shenoy, 2006). It is known that food availability, good vegetation cover are the most important factor determining otter presence in a given habitat (Nel and Sommers, 2007). In the absence of good cover also can greatly influence the presence or absence of otter. The large distribution of spotted-necked otter in the study area can be explained by the abundance of fish, its principal food (Akpona, 2004) in Ouémé valley. Indeed, the study area is described as a fishing zone because of its ecological characteristics that allow the extensive colonization by fish (Attingli et al., 2016; Perrin and Carranza, 2000). Otters cannot live in the area without suitable prey resources (Ayres and García, 2009). Spotted-necked otter have been seen in marshes of less than three meters (Kintocome, Kodonou and Kessounou) and in swampy forests with trees exceeding eight meters (Gnanhouizoumè, Démin and Hon). Use of similar habitats was reported by Perrin and Carrugati (2000) by spotted-necked otter and African clawless otter in Kwazulu-natal Drakensberg (South Africa). A recent, similar study on other otter species confirmed the proximity of otters' habitat with water (Romero Suances, 2018). The otters' presence in marsh and in swampy forests indicates it uses all habitats in the study area. Our study confirmed that otter can use all habitat where the water is fresh and rich in fish.

Sites in which the evidence of presence of the species was not observed are sites where human habitations were located along the river bank (Agonli in Adjohoun municipality) and the vegetation cover was low. Trivedi and Joshi (2018) have observed that otters are not habituated to human presence. Human presence negatively influences spotted-necked otter. However, many otter species are tolerant of some degree of human disturbance, and a few species have adapted to human-modified systems (Okes and O'Riain, 2017). Human presence alone cannot explain the absence of spotted-necked otters in the area. These otters require good vegetation cover or rocky shorelines to hide in; the absence of good cover also can greatly influence the presence or absence of otters. We also observe in these areas that the depth of the river is great. Nel and Sommers (2007) reported that presence of *Aonyx capensis*, a species having similar habitat requirements to *H. macullicolis,* is significantly

affected by the depth of river. However, in Lake Victoria the presence or absence of otters did not correlate with water depth but with shoreline cover (Reed-Smith et al., 2015). Most of these sites are in places where the species has been reported as absent by Akpona, (2004). This study was implemented in the rainy season, and due to flooding in the study area, it was very difficult to maximize the observation of the otter sign (such as footprints, anal secretions, and spraint). We suggest more investigations during the dry season to confirm the presence/ absence of otter in the study area.

The frequency of observation in marsh and swampy forest is due to the ecology of a species that needs water, fisheries resources and vegetation cover. Night and twilight have been reported as the times of day when otter is more active. Indeed, these periods correspond with when human activities are less intense. The fishermen would have finished visiting the hoop nets and the animal feels safe to move and look for food without risk of being seen. These results are corroborated by those obtained by Akpona (2004) who noticed that *H. macullicolis* is active at times when their habitat is quiet and unexploited. The same observations were made by Triplet (2009) in his book on the management of protected areas. Greater abundance of otters was reported during the long rainy season. This period is suitable for the animal's reproduction (June-August) (Akpona 2004). The use of camera trap in future studies can help to get more information on otter's activity cycle.

The impressions of the Weme ethnic group (a less abundant otter population) can be explained by the fact that spotted-necked otter is much more dispersed in their part of Ouémé valley. This dispersion is justified by the high fishing intensity by the local population which extendsd to all portions of otter's habitat (Akpona, 2004). Chettri and Savage (2014) showed, through their study on distribution, a negative correlation between the abundance of otter and intensity of fishing activity. The perception of the abundance of otter in an environment is influenced by habitat characteristics and the frequency of hoop net placement in the area. The thicker of the vegetation and the abundance of fish along the Hlan river would favor the colonization of this area by otters which find the habitat and the necessary food resources for their development and growth.

The correlation between the vegetation cover and the presence of otter revealed by this study is similar to th findings of several other authors (Anoop and Hussain, 2004; Chettri and Savage, 2014). The significance of this variable could be explained by the cryptic behaviour of the species. Otters require dense vegetation cover in order to have a hiding place where they feel safe to rest, groom, and raise their young; their presence in a specific area is often dependent on this (Reed-Smith et al., 2015). Perrin and Carrugati (2000) in Kwazulu-Natal discussed the importance of vegetation cover in the habitat selection by spotted-necked otters, and showed that otters choose habitats with dense vegetation, which can provide them with suitable habitat for feeding, reproduction and the safety necessary to ensure the survival of young otters. Hon et al. (2010) showed that otters preferred to live under the forest canopy more than in the open areas. *Aonyx cinereu,s* like *H. maculicolis,* dislike open areas that do not offer any shelter. However, in their study, Ottino and Giller (2004) found no correlation in *Lutra lutra* between otter signs and vegetation cover.

The influence of "vegetation cover" is clearly demonstrate by otter presence in the Gnanhouizounmè swampy forest whereas they are absent in surrounding sites. Similarly, footprints have occasionally been observed in other areas with dense vegetation (Sekodji in Adjohoun municipality and Demé in Lokoli Forest). This result has to be consider with caution, as the absence of otter sign does not mean they are

not there, only that it is harder to find. Furthermore, the presence of sign in more open areas may only mean otters are passing through, rather than indicating residency. More investigations are needed, using camera traps, to investigate otter habitat occupancy in the study area. A previous study (Urban et al., 2011) has demonstrated that optimal habitats for otter are defined as areas with unregulated rivers with trees and other plants providing good cover. The absence of sign of this small carnivore in the localities of Avlankame and Dame Wogon, where there is low vegetation cover, could confirm the high influence of this factor in the choice of habitat of by the species. The importance of vegetation cover is considered to explain habitat choice and preference in other otter species. Acharya and Lamsal (2010) made similar observations on the occurrence of the Smooth-coated otter (*Lutrogale perspicillata*) in Nepal. Vegetation cover is one of mains factors affecting habitat selection by smooth-coated otter *(L. perspicillata*) in India (Anoop and Hussain, 2004). In Pakistan, the study done on the Eurasian otter (*Lutra lutra*) showed the continued survival of species is due to the protection of vegetation (Ullah et al., 2012). Nawab and Hussain (2012) consur. However, it is important to know that this factor alone cannot explain the choice of otter occurrence sites. In fact, studies made by Perrin and Carrugati (2000) in Kwazulu-Natal have revealed that, apart from the vegetation cover, otters prefer areas with little or no human presence and good quality of the water. Kubheka et al. (2012) remarked that river bank vegetation cover and human disturbance were the main factors determining the presence or absence of *H. maculicollis*.

The period of this study did not allow us to consider all factors determining habitat of spotted-necked otter like stream substrate, the level of disturbance at each site and the presence of visible pollution. The presence sign used (hoop nets damage) is the limit of this study but the unanimity observed around this criterion as an index of the presence of the otter by the population, makes it possible to consider the results of this study in the development of otter conservation strategies.

CONCLUSION

The success of a species-specific conservation project is related to good understanding of the animals' distribution, and ecological factors determining its habitat choice. Results of this study showed that spotted-necked otter sign is widely distributed in its geographic range, and locally, its presence is strongly influenced by a high percentage of vegetation cover. For the conservation of this species, it is necessary to protect the vegetation cover by reducing tree cutting and exploitation of grasses in the swampy forests. It would be appropriate for future research to extend the study area to all the wetlands of southern Benin and to conduct a line transect study along the bank to collect data on the factors determining the habitat choice.

REFERENCES

Acharya, P.M., Lamsal, P. (2010). A survey for smooth coated otter *Lutrogale perspicillata* on the River Barayani, Chitwan National Park, Nepal. *Hystrix Italian Journal of Mammalogy. (n.s.).***21**(2): 203-207.

Akpona, A.H. (2004). Facteurs de conservation des loutres au Sud du Bénin: Cas de la forêt classée de la Lama et des corridors avec les zones humides de la vallée de l'Ouémé: Thèse d'Ingenieur agronome, *FSA* UAC Bénin.pp. 81.

Akpona, H.A., Mensah, G.A., Sinsin, B. (2007). Rôle culturel et importance économique de la loutre à cou tacheté *Lutra maculicollis* au Sud-Bénin *Bulletin de la Recherche Agronomique du Bénin.* **57**: 52-60.

Akpona, H.A., Sinsin, B. and Mensah, G.A. (2011) Monitoring and Threat Assessment of the Spotted-Necked Otter (*Lutra maculicollis*) in Southern Benin Wetlands .

Proceedings of Xth International Otter Colloquium, IUCN Otter Spec. Group Bull. **28A:** 45 – 59 https://www.iucnosgbull.org/Volume28A/Akpona_et_al_2011.html

Akpona, A.H., Djagoun, C.A.M.S., Harringtonc, L.A., Kabréd, A.T., Mensah, G.A., Sinsin, B. (2015). Conflict between spotted-necked otters and fishermen in Hlan River,Benin. *Journal for Nature Conservation*.**27**: 63–71.

Ali, R., Odjoubere, J., Tente, B.H., Sinsin, B. (2014). Caractérisation floristique et analyse des formes de pression sur les forêts sacrées ou communautaires de la Basse Vallée de l'Ouémé au Sud-Est du Bénin. *Afrique SCIENCE*. **10**(2): 243 - 257.

Al-Sheikhly, O., Haba, M., Barbanera, F. (2014). Otter hunting and trapping, a traditional practice of marsh arabs of Iraq. *IUCN Otter Spec Group Bull*. **31**(2): 80-88 https://www.iucnosgbull.org/Volume31/Al_Sheikhly_et_al_2014.html

Angelici, F.M., E.Politano, Bogudue, A.J., Luiselli, L. (2005). Distribution and habitat of otters (*Aonyx capensis* and *Lutra maculicollis*) in southern Nigeria. *Italian Journal of Zoology*.**72**(3): 223-227.

Anoop, K.R., Hussain, S.A. (2004). Factors affecting habitat selection by smooth-coated otters *(Lutra perspicillata*) in Kerala, India. *J. Zool*. **263**: 417–423.

Attingli, A.H., Zinsou, L.H., Vissin, E.W., Laleye, P.A. (2016). Spatialisation des paramètres physico-chimiques dans les pêcheries de la Basse Vallée de l'Ouémé (sud-Bénin). *Journal of Applied Biosciences*.**105**: 10190–10202.

Ayres, C., García, P.(2009). Abandoned clay mines: an opportunity for Eurasian otters in Spain. *IUCN Otter Spec. Group Bull.* **26**(2): 66-71 https://www.iucnosgbull.org/Volume26/Ayres_Garcia_2009.html

Bueno–Enciso, J., Núñez–Escribano, D., Sanz, J. J. (2015). Cultural transmission and its possible effect on urban acoustic adaptation of the great tit Parus major. *Animal Biodiversity and Conservation.* **38**(2): 221-231.

Carugati, C., Rowe-rowe, D.T., Perrin, M.R. (1995). Habitat use by *Aonyx capensis* and *Lutra maculicollis* in the natal drakensberg (south africa): preliminary results. *Hystrix*. **7** (1-2): 239-242.

Chettri, P., Savage, M. (2014). Distribution survey for otter along a river in central Bhutan. *IUCN Otter Spec. Group Bull.* **31**(2)*:* 65-73 https://www.iucnosgbull.org/Volume31/Chettri_Savage_2014.html

Chongsuvivatwong, V. (2012). epicalc: Epidemiological calculator p. R package

Contesse, P., Hegglin, D., Gloor, S., Botadina, F., Duplazes, P. (2004). The diet of urbant foxes (*Vulpes vulpes*) and the availability of anthropogenic food in the city of Zurich, Switzerland. *Mamm.biol*. **69** (2): 81-95

Djagoun, C.A.M.S., Akpona, A.H., Daouda, I. (2011). Petits carnivores:Herpestidae, Mustelidae, Viverridae, Canidae, Felidae et Nandiniidae. In: *Protection de la nature en Afrique de l'Ouest: Une liste rouge pour le Bénin* (eds. **P.Neuenschwander, Sinsin, B and Georgen, G**.), pp. 318–330.

Hon, N., Neak, P., Khov, V., Cheat, V. (2010). Food and habitat of Asian small-clawed otters in northeastern Cambodia. *IUCN Otter Spec. Group Bull*, **27**(1):12-23 https://www.iucnosgbull.org/Volume27/Hon_et_al_2010.html

Husson, F., Josse, J, Le, S. and Mazet, J. (2014) FactoMineR: Multivariate Exploratory Data Analysis and Data Mining with R. http://CRAN.R-project.org/package=FactoMineR

INSAE (2013). Cahier des villages et quartiers de ville, pp. 40.

Kidjo, F.C. (2000). Estimation des indices de présence et étude de la stratégie de protection et de conservation des loutres (*Aonyx capensis*-Scinz, 1821 et *Lutra maculicollis* - Lichtenstein, 1835; Lutrinae- Mustelidae) dans les zones humides du Sud- Bénin., 26.

Kidjo, F.C. and Guédou, R. (2001). Inventaire et caractérisation des écosystèmes humides des deux complexes Est et Ouest des zones humides du Sud Bénin. *Rapport Groupe Faune reptilienne et mammalienne*. PAZH, 14p

Kruuk, H. (1995). *Wild otters – predation and populations*. Oxford University Press.

Kubheka, S.P., Rowe-Rowe, D.T., Alletson, J.D., Perrin, M.R. (2012). Possible influence of increased riparian activity (stream modification and agricultural intensification) on abundance of South African otters. *African Journal of Ecology*. **51**(2): 288–294.

Kuhn, R. (2012). Loutre et activité aquacole : synthèse des connaissances sur la problématique à l'échelle international (Plan National d'Action en Faveur de la Loutre d'Europe, SFEPM), pp.33.

Lalèyè, P., Ezin, A., Vandewalle, P., Philippart, J.C., Teugels, G.G. (2007). La pêche dans le fleuve Ouémé (Bénin). *Journal. Afrotropical. Zoology.,Special issue*. pp137-148.

Nawab, A., Hussain, S.A. (2012). Factors affecting the occurrence of smooth-coated otter in aquatic systems of the Upper Gangetic Plains, India. *Aquatic Conservation: Marine and Freshwater Ecosystems*. **22**(5): 616–625.

Nel, J.A.J., Somers, M.J. (2007). Distribution and habitat choice of Cape clawless otters, in South Africa. *South African Journal of Wildlife Research*. **37**(1):61-70.

Okes, N.C., O'Riain, M.J. (2017). Otter occupancy in the Cape Peninsula: Estimating the probability of river habitat use by Cape clawless otters, Aonyx capensis , across a gradient of human influence. *Aquatic Conservation: Marine and Freshwater Ecosystems*. **27**(3):706–716.

Ottino, P., Giller, P. (2004). Distribution, density,diet and habitat use of the otter in relation to land use in the Araglin valley southern Ireland. Biology and environment. Proceedings of the Royal Irish Academy, p 104

Pedroso, G.M., van Kessel,C., Six,J., Putnam, D., Linquist, B.A. (2014). Productivity,dynamics and water use efficiency in low- and high-input switchgrass systems. *GCB Bioenergy*. **6**: 704–716.

Perrin, M.R., Carranza, D.I. (2000). Use of space by spotted-necked otters in KwaZulu-Natal Drakensberg, South Africa. *S. Afr. J. Wildl. Res*. **30**(1): 15–21.

Perrin, M.R., Carrugati, C. (2000). Habitat use by the cape clawless otter and spotted-necked otters in KwaZulu-Natal Drakensberg, South Africa. *S. Afr. J. Wildl. Res*. **30**(3): 103-113.

RCoreTeam (2017). R: A language and environment for statistical computing. R Foundation for Statistical Computing Vienna, Austria.

Reed-Smith, J., Jacques, H., Somers, M.J. (2015). *Hydrictis maculicollis. The IUCN Red List of Threatened Species.*

Ripple, W.J., Estes, J. A., Beschta, R.L., Wilmers, C.C., Ritchie, E. G., Hebblewhite, M., Berger,J., Elmhagen, B., Letnic, M., Nelson, P., Schmitz, O.J., Smith,D.W., Wallach, A.D., Wirsing, A.J. (2014). Status and Ecological Effects of the World's Largest Carnivores. *Science*, **343**:1241484-11.

Romero Suances, R. (2018). The Recovery of a Coastal Eurasian Otter (*Lutra lutra*) Population in the Galician Atlantic Islands Maritime-Terrestrial National Park. *IUCN Otter Spec. Group Bull*. **35** (1): 37– 46. https://www.iucnosgbull.org/Volume35/Romero_2018.html

Rowe-Rowe, D.T. (2016). Densities of Otters in the Drakensberg of Kwazulu-Natal, South Africa. *IUCN Otter Spec. Group Bull*. **33** (2):64 - 67.

Shenoy, K., Varma, S., Prasad, K. V. (2006). Factors determining habitat choice of the smooth-coated otter, *Lutra perspicillata* in a South Indian river system. *Current science*. **91**(5):637-643.

Triplet, P. (2009). *Manuel de gestion des aires protégées d'Afrique francophone*, Paris

Trivedi, K., Joshi, P (2018). Photographic Documentation and Distribution of Smooth-Coated Otter (Lutrogale perspicillata) (Geoffroy 1826) in Surat, Gujarat. *IUCN Otter Spec. Group Bull*. **35** (1): 31 – 36 https://www.iucnosgbull.org/Volume35/Trivedi_Joshi_2018.html

Ullah, I., Noureen, U., Arshad, M. and Jadoon, W. (2012). Factors Influencing Distribution of Eurasian Otter (*Lutra lutra*) in Swat and Dir Districts, Pakistan**.** *IUCN Otter Spec. Group Bull.* **29** (1): 24 – 33

Urban, P., Balázs, C., Lantos,I., Gáspár,S., Joó, M., Harmos, K. (2011). Eurasian otter (*Lutra lutra*) in the central part of the Slovak-Hungarian border area. *IUCN Otter Spec. Group Bull*, **28**(2): 99 – 112

Vitousek, P.M., Harold, A.M., Lubchenco, J., Melillo, J.M. (1997). Human Domination of Earth's Ecosystems. *Science*, **277** (5325) : 494-499.

Résumé:

DISTRIBUTION DE LA LOUTRE À COU TACHETÉ (*Hydrictis maculicollis*) ET FACTEURS DÉTERMINANTS DE LA PRÉSENCE D'HABITAT DANS LA VALLÉE DU BAS *OUÉMÉ*, AU SUD DU BÉNIN

Les loutres à cou tacheté (*Hydrictis maculicollis*) sont présentes dans plusieurs grands réseaux hydrographiques au sud du Bénin. Leurs exigences environnementales les lient aux problèmes de sécurité alimentaire et hydrique, la région étant densément peuplée par l'homme. L'absence de données de base sur leur répartition et leur écologie est une autre contrainte majeure à laquelle l'espèce est confrontée au Bénin. La présente étude vise à déterminer la répartition de la loutre et les facteurs affectant la sélection de l'habitat dans un environnement fortement impacté par l'homme. Nous avons mené une enquête sur la présence / absence de loutres à cou tacheté dans les localités de la vallée du bas Ouémé, au sud du Bénin, à l'aide de la méthode d'échantillonnage non probabiliste "boule de neige". Nous avons ensuite évalué les besoins en matière d'habitat et d'environnement de la loutre à cou tacheté sur base d'observations de terrain. La loutre à cou tacheté a une large distribution dans le sud du Bénin et les indices de présence ont été confirmés dans 89% des sites recensés, suivant une information locale. Selon les variables expliquant sa présence, seules les caractéristiques de l'habitat comme la couverture végétale étaient significatives. La loutre à cou tacheté a fait preuve d'une flexibilité surprenante dans ses exigences environnementales. Nos résultats démontrent une grande capacité d'adaptation de ce carnivore menacé dans des paysages altérés et montrent comment ce comportement flexible ouvre des opportunités de récupération.

Resumen

LA DISTRIBUCION Y DETERMINANTES DE LA OCURRENCIA DE HABITAT PARA LA NUTRIA DE CUELLO MANCHADO (*Hydrictis maculicollis*) A LO LARGO DEL VALLE DE OUEME Y EL RIO HLAN EN EL SUR DE BENIN

Las especies de nutria de cuello manchado están presentes en varios sistemas fluviales importantes en el sur de Benin, y sus requisitos ambientales los vinculan con los problemas de seguridad de los alimentos y el agua, ya que la región está tan densamente poblada por humanos. La falta de datos de referencia sobre su distribución y ecología es otra limitación importante que enfrenta la especie en Benin. El presente estudio tiene como objetivo determinar la distribución de la nutria y los factores que afectan la selección del hábitat en un entorno altamente afectado por el ser humano. Realizamos un estudio sobre la presencia / ausencia de nutria de cuello manchado en las localidades del valle inferior de Ouémé, en el Benin, utilizando el método de muestreo no probabilístico de "bola de nieve". Luego accedemos a los requisitos de hábitat y ambientales de la nutria de cuello moteado a partir de observaciones de campo. La nutria de cuello manchado ha mostrado una amplia distribución en el sur de Benin, con signos de presencia que confirman en el 89% del sitio registrado a partir de la percepción local. De acuerdo con las variables que explican la presencia, solo las características del hábitat como la cobertura vegetal fueron significativas. La nutria de cuello manchado mostró una sorprendente flexibilidad en sus requisitos medioambientales. Nuestros resultados demuestran una alta adaptabilidad de un carnívoro amenazado a paisajes alterados y muestran cómo este comportamiento flexible abre oportunidades para la recuperación.

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

Since the last issue, we have welcomed 8 new members to the OSG, and welcomed back a former member: you can read more about them on the Members-Only pages.

Manuel Badilla, Chile: I originally joined OSG in 2007. I work now to bridge the gap between the public and the world of science. I believe that wild otters can be used as an excellent ecological service to raise awareness, but that before doing anything, we must personally consider our footprint, our socio-environmental responsibility as a whole.

Aarati Basnet, Nepal: I am a final year student pursuing a bachelor's degree in Forestry Science from Institute of Forestry, Pokhara, Nepal. I was recently awarded a Small Mammal Research Fellowship by the Small Mammals Conservation and Research Foundation of Nepal to conduct an otter survey in the Budigandaki River of Nepal, where I have already conducted preliminary research on otter presence, including a key informant survey and camera trapping.

Laura Fasola, Argentina: I joined OSG in 2004, when was I working on Southern River Otters in Argentinean Patagonia. After a few years working on other species, I found that I always looked for otter sign and how to promote their conservation. In 2016, I began working on the only known freshwater *Lontra provocax* population in Argentina, focussing on understanding occupation dynamics and how to promote and encourage the population.

Rohit Raj Jha, Nepal: My interest lies in long term study of otter habitat and to see how change in intensity of anthropogenic factors is changing the distribution of habitat. My study on Smooth-Coated Otter distribution in Bardiya National Park showed that as anthropogenic disturbances increase, otter distribution decreases. I plan to continue this work over several seasons and on more sites, in order to develop information that can be the basis of conservation intervention policies.

Ade Kurniawan, Singapore: I worked as a zookeeper with Asian small-clawed otters for 6 years. I am currently working on the impact of otter display and messaging in the zoo on visitor's attitude to otters as pets. I am also interested in helping with regional and national conservation strategy plans for otters, having worked on such plans for the Sunda Pangolin.

Shiri Lev, India: I am working at Wild Otters, Goa, and my particular interest is combatting the pet otter trade, and the rehabilitation and return to the wild of otters rescued from unsuitable situations. I'm currently working on a concept project of depicting otters as wildlife who should not be kept as pets. The basic plan is to create and publish visual elements such as 'memes' and caricatures of captive otters vs. wild otters through social media, in order to raise public awareness around the world.

Tim Schikora, Germany: I work with giant otters, particularly in captive population management (I am EEP Coordinator for EAZA and International Studbook Keeper for WAZA). I am already working together with the OSG and other giant otter enthusiasts from research, conservation and other zoo staff in Europe, the Americas and Singapore

Paul Todd, USA: I am a lawyer and policy advocate currently working for the Natural Resources Defense Council (NRDC) in the United States, and I have

extensive experience in the areas of international wildlife law and policy, political advocacy, behavior change strategies, institutional strategic planning, communications, and project and campaign design. I have been working with members of OSG to "uplist" three species of tropical Asian otters from CITES Appendix II to Appendix I. I am also working on a strategy to secure the uplisting of the hairy-nosed otter as soon as possible following the CITES conference in Sri Lanka