NOTE FROM THE EDITOR

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Dear Friends, Colleagues and Otter Enthusiasts!

We this editorial we start our first issue of 2017. I have received already enough issues to fill at least the first issue of 2017 provided that the reviewers accept the manuscripts that are currently under revision. I hope you all will keep coming back to our website and see what new manuscripts went online.

I want to express my thanks to all the efforts to of the reviewers to evaluate the manuscripts and to provide wherever possible positive comments to improve the manuscripts. However, I have to note that submission to the IUCN OSG Bulletin clearly does not guarantee publication and that manuscripts have been rejected and will be rejected if the science is below standards. Since I thanked the reviewers the last time personally Aadrean, Michael Belanger, Laura Bonesi, Tom Brooks, Emmelianna Bujak, Oldemar Carvalho Junior, Will Duckworth, Nicole Duplaix, Morten Elmeros, Syed Ainul Hussain, Waseem Ahmad Khan, Chris Marnell, Fabiano de Melo, Fernanda Michalski, Darren Norris, Hiroshi Sasaki, Melissa Savage, Tom Serfass and Lesley Wright provided reviews for which I am very thankful. In addition I want to thank Sebastien Cambier, Claudio Chehebar, Helen Jaques, Servane Contal and Gerard Schmidt for the translations of the abstracts into French and Spanish in the last period.

It would be of real great support is some of you could provide us photos as we need good resolution pictures for the title page.

At the end of my note I have to say “Merci-Gracias-Danke” to Lesley who does an incredible job to put all your manuscripts online and whom I or you as authors bother to perform last minute or post-publishing changes if they are necessary. Lesley, thank you so much for all your efforts.

R E P O R T

THE STATUS AND DISTRIBUTION OF THE CLAWLESS OTTER (*Aonyx capensis*) IN VWAZA MARSH WILDLIFE RESERVE AND NYIKA NATIONAL PARK, NORTHERN MALAWI

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Abstract: The clawless otter (A*onyx capensis*) occurs in Nyika National Park and Vwaza Marsh Wildlife, Northern Malawi. A number of rivers, streams and other wetlands areas were searched for otter signs (spraints, tracks, dens, runs, food remains). The species status in Nyika could be rated as common and sparse in Vwaza. The clawless otter commonly occurs in Nyika; all the wetland areas surveyed indicated positive otter signs. A total of 790 signs were recorded in Nyika National Park, these signs were registered most frequently in riverine habitats in northern hills, followed by montane riverine habitats on plateaus and southern hills wetlands. There is no significant difference in density of otter in Nyika Wetlands (F=2.636 df= 2 and 6; $P<0 .001$). This area has high potential for the survival of the clawless otter. There is abundant otter prey (fish, crabs), adequate vegetation cover, water, and reduced human activity. *Aonyx capensis* in the Vwaza Marsh Wildlife Reserve were recorded only in the marsh (247 signs) and very rare in downstream areas. Luwewe and South Rukuru rivers remained negative with no evidence of otter occurrence. The habitat in the marsh is ideal for the survival and existence of otters, adequate vegetation cover, water and prey. The main threats observed in Nyika National Park include illegal bushfires, fish poaching especially in northern hills wetlands, and soil erosion. The major factors of stress in Vwaza Marsh Wildlife Reserve are streambank cultivation, riparian vegetation destruction, siltation, illegal bushfires and competition for fish and crabs between humans and otters. Broad-based conservation measures are proposed for long term survival and existence of clawless otter and its habitats.

Keywords: Clawless otter, spraints (scats), holts, tracks, habitat

INTRODUCTION

The Cape clawless otter (*Aonyx capensis*), belonging to the family *Mustelidae* and Order Carnivora, has received no formal scientific research on its status and distribution in Vwaza Marsh Wildlife Reserve and Nyika National Park in the northern region of Malawi. The knowledge of the species is traditionally widespread amongst protected area staff as well as rural people bordering the protected areas. Small mammal conservation has taken a back seat to general conservation measures that emphasize large mammals. Otters locally known as *Katumbwi* or *Katumbu* (Tumbuka and Chichewa local names for otter respectively) are known to occur in the wetlands of Malawi, and there are two types, the cape clawless otter and the spotted–necked otter. The former is the larger of the two and has dark brown back and head with contrasting white neck and under parts whereas the latter has brown upper parts and its under parts pale but strongly mottled with brown spots. Hough (1989) reported that the distribution of the clawless otter is probably widespread in Nyika National Park and Vwaza Marsh Wildlife Reserve whereas the Spotted-necked otter is absent.

Some community members in the northern part of Vwaza reported having their fishing baskets destroyed by otters hunting for food. Otters have been observed feeding on trout in Nyika (Mill, 1979). Husson et al. (1997) recorded some otter signs in the northern hills of Nyika National Park. The primary living requirement for otters in freshwater habitats is unpolluted, unsilted water in which crabs, fish, and frogs occur (Nagulu et al., 1998; Rowe-Rowe, 1992). The International Union for Conservation of Nature (IUCN) Otter Specialist Group also underscores the fact that otters play a significant role as indicators of the health of the wetlands they inhabit (Butler and Hillman, 1995). In light of this, presence of otters in a river or stream reflects healthy aquatic conditions. Nyika and Vwaza protected areas were established to conserve and protect biological diversity of fauna and flora. Additionally the majority of the local communities in the border zone depend on these protected wildlife areas for their livelihood in terms of water for domestic and agricultural purposes downstream. The protected areas are of extreme economic importance to northern Malawi as the main reservoir of dry season water supply.

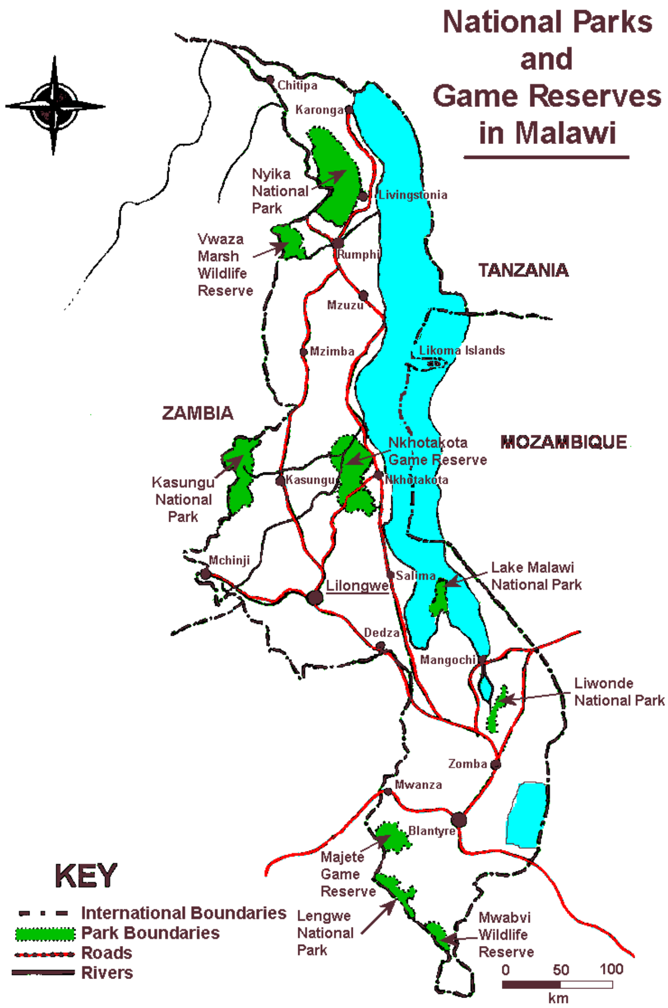

Figure 1: Map of Malawi and National Parks

In recent years there has been growing recognition that the earth is facing a loss of biological diversity of crisis proportion (Wilson et al., 1996). The ever increasing pressure of human population growth has led to worldwide habitat degradation that has driven many known and unknown plant and animal species to extinction and put numerous others at risk. This dilemma has focused attention on the need to survey biological resources as a first step in developing management strategies essential for establishing legislation and other guidelines to save biological resources for the future. Otters are some of the endangered and threaten mammal species in Malawi due to habitat loss which is linked to human population growth. Smith (1992) documented of negative human impacts in the Otter Point area of Lake Malawi National Park. The Cape clawless otter and Spotted-necked otter are known to inhabit large rivers and their associated tributaries, estuaries, swamps and requires undisturbed riparian forest vegetation with long grass, reeds and bushes to provide cover for resting places and holts (Rowe-Rowe, 1992). Sweeney (1966) indicated that the Cape clawless otter in Malawi is more common than Spotted-necked otter and that it occurs in marshy places at lower levels in small streams while the latter is restricted to larger rivers and lakes. Otters are rarely seen and as such indirect methods of observations using sign are widely used. The spraints or scats are normally deposited on easily recognized sites, on grassy mounds near the seashore, at the mouth of rivers; under bridges and at the entrance to holts (Yoxon, 1998). Signs such as spraints (scats), dens (holts) and tracks have been used by various otter scientists in wetlands to assess the distribution or habitat use (Romanowski and Brzezinski, 1997).

Assessment of mammal diversity focuses on the broad distributional patterns of mammals in relation to natural and human landscape elements (Wilson et al., 1996). By obtaining information on mammal distribution, natural landscape elements and human influences at any given site, many questions relevant to the understanding and conservation of mammals' diversity can be addressed. There is no information available regarding the status and distribution of otters in Nyika and Vwaza since the two were designated as protected areas. Sound management conservation measures can only be made on the basis of information. The key to successful management of park resources is an understanding of the structure (baseline inventories) and function (ecosystem dynamics) of the ecosystems and the transformation of these into a flexible mechanism for decision making (Mill, 1979). Consequently, a survey was undertaken from May 2000 to February 2001 in the two protected areas in order to ascertain the otter status, identify localities they inhabit, major threats endangering their survival and conservation measures that can be undertaken to enhance otter survival and protection of habitats.

STUDY AREAS

The survey was carried out in two protected areas in the northern region of Malawi.

Vwaza Marsh Wildlife Reserve

Vwaza Marsh Wildlife Reserve is located in the Central African Plateau, west of Northern Malawi (Figure 1) and covers an area of 986 km². It lies on the watershed between Lake Malawi and the Luangwa valley, Zambia [33º 28'E / 11º 00'S] and the western part of its boundary coincides with Malawi – Zambia border (Clarke, 1983). The reserve has three major landscape types namely the plateau on the western sector, hills and pediments occupy the eastern half of the area whereas the wetland-alluvial types is found on the north-central and southern boundary of the area (McShane, 1985). Three major wetland areas were surveyed (Figure 2), marsh, Luwewe and South Rukuru dambo-floodplains including Zaro pool and Lake Kazuni. Luwewe river has an average width of 8m, depth 1.5m and runs in a north –south direction forming a seasonally flooded belt. It ceases continuous flow as soon as the rainy season has come to an end thereby leaving water pools in certain portions. The riverbanks are characterized by tall grasses (*Hyparrehnia species)* with a narrow strip of riverine forests dominated by *Syzigium quineense* lining its entire channel. South Rukuru river forms the southern boundary of the reserve and is the principal river draining the majority of the reserve. Its banks are open due to widespread streambank cultivation by the adjacent local communities. It is characterized by seasonally inundated floodplain grassland dominated by *Hyparrehnia species* with scattered trees mainly *Acacia species* on raised alluvial edges. The river width ranges from 8m to 13m with an average depth of 3m. The marsh, the major otter locality is dominated by dense papyrus marsh (*Cyperus papyrus)* with patches of bulrush *(Typha austriralis)* and reeds *(Phraggmites mauritians).* It comprises four main streams, Hewe, Chamatete, Kaling'ondo and Dera. The mean depth is 1.6m and width 5.6m. It supports a high density of freshwater river crabs *(Potamomaues species)* and catfish *(Clarias gariepinus).* The area is a waterlogged alluvial basin holding water throughout the year.

The altitude of the reserve varies from 1082m to 1160 m above sea level. Mean annual rainfall ranges between 700 mm to 1100 mm. Rainfall occurs from November to April. Annual mean temperatures range between 16 ºC to 28 ºC. Temperatures are lowest during early dry season (May to August) and highest in late dry season (September to November).

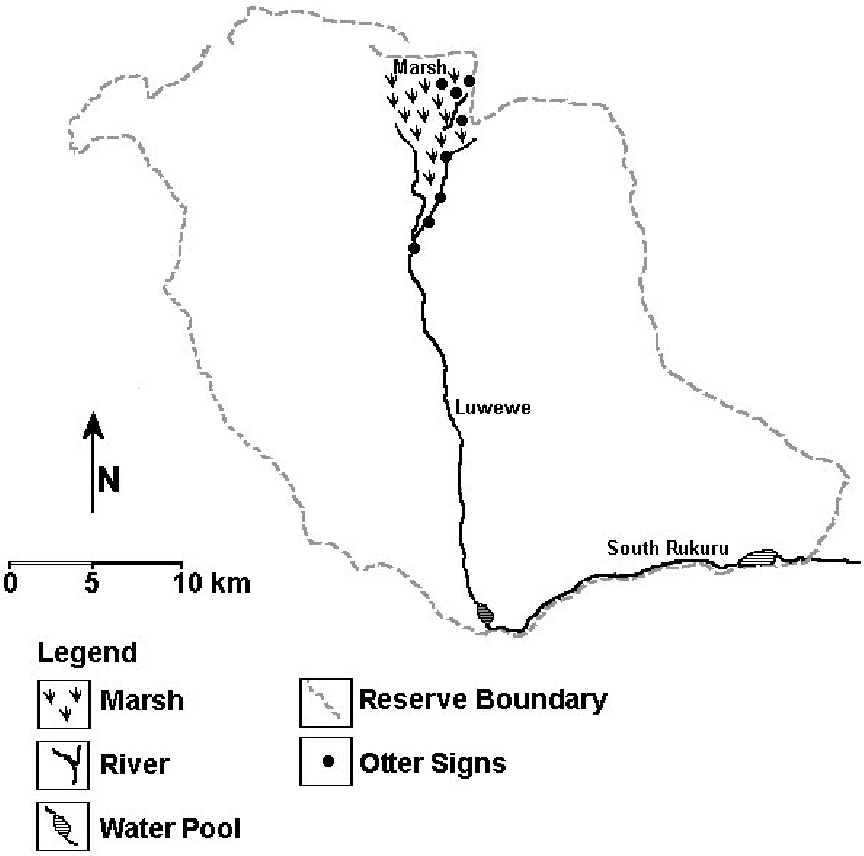

Figure 2: Distribution of otter signs in Vwaza Marsh Wildlife Reserve

Nyika National Park

Nyika National Park (3132 km²) is the largest protected area in Malawi. It is centered on 10º 33'S; 33º 50'E and occupies a track of montane plateau and associated hills and escarpments in Northern Malawi (Clarke, 1983). Part of its western boundary coincides with the Malawi – Zambia border.

There are four different vegetation communities, each supporting a different complement of plants and animals. These are *Brachystegia* woodland, montane grassland (dominates 90% of the plateau, dambos and montane evergreen forests. The valleys between the grassland slopes harbor dambo vegetation community. The dambo grassland is characterised by sedges and herbaceous plant growing in tussocks. A total of eleven major rivers and streams were sampled on the plateau, northern and southern hills of the park (Figure 3). These included North Rukuru, Chilinda-Rumphi, Runyina, Dembo, North Rumphi and Manyenyezi on the plateau. In the northern and southern hills, Chipome, Ulovi, Matolo, Kaswerera, Lusero, Lutete and Runyina were sampled. The riverine vegetation on the plateau is dominated by sedges *(Xyris species, Carex species)* and grasses typical of the moist habitat such as *Setaria longisetta* associated with a rich variety of herbaceous plants and occasional woody shrubs. Scattered evergreen forest patches are present in most of the river channels. The mean river depth and width was 1.1m and 4.6 m respectively. The northern and southern hills consist of *Brachystegia* woodland dominated by *Acacia* and *Uapaca species.* Vegetation on the stream bank is characterized by dense long grasses *(Hyparrhenia species)* with patches of reeds. The average river width in the southern hills was 5.4m and depth 1.4m. Rivers in the northern hills had a mean depth of 1.1m and width 6.3m. Most rivers in Nyika have a good supply of different fish species such as montane catfish *(Amphilus platyychir), Baribus species* and the introduced rainbow trout (*Salmo gairdner)* which prefers cool conditions including graspid crabs (Bowden and Mahto, 1999). The altitude ranges between 1600m and 2600m above sea level. The mean annual rainfall varies between from 890mm to 1600mm and annual mean temperatures range between 10 ºC to 20 ºC.

METHODS

A total of 74 km of river network was covered during the survey period of which 30km was sampled in Vwaza and 44 km in Nyika. Accessibility in the latter was difficult in some areas due to steep slopes on hills and escarpments. Otters are secretive mammals and indirect method of observation using sign was employed. Rivers, streams, dams and other wetlands areas were searched for otter signs (spraints, dens, tracks, food remains and other indicators) by walking along on both riverbanks (Rowe-Rowe, 1993). The tracks of the clawless otter were differentiated from those of the water mongoose which also appeared to be common in the survey areas. Length and diameter of intact spraints was measured in millimeters and the age of the spraints ranged from very fresh to old. Tracks of the forefoot and hind foot were not differentiated and width was measured at the widest point. Observations were noted with a GPS and marked on a 1:50 000 maps to give a topographically exact picture of distribution. Data sheets principally covering habitat and signs were completed for each observation. Open ended interviews were also carried out among some local fishermen to establish the presence or absence of otters in an area. A total of forty respondents were interviewed especially in Vwaza Wetlands where there is community fishing programme. Depending on the occurrence of positive otter signs, the status of otter population was categorized as common or sparse. All mean are given ± Standard Deviation (Hayslett and Murphy, 1968). Analysis of variance was applied to compare density of otter signs in Nyika Wetlands.

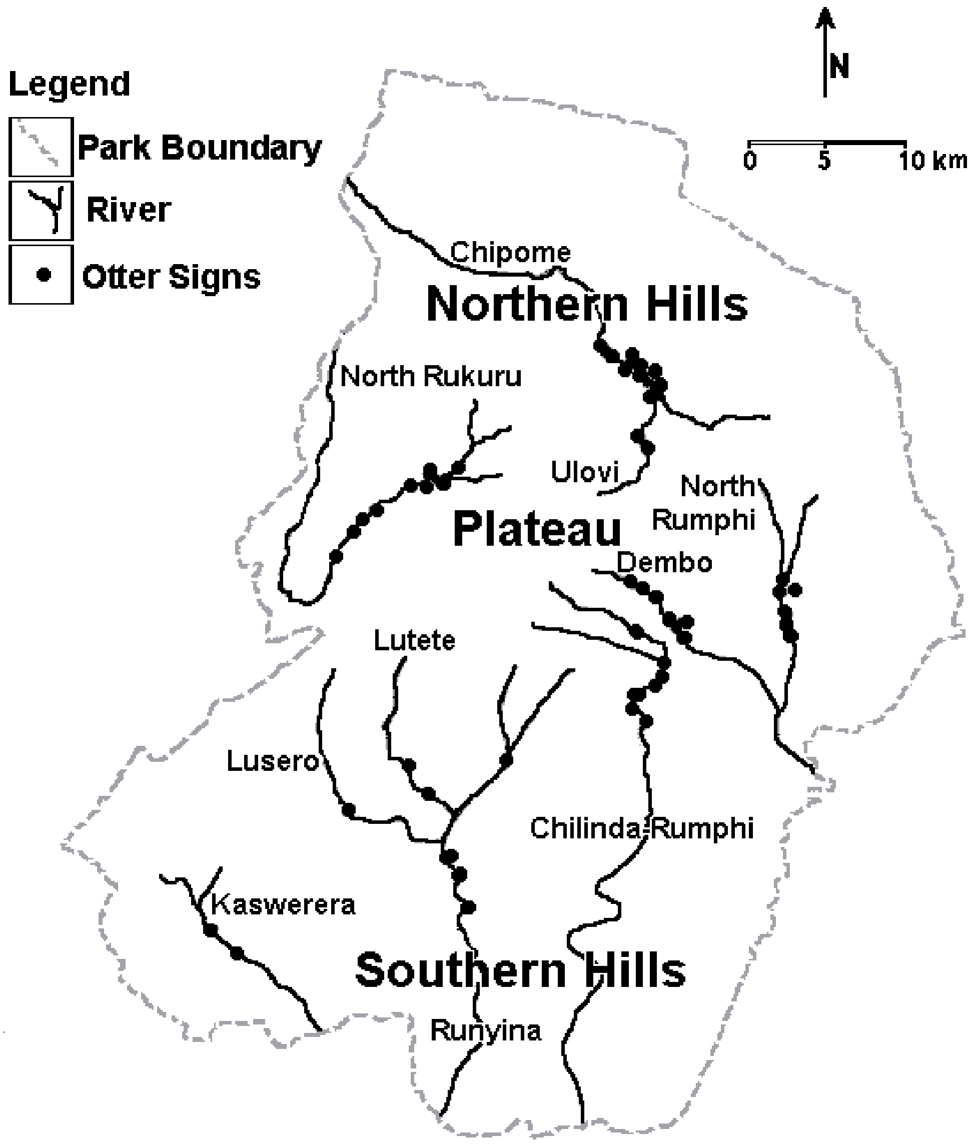

Figure 3: Distribution of otter signs in Nyika National Park

RESULTS

The otter species occurring in both study areas is *A. capensis.* Its status in Nyika could be rated as common and sparse in Vwaza. All the eleven river sampled in Nyika had positive signs of *A. capensis.* Regarding habitats, signs were registered most frequently in riverine habitats in the northern hills (Table 4b), followed by montane riverine habitats on the plateau and the southern hills. Of the three wetlands areas surveyed in Vwaza, only the marsh indicated positive otter signs (Table 4a). The habitat is ideal in terms of cover and food availability. Luwewe and South Rukuru rivers remained negative with no evidence of otter occurrence.

Table 1: Percentage of the total Aonyx *capensis* signs recorded in each study area

Study area	Total otter signs	Spraints	Tracks	Food° remains	Runs[1]	Rolling places[2]	Dens[3]
Vwaza	247	55.5%	36.4%	2.4%	5.7%	-	-
Nyika	790	60.4%	28.7%	4.6%	4.1%	1.6%	0.6%

° Includes crabs and fish remains; [1]Paths regularly used by otters; [2]Areas of flattened grass or sand where otters have rolled to groom themselves; [3] Holes used by otters

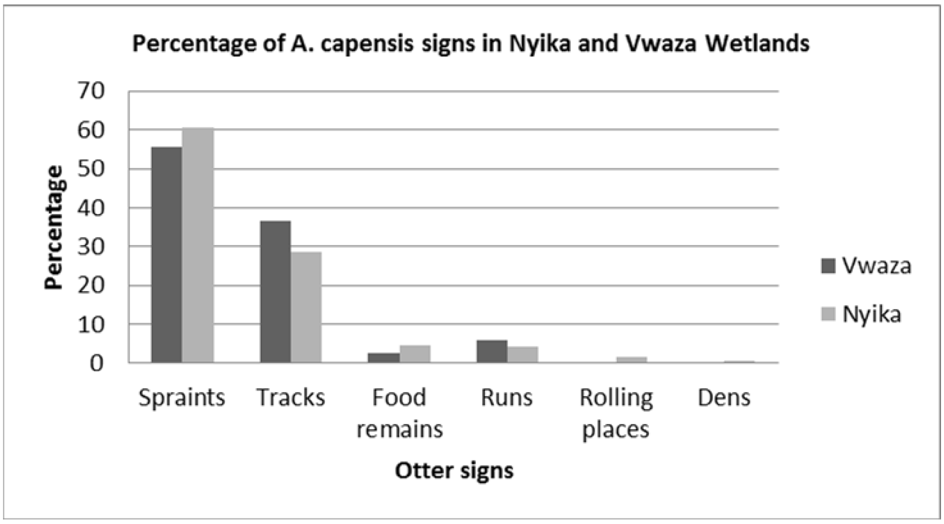

Figure 4: Percentage of *A. capensis* signs in Nyika and Vwaza Wetlands

A total of 247 *Aonyx capensis* signs were recorded in Vwaza (Table 1) and most of them were found along riverbanks. The majority of these were scats (55.5%) (Figure 2), followed by tracks (36.4%), runs (5.7%) and food remains (2.4%). Twenty three spraints sites were identified and all occurred in the northern section of the reserve (Table 2a and 4a). The mean for spraints sighted was 6.85 ± 6.16 (n=20), mean length 59.10 ± 17.30 (n=10) and mean diameter of 23.40 ± 3.86mm (n=10) (Table 2a). Most of the spraints were deposited on grass and sometimes on raised ground along the riverbanks. The tracks were clawless and mean width was 56.07 ± 15.72 mm (n=15).

Table 2a: Summary of *Aonyx capensis* signs recorded in Vwaza Marsh Wildlife Reserve

Spraints				Tracks		Spraint site	Dens	Run	Rolling Place	Food Remains
	No	Length (mm)	Diameter (mm)	No.	Width (mm)					
Mean	6.85	59.10	23.40	6.00	56.07	1.28	-	1.75	-	2.00
Total	137	-	-	90	-	23	-	14	-	6
S.D.	±6.16	±17.30	±3.86	±5.81	±15.72	±0.57	-	±1.16	-	±1.00

S.D.: Standard Deviation

All the respondents fishing in the marsh (100%) (Table 2b) indicated having seen otters or signs. In South Rukuru and Luwewe wetlands, 90% of the fishermen mentioned of not having seen otters or their signs. Of the fishermen who saw otters in the marsh, 50% indicated that it had a brown back with white throat which are the colour characteristics of the clawless otter. The majority of respondents in South Rukuru and Luwewe wetlands (60%) explained that otters were seen in the past and now are very rare. On the other hand, fishermen in the marsh see otters or their signs frequently.

Aonyx capensis signs in Nyika totaled 790 of which 60.4% were scats, (Table 1), 28.7% (tracks), 4.6% (food remains), 4.1% (runs), 1.6% (rolling places) and dens 0.6%. The mean width of tracks recorded is not very much different from that observed in Vwaza, 53.52 ± 12.67mm (n=42) (Table2c). Mean length for spraints was 47.14 ± 16.02mm (n = 29) and mean diameter 20.70 ± 6.39mm (n=27). The mean for scats sighted was 8.37 ± 9.45 (n=57). Scats observed on the plateau were mostly found on riverine rocks while those recorded in northern and southern hills were deposited on grass along the riverbanks. Furthermore, the majority of food remains recorded on the plateau were sighted on riverine rocks.

Table 2b: Summary of fishermen responses in Vwaza Marsh Wildlife Reserve

	Wetland Area	
	Marsh	South Rukuru & Luwewe
Signs of otter around fish trap	Yes 100% No None	Yes 10% No 90%
Did you see otters yourself	Yes 80% No 20%	Yes None No 90% Heard from friend 10%
Colour	Brown back / whitethroat 50% Brown 30% Don't know 20%	- - -
Otters last seen	Seen frequently 70% Last month 20% Two weeks ago 10%	Seen frequently in 1970's and now rare 60% Seen in 1960's 20% No idea 20%

Table 2c: Summary of *Aonyx capensis* signs recorded in Nyika National Park

	Spraints			Tracks		Spraint site	Den	Run	Rolling Place	Food remains
	No.	Length (mm)	Diameter (mm)	No	Width (mm)					
Mean	8.37	47.14	20.70	5.16	53.52	1.59	-	1.29	1.86	2.40
Total	477	-	-	227	-	92	5	32	13	36
S.D	±9.45	±16.02	±6.39	±4.90	±12.67	±1.00	-	±0.72	±1.86	±1.72

S.D.: Standard Deviation

Nyika National Park registered the highest number of otter signs observed per km travelled (Table 3). The densities for spraints and tracks were 10.84 and 5.16 respectively. On the other hand in Vwaza Marsh Wildlife Reserve densities of 4.57 spraints and 3.00 tracks per km travelled were recorded.

Table 3: Density of *Aonyx capensis* signs in Nyika and Vwaza Protected areas

Wetland Area	Density (n/km)					
	Spraints site	Tracks	Runs	Spraints	Rolling Places	Food Remains
Nyika	2.09	5.16	0.73	10.84	0.30	0.82
Vwaza	0.77	3.00	0.47	4.57	-	0.20

Distribution

In Vwaza Otter signs were recorded mainly in the marsh, the northern part of the reserve and are very rare downstream. Luwewe river which rises from the marsh and the southern part of the reserve (Figure 1, Table 4a). The marsh is the major otter locality in Vwaza Marsh Wildlife Reserve.

Table 4a: Density of *Aonyx capensis* signs in Vwaza wetlands with regard to habitat

Wetland area	Habitat	Density (n/km)		
		Spraint site	Spraints	Tracks
Marsh	Papyrus marsh	2.30	13.70	9.00
Luwewe Floodplain	Dambo grassland with narrow strip of riverine forest	0	0	0
South Rukuru Floodplain	Scattered Dambo grassland with open riverbanks	0	0	0

Otter signs are common in Nyika (Figure 3, Table 4b). All the wetland areas sampled indicated positive otter signs. The highest density of signs was recorded in northern hills and the riverine habitats are ideal for otter survival, adequate bush cover and otter prey. The plateau and southern hills wetlands also indicated positive otter signs. However, there is no significant difference in density of otter signs (Table 4b) in northern, southern and plateau areas [F=2.636; df=2 and 6; $P< 0.001$].

Table 4b: Density of *Aonyx capensis* signs in Nyika wetlands with regard to habitat

Wetland Area	Habitat	Density (n/ km)		
		Spraint site	Spraints	Tracks
Plateau	Montane riverine	2.98	16.72	3.18
Northern hills	Dense long grasses intertwined with reed patches	5.68	28.11	42.70
Southern hills	Dense long grass with reed patches	3.75	9.50	1.50

Threats

There are a number of threats observed in Vwaza wetlands endangering the survival of *Aonyx capensis* (Table 5a). These include streambank cultivation along the inlet stream into the marsh, illegal dry season hot fires, habitat destruction as well as siltation. Also the prevalent is competition for fish and crabs between local communities and otters. During interviews with some fishermen and field observations, it was noted that otter destroy fishing baskets of the local people in order to get fish and crabs, their major food items. In order to protect their fish from being eaten by otters, communities construct a dome shaped structure made of vegetation materials to enclose fishing baskets. The method is very destructive as it involves riparian vegetation cutting and channeling of water from the main streams into smaller dug channels for purposes setting basket fish traps (Msiska, 1997).

Table 5a: Threats to *Aonyx capensis* in Vwaza Marsh Wildlife Reserve

Wetland Area	Threats
Marsh	Streambank cultivation on inlet stream, competition for fish and crabs between local communities and otters, illegal dry season hot fires and habitat destruction
Luwewe Floodplain	Illegal dry season hot fires and siltation
South Rukuru Floodplain	Streambank cultivation, illegal dry season hot fires, siltation and human disturbance

Soil erosion, illegal dry season hot fires and fish poaching especially in the northern hills were recorded as the major threats in Nyika wetlands (Table 5b).

Table 5b: Threats to *Aonyx capensis* in Nyika National Park

Wetland Area	Threats
Plateau	Soil erosion and illegal dry season hot fires
Northern hills	Fish poaching and illegal dry season hot fires
Southern hills	Illegal dry season hot fires

DISCUSSION

There is evidence of *Aonyx capensis* occurring in Nyika National Park and Vwaza Marsh Wildlife Reserve from the surveys that were undertaken. The majority of the clawless otter signs sighted were scats (Table 1, Figure 4) in addition to other signs. The status of the *Aonyx capensis* in Nyika could be rated as common whereas in Vwaza it is sparse. We are well aware of the weakness of otter sign counts but possibly they are better than nothing. The use of otter signs mainly spraints is a problematic parameter for indicating the status of a population (Mason and Macdonald, 1987; Kruuk et al., 1986). However, the fact that otter signs occurred in almost all the rivers and streams surveyed in Nyika National Park, indicates the clawless otter is common. In Vwaza Marsh Wildlife Reserve, the signs occurred only in the marsh hence *A. capensis* is considered to be localized. The widths of their tracks are almost similar in both protected areas (Tables 2a, 2c). There was no evidence of occurrence of Spotted-necked otter in the two protected areas. All sites remained negative. Hough (1989) indicated that the distribution of the clawless otter is probably widespread in Nyika and Vwaza whereas the spotted necked otter is absent. Furthermore, Sweeney (1966) maintains that the clawless otter in Malawi is more common than the spotted necked otter and that it occurs in marshy places at lower levels in small streams while the latter is restricted to larger rivers and lakes.

A. capensis signs were not sighted in all the three major wetlands in Vwaza Marsh Wildlife Reserve (Table 4a, Figure 2). Only the marsh indicated positive signs. Luwewe and South Rukuru rivers remained negative with no evidence of otter occurrence. The finding agrees with the results on the interviews conducted among local fishermen (Table 2b). The primary living requirement for otters in freshwater habitats is unpolluted, unsilted water which contains sufficient numbers of most important food items, crabs and fish. Dense riparian vegetation (long grass, reeds, bushes) is essential to provide cover for resting places and holts (Rowe-Rowe, 1992; Trindade et al., 1995). The habitat in the marsh is ideal for the existence of the species (Table 4a). It is characterized by dense papyrus marsh with patches of bulrush and reeds and a high density of freshwater river crabs and catfish. Crabs, fish and frogs are the major food items for clawless otter (Rowe- Rowe 1977). The main factors of stress are competition for fish and crabs between otters and local fishermen, riparian vegetation destruction, illegal bush fires and streambank cultivation. In Luwewe and South Rukuru rivers including Zaro pool and Lake Kazuni (approximately 50 ha), the habitat is not conducive to the survival of otters. During the dry season, the rivers dry up fast leaving only very small silted water pools. Crabs are very rare also in the rivers. There is high level of human disturbance mainly due to fishing activities. Additionally, streambanks are open with little vegetation cover for otters mainly due to illegal dry season hot fires. Mkanda (1993) showed that fires strongly affect plant growth. South Rukuru floodplain is dominated by a high density of young trees less than one meter high (Mgoola, 1999). It has an open canopy; soils are clayey with medium to high fertility and low to medium soil water infiltration rates (McShane, 1985). These condition favours high grass biomass production that lead to intense fires which burn vegetation along riverbanks leaving them vulnerable to soil erosion.

A. capensis community occurs in Nyika National Park. Signs were sighted in almost all the river and streams surveyed (Table 4b, Figure 3). A total of 790 otter signs were recorded (Table 1) and most occurred frequently in riverine habitats in northern hills, followed by montane riverine habitats on plateau and southern hills. Scats recorded on plateau mostly occurred on river rocks, some on riverbank grasses while those in northern and southern hills were deposited mainly on grasses along riverbanks. The densities of *A. capensis* signs are higher than in Vwaza Marsh Wildlife Reserve (Table 3). Habitats are ideal for the survival of otters. There is abundant otter prey (fish, crabs), good riverine vegetation cover, continuous water flow and reduced human activity on rivers and streams. There is enough ground to indicate that most clawless otters in Nyika National Park occur in the northern hills wetlands. Abundant otter prey, perennial waters, good bush cover and minimum human disturbances are some of the factors contributing to higher densities of otter signs than the plateau and southern hills wetlands (Table 4b). Fish poaching is the major threat to the survival of *A. capensis* and can be controlled by regularly patrolling the area. Nyika National Park has high potential for the survival and existence of the clawless otter. Nevertheless increasing stress factors in some sites are threatening the species, illegal bush fires and fish poaching.

CONSERVATION PERSPECTIVES

In order to enhance the survivability of otters and their habitats, the following conservation measures are recommended:
[1] Illegal bush fires are the common problem in Nyika and Vwaza protected areas. It was observed in almost all the sites sampled. It is essential to implement early burning regimes to reduce dry season hot late fires which are very destructive to all fauna and flora.
[2] The northern hills wetlands in Nyika support a viable population of *A. capensis.* Fish poaching is the main stress and regular patrols in the area can assist curb the situation.
[3] Awareness campaigns among the local communities on the importance of conserving wetlands and their associated wildlife bushfire hazards, streambank cultivation.
[4] Soil erosion is common on the plateau in Nyika plateau due to illegal fires and roadside drain. This result in high silt load in streams and rivers. Grassland burning programmes should whenever possible leave a buffer strip of unburn vegetation along streams and riverbanks to contain surface wash at the beginning of rains.
[5] The marsh is potential otter area in Vwaza and such deserves special conservation measures. There is need to control the fishing programme to reduce the otter- human conflicts. Close season fishing period should be developed joinery with local communities. Furthermore, riparian vegetation destruction should be discarded.
[6] Monitoring of water quality in wetland to check pollution.
[7] Vwaza and Nyika Research Unit to continue otter monitoring and their habitat. The information reported herein should serve as baseline data for the future management and conservation of *Aonyx capensis* in Nyika National Park and Vwaza Marsh Wildlife Reserve.

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APPENDIX I
Vwaza Marsh Wildlife Reserve Data

Spraints			Tracks		Spraint Site	Den	Run	Rolling Places	Food Remains
No	Length (mm)	Diameter (mm)	No	Width (mm)					
3	-	-	-	-	1	-	-	-	-
28	-	-	5	90	1	-	-	-	-
-	-	-	3	65	-	-	-	-	-
-	-	-	4	70	-	-	-	-	-
-	-	-	5	70	-	-	-	-	-
15	40	18	2	60	1	-	-	-	-
12	-	-	-	-	1	-	4	-	-
2	-	-	-	-	1	-	1	-	1
3	-	-	-	-	1	-	-	-	-
-	-	-	-	-	-	-	1	-	2
3	36	24	-	-	1	-	-	-	-
4	35	24	-	-	1	-	-	-	-
3	-	-	22	35	1	-	1	-	-
8	70	28	4	30	1	-	-	-	-
10	-	-	4	35	2	-	3	-	-
6	70	25	-	-	1	-	-	-	-
10	75	20	3	55	3	-	1	-	-

8	60	25	11	65	1	-	2	-	-
6	55	20	3	45	2	-	-	-	-
8	65	20	16	56	1	-	-	-	-
-	-	-	3	55	-	-	-	-	-
-	-	-	2	50	-	-	-	-	-
7	85	30	3	60	2	-	1	-	-
1	-	-	-	-	1	-	-	-	-

APPENDIX II
Nyika National Park Data

Spraints			Tracks		Spraint site	Den	Run	Rolling Places	Food Remains
No	Length (mm)	Diameter (mm)	No	Width (mm)					
-	-	-	9	30	3	-	-	-	1
-	-	-	4	30	-	-	-	-	-
15	-	-	-	-	3	-	-	-	-
12	-	-	-	-	5	-	-	-	-
12	-	-	8	30	4	-	-	-	-
5	-	-	1	35	1	-	1	2	2
20	-	-	4	35	1	-	-	-	6
13	-	-	-	-	2	-	-	-	3
8	-	-	15	70	1	-	-	-	4
1	-	-	-	-	1	-	-	-	6
18	-	-	4	50	5	-	-	6	-
6	-	-	-	-	1	-	-	-	-
4	-	-	-	-	1	-	3	-	2
10	60	-	-	-	1	-	1	-	2
6	40	20	-	-	1	-	3	-	-
4	35	16	-	-	1	-	3	1	-
65	45	-	--	-	1	1	-	1	-
20	-	-	-	-	1	1	-	1	-
2	-	-	-	-	1	-	2	-	-
4	-	-	-	-	1	-	-	-	-
1	-	-	-	-	1	-	-	-	-
1	-	-		-	2	-	1	-	1
7	38	23	-	-	2	-	-	-	2
5	40	15	-	-	2	1	-	-	1
6	-	-	-	-	4	-	-	-	-
3	-	-	-	-	-	-	-	-	2
11	45	20	6	35		-	1	-	-
-	-	-	1	32	2	-	-	-	1
-	-	-	7	55	-	-	2	-	-
-	-	-	-	-	1	-	-	1	1
13	50	20	-	-	3	-	1	-	3
9	30	20	-	-	2	-	-	-	-
4	70	30	-	-	1	-	1	-	-
6	40	25	-	-	1	-	1	-	-
14	45	30	-	-	1	-	-	-	-
11	40	25	4	75	2	-	1	-	-
22	75	30	-	-	2	-	1	-	-
10	35	10	2	-	1	-	-	-	-
2	-	-	-	-	1	-	1	-	-
3	-	-	-	-	2	-	-	-	-
4	35	15	4	70	1	-	1	-	-
10	-	-	-	-	2	-	-	-	-
6	34	20	-	-	-	-	-	-	-
5	60	15	-	-	1	-	-	-	-
6	55	15	25	40	1	-	-	-	-

-	-	-	4	50	-	-	1	-	-
-	-	-	2	55	-	-	-	-	-
-	-	-	1	55	-	-	-	-	-
-	-	-	2	60	-	-	-	-	-
-	-	-	2	70	-	-	-	-	-
-	-	-	1	50	-	-	-	-	-
-	-	-	3	50	-	-	-	-	-
12	60	30	4	60	1	-	-	-	-
-	-	-	3	55	-	-	-	-	-
-	-	-	1	60	-	-	-	-	-
-	-	-	2	55	-	-		-	-
-	-	-	5	50	-	-	-	-	-
2	30	15	2	50	1	-	-	-	-
6	90	30	-	-	2	-	-	-	-
-	-	-	1	50	-	-	-	-	-
2	50	30	-	-	1	-	-	-	-
2	30	15	5	50	1	-	-	-	-
7	40	10	4	50	1	-	-	-	-
6	40	20	6	60	1	1	-	-	-
12	80	20	-	-	1	1	-	-	-
-	-	-	4	50	-	-	-	-	-
-	-	-	5	51	-	-	-	-	-
-	-	-	1	60	-	-	-	-	-
-	-	-	2	50	-	-	-	-	-
-	-	-	1	60	-	-	-	-	-
22	50	25	-	-	1	-	1	1	-
3	25	15	-	-	-	-	-	-	-
2	-	-	18	70	2	-	1	-	-
3	-	-	7	-	1	-	-	-	-
-	-	-	13	-	-	-	1	-	-
4	-	-	5	65	1	-	1	-	-
3	-	-	7	80	2	-	-	-	-
1	-	-	-	40	1	-	2	-	-
-	-	-	10	60	-	-	-	-	-
1	-	-	8	75	1	-	1	-	-
-	-	-	3	60	-	-	-	-	-

APPENDIX III
QUESTIONNAIRE

Name:………………………………………………………………………………...
Village:……………………………………………………………………………
Fishing locality:…………………………………………………………………...
1.0 Have you ever seen any otters or their signs around your fishing traps?..................
2.0 (a) Did you see otters yourself? Yes/No
(b) If yes, what colour was it?..
3.0 When did you last see otters or their signs in your area?..

RÉSUMÉ
ETAT DES LIEUX ET DISTRIBUTION DE LA LOUTRE A JOUES BLANCHES (*AONYX CAPENSIS*) DANS LA RESERVE NATURELLE DU MARAIS DU VWAZA ET DU PARC NATIONAL DE NYIKA, AU NORD DU MALAWI

La loutre à joues blanches (A*onyx capensis*) est présente dans le parc national de Nyika ainsi que dans la réserve naturelle du marais de Vwaza au nord du Malawi. Des recherches d'indices (excréments, pistes, tanières, parcours, restes de nourriture) sur la présence de loutres sont menées dans d'autres rivières, ruisseaux, et zones humides. Le statu de cette espèce peut être considéré comme commun au Nyika et clairsemé au Vwaza. En effet au Nyika, cette loutre est communément présente car toutes les zones humides sous surveillances montrées des signes positifs quant à la présence de loutre. Un total de 790 indices fut enregistré dans le parc national de Nyika, et ces indices ont été le plus souvent retrouvés dans des habitats aquatiques proches de rivières et de ruisseaux dans les collines du nord suivi de ceux présents dans la montagne et sur le plateau, et finalement dans les zones hune au sud. Aucune différence significative concernant la densité de loutres n'a été observée au sein des différentes zones humides du Nyika (F=2.636 df= 2 and 6; P<0.001). Cette zone géographique possède un fort potentiel pour la survie de ces loutres à joues blanches. Les proies (poissons et crabes) y sont abondantes, la couverture végétale, l'eau et la faible activité humaine y sont adéquates. *Aonyx capensis* n'a été recensées que dans les marais de la réserve naturelle de Vwaza (247 indices) avec de très rares cas en aval. Les rivières de Luwewe et du sud de Rukuru restent négatives quant à la présence de loutres. Ce marais est un habitat idéal pour la survie et l'existence de ces loutres avec une couverture végétale, de l'eau et des proies adéquates. Les menaces principales observées dans le parc national de Nyika sont les feux de brousse illégaux, la pêche illégale en particulier dans les zones humides dans les collines du nord, et l'érosion des sols. Concernant la réserve naturelle des marais du Vwaza les facteurs majeurs de stress sont la culture des berges, la destruction de la végétation riparienne, envasement, les feux de brousse illégaux et la compétition vis-à-vis des hommes quant aux poissons et aux crabes. De vastes mesures de conservation sont proposées pour une survie et une existence à long terme des loutres à joues blanches et de leurs habitats.

RESUMEN
STATUS Y DISTRIBUCIÓN DE LA NUTRIA SIN GARRAS (*Aonyx capensis*) EN LA RESERVA DE VIDA SILVESTRE DEL PANTANO DE VWAZA, Y EL PARQUE NACIONAL NYIKA, NORTE DE MALAWI

La nutria sin garras (*Aonyx capensis*) está presente en el Parque Nacional Nyika y la Reserva de Vida Silvestre del pantano de Vwaza, en el Norte de Malawi. Realizamos búsqueda de signos de la nutria (fecas, huellas, madrigueras, rastros de deslizamiento, restos de comida). El status de la especie en Nyika podría ser clasificado como común, y escaso en Vwaza. La nutria sin garras aparece en forma común en Nyika; todas las áreas de humedal prospectadas indicaron signos positivos. Registramos un total de 790 signos en el Parque Nacional Nyika; estos signos fueron registrados más frecuentemente en hábitats de ríos en las colinas del norte, seguidos por hábitats de ríos montanos en los humedales de las mesetas y las colinas del sur. No hay diferencia significativa en la densidad de nutrias en los humedales de Nyika (F=2.636 df=2 y 6; P<0.001). Este área tiene un alto potencial para la supervivencia de la nutria sin garras. Hay abundantes presas (peces, cangrejos), adecuada cobertura vegetal, agua, y poca actividad humana. *Aonyx capensis* en la Reserva de Vida Silvestre del pantano de Vwaza fue registrada solamente en el pantano (247 signos), y muy raramente en las áreas aguas abajo. Los ríos Luwewe y Rukuru del Sur permanecieron negativos, sin evidencia de ocurrencia de nutrias. El hábitat en el pantano es ideal para la supervivencia y existencia de las nutrias, con adecuada cobertura vegetal, agua y presas. Las principales amenazas observadas en el Parque Nacional Nyika incluyen incendios ilegales, pesca furtiva especialmente en los humedales de las colinas del norte, y erosión del suelo. Los principales factores de stress en la Reserva de Vida Silvestre del pantano de Vwaza son los cultivos en las costas de los arroyos, destrucción de vegetación ribereña, sedimentación, incendios ilegales, y competencia por los peces y los cangrejos entre los humanos y las nutrias. Se proponen medidas amplias de conservación para la supervivencia y existencia a largo plazo de la nutria sin garras y sus hábitats.

R E P O R T

NEW RECORD OF RIVER OTTER (*Lontra longicaudis* Olfers, 1818) IN THE EXTREME SOUTH OF YUNGAS OF NORTHWESTERN ARGENTINA

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Abstract: The neotropical river otter (*Lontra longicaudis*) has scarce distribution records in Northwestern Argentina (NWA); most of them are old, inaccurate, and/or coming from mentions not well corroborated. We report filmic and photographic records of this species from the piedemont of Yungas of the southern NWA obtained in riparian forest patches located in citrus farms in Tucumán province. The record is important by the scarcity of information, but also because this otter have its southernmost distribution in the western portion in this area, it is a taxa with conservation concerns, and the records come from a natural environment heavily modified.

Keywords: Distribution. Lutrinae. Mustelidae. New record. Subtropical forest. Neotropical river otter

The Yungas forest acts as an important corridor in the dispersion of elements from Amazonia toward Northwestern Argentina (NWA; Ojeda et al., 2003). In this region, the Yungas reach their southernmost distribution, and although it has a discontinuous distribution and wedge-like or peninsula shape between arid and semiarid environments (Ojeda et al., 2008), they shelter a large part of the biological diversity of terrestrial mammals of medium and large-size of Argentina (Barquez et al., 2006). For this environment, 37 species included in the Artiodactyla, Carnivora, Cingulata, Didelphimorphia, Lagomorpha, Perissodactyla, Pilosa, Primates and Rodentia orders have been reliably recorded (e.g., Olrog, 1979; Mares et al., 1981,1996; Ojeda and Mares, 1989; Heinonen and Basso, 1994; Capllonch et al., 1997; Jayat and Ortiz, 2010; Jayat et al., 2009).

Although this Yungas species list has been relatively well established, most of them are known through few records, many of which are historic or come from unreliable sources. Thus, the presence of some species for certain areas is assumed, or is considered probable, without an appropriate documentation. One of the most notorious cases of this, is the neotropical river otter (*Lontra longicaudis* Olfers, 1818), of which there are just 18 georeferable records for Yungas of NWA (Table 1). Most mentions of this species for this ecoregion are old, unspecific in their locality of origin, and/or come from unconfirmed occasional mention. Furthermore, they are mostly clustered in the Alta Cuenca del Rio Bermejo (ACRB) in the North of NWA (Fig. 1). The presence of this species in the Argentina's southern Yungas end has such insufficient bases that their scanty records were not considered in the most comprehensive study of this species distribution in South America (Rheingantz et al., 2014).

Table 1: Records of distritution of neotropical river otter (*Lontra longicaudis*) in Yungas of Northwestern Argentina (NWA).

LOCN. NO	PROVINCE	DEPARTMENT	SPECIFIC LOCALITY	LAT.	LONG.	CITATION
1	Salta	General José de San Martín	Campo Largo, 705 m	-22,02692	-63,92673	Jayat et al. (2009)
2	Salta	General José de San Martín	5 km al O de Los Madrejones, frontera Argentina-Bolivia	-22,33300	-64,13300	CML 00894/ Lucero (1987)
3	Salta	Santa Victoria	Lipeo, 1100 a 1300 m	-22,43458	-64,73375	Gil y Heinonen Fortabat (2003)
4	Salta	Santa Victoria	las juntas de los ríos Lipeo y Bermejo y casco de Finca Lipeo Chico, 570 a 600 m	-22,44041	-64,52958	Gil y Heinonen Fortabat (2003)
5	Salta	Santa Victoria	angosto del río Baritú, 1500 m	-22,50708	-64,75958	Gil y Heinonen Fortabat (2003)
6	Salta	Santa Victoria	desembocadura del Arroyo Santelmita, 700 m	-22,51708	-64,59875	Gil y Heinonen Fortabat (2003)
7	Salta	Orán	Los Naranjos, Finca San Andrés	-23,08300	-64,58300	Díaz et al. (2000)
8	Jujuy	Ledesma	Mesada de Las Colmenas, 1150 m	-23,70681	-64,85624	Heinonen y Bosso (1994)
9	Jujuy	Ledesma	Arroyito Negro, Parque Nacional Calilegua	-23,71875	-65,05541	Díaz y Barquez (2007)
9	Jujuy	Ledesma	Arroyo Negrito, Parque Nacional Calilegua	-23,71875	-65,05541	Díaz y Barquez (2007)

10	Jujuy	Ledesma	Caimancito, pozos petroleros 38 and 39	-23,73300	-64,60000	MCNS 108/ Díaz y Barquez (2007)
11	Jujuy	Ledesma	Aguas Negras, 1400 m	-23,75000	-64,93300	Díaz y Barquez (2007)
11	Jujuy	Ledesma	Aguas Negras, afluente del río San Lorenzo, a 1400 m	-23,75000	-64,93300	Olrog (1979)
12	Jujuy	Ledesma	Aguas Negras, 600 m	-23,75933	-64,85031	Heinonen y Bosso (1994)
13	Jujuy	Ledesma	Río Grande de Jujuy bei Aival	-24,01600	-65,01600	Díaz y Barquez (2007)
14	Jujuy	Dr. Manuel Belgrano	Río Las Capillas, 15 km al N de Las Capillas, por ruta provincial Nº 20	-24,02958	-65,10375	Díaz y Barquez (2007)
15	Tucumán	Leales	Río Colorado, Famaillá	-27,15000	-65,35000	CML 00065/ Lucero (1987), Mares et al. (1996)
16	Tucumán	Chicligasta	Los Chorizos, Parque Nacional Campo de los Alisos, 1100 m	-27,25000	-65,88300	Jayat et al. (1999)
17	Tucumán	Chicligasta	Concepción	-27,35000	-65,58300	CML 00208/ Lucero (1987)
18	Tucumán	Río Chico	Reserva Provincial Santa Ana, app. 5 Km al O de Santa Ana, Arroyo El Saltón, Remanso del Gallego	-27,43590	-65,77488	Jayat et al. (1999)
	Salta	Orán	Río Pescado	Unclear		MCNS s/n/ Díaz et al. (2000)
	Jujuy	Ledesma	Parque Nacional Calilegua	Unclear		Heinonen y Chebez (1997)
	Salta	Orán y Santa Victoria	Parque Nacional Baritú	Unclear		Heinonen y Chebez (1997), Díaz et al. (2000)
	Tucumán	Chicligasta	Parque Nacional Campo de los Alisos	Unclear		Heinonen y Chebez (1997)
	Salta	Anta	Parque Nacional El Rey	Unclear		Heinonen y Chebez (1997), Díaz et al. (2000)

Salta		Río Bermejo	Unclear	Ojeda y Mares (1989), Díaz et al. (2000)
Salta		Río Itaú	Unclear	Ojeda y Mares (1989), Díaz et al. (2000)
Salta		Río Pilcomayo	Unclear	Ojeda y Mares (1989), Díaz et al. (2000)
Salta		Río Tarija	Unclear	Ojeda y Mares (1989), Díaz et al. (2000)
Jujuy	Valle Grande		Unclear	Chebez (1994), Díaz y Barquez (2007)
Jujuy	Ledesma		Unclear	Chebez (1994)
Tucumán	Chicligasta		Unclear	Chebez (1994)
Tucumán	Leales		Unclear	Chebez (1994)
Tucumán	Trancas		Unclear	Chebez (1994)
Salta		Río Tarija	Unclear	Ojeda y Mares (1989), Díaz et al. (2000)
Jujuy	Valle Grande		Unclear	Chebez (1994), Díaz y Barquez (2007)
Jujuy	Ledesma		Unclear	Chebez (1994)
Tucumán	Chicligasta		Unclear	Chebez (1994)
Tucumán	Leales		Unclear	Chebez (1994)
Tucumán	Trancas		Unclear	Chebez (1994)

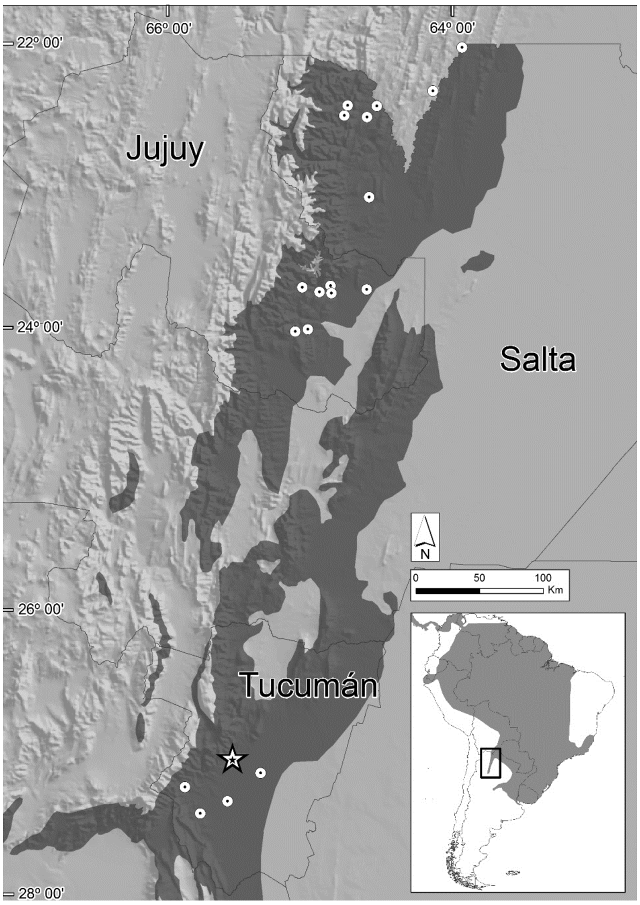

Figure 1. Map of localities of georeferable records of neotropical river otter (*Lontra longicaudis*) in Yungas of NWA (in gray shading) Argentina. The circles indicate locations published in the literature (see table 1) and the star indicates the new record in the province of Tucuman. The gray shading in the inset map shows the approximate distribution of neotropical river otter in South America

In this study, we report filmic and photographic records of this species from the Piedemont of Yungas of the Southern end (Province of Tucuman) obtained during biodiversity surveys of mammals, realized in an environmental strategy frame of the citrus company San Miguel.

We obtained the records (Fig. 2) during the month of September, 2015, and July and August, 2016 through Bushnell HD cameras trap, programmed to shoot three photos and record a video of 20’’ long, with a delay time of 5’. The cameras were installed on the banks of a stream that runs along forest patches of Yungas inmersed in citrus plantations inside the Caspinchango property. The cameras were baited with a can of tuna attached to a trunk and placed at a 2 m distance. The exact locality of the records is approximately 13 km east of Famailla City (Famailla Department, 27°2'36.84"S, 65°32'52.96"W).

https://www.youtube.com/watch?v=Cs6ALSfjDsI
https://www.youtube.com/watch?v=sg_XpW3AoLU

Figure 2. Photographic records of neotropical river otter (*Lontra longicaudis*) in the piedemont of Yungas in the Caspinchango property, Tucuman, Argentina

The environment in the area where the record was made is a forest dominated by cebil colorado (*Anandenanthera colubrina*), tipa (*Tipuana tipu*), pacara (*Enterolobium contortiticiliquum*), laurel (*Cinnamomun porphirium*), nogal (*Junlans australis*), san antonio (*Myrcine laetevirens*), chalchal (*Allophilus edulis*), amyruca (*Psychotria cartaginensis*) and ramo (*Cupania vernalis*). Some exotic tree species such as ligustro (*Ligustrum lucidum*), higo (*Ficus carica*), and naranjo (*Citrus sp.*) also were present, although with minor abundances. We observed large amount of epiphytes (bromelias, mosses, lichens) and standing and fallen dead trees in a densely covered understory of ferns and seedlings of chalchal (*Allophylus edulis*) (Fig. 3).

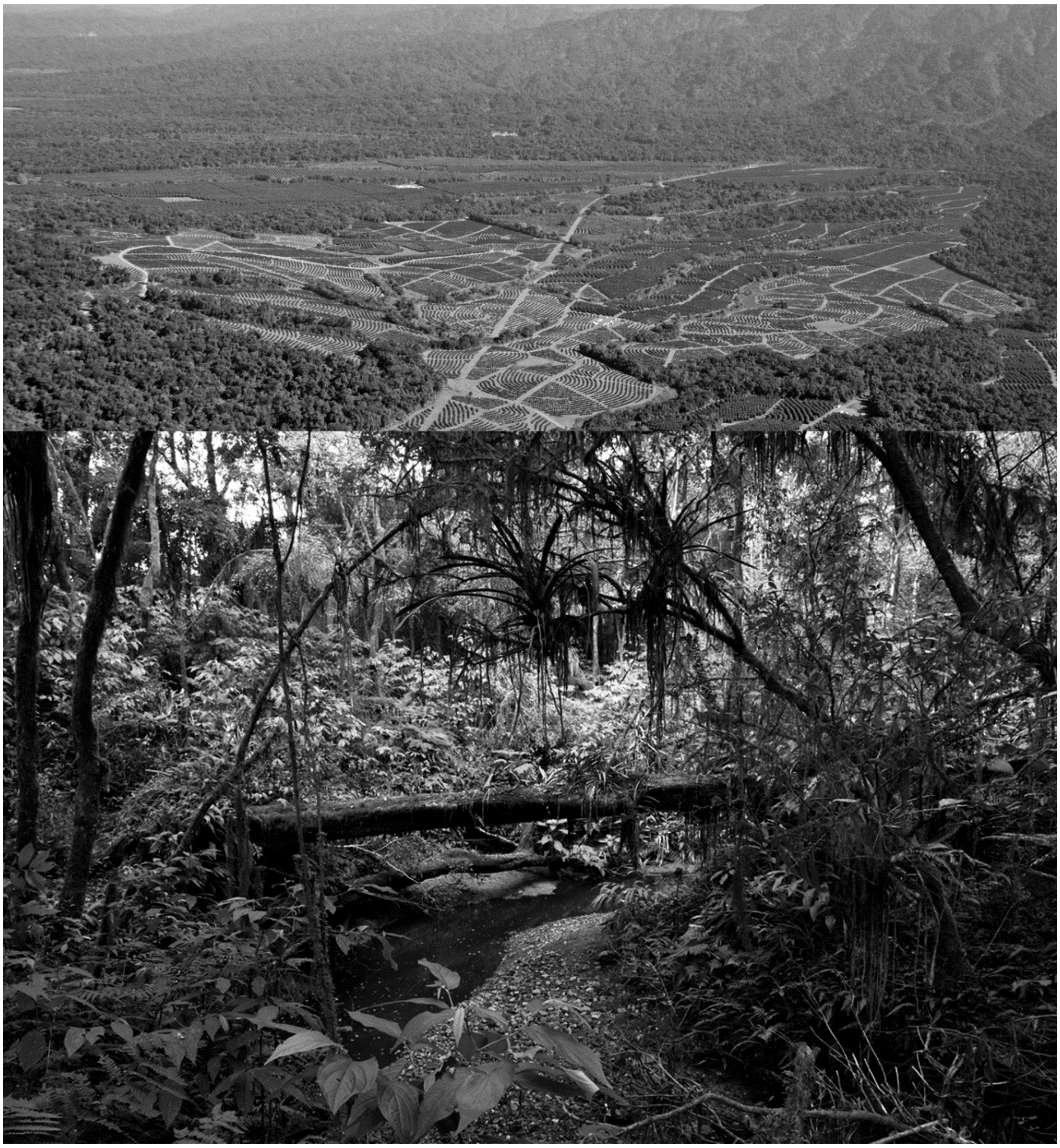

Figure 3. The environment on the Caspinchango property. Top: Forest patches of piedemont of Yungas between citrus plantations (photography: company San Miguel). Bottom: Natural environment within the forest patch in which we recorded the neotropical river otter (*Lontra longicaudis*)

The stream has a maximum depth of 1 m, usually in the pools, and a width of 3 to 4 m, and in some portions we observed steep walls, beach sectors, trunks and rocks that stand out of the water. The water level is minimal and constant throughout the year, however in the rainy season flow increases abruptly for a short period of time (Fig. 3).

Other species of medium and large sized mammals recorded at the same site included the Massoia's lutrine opossum (*Lutreolina massoia*), tayra (*Eira barbara*), crab-eating raccoon (*Procyon cancrivorus*), crab-eating fox (*Cerdocyon thous*), gray brocket (*Mazama gouazoubira*), and the ocelot (*Leopardus pardalis*) (Fig. 4). In addition, we recorded the white-eared opossum (*Didelphis albiventris*), collared Peccary (*Pecari tajacu*), jaguarundi (*Puma yaguoroundi*), and the pampa fox (*Lycalopex gymnocercus*) near of sampling sites and within the same property.

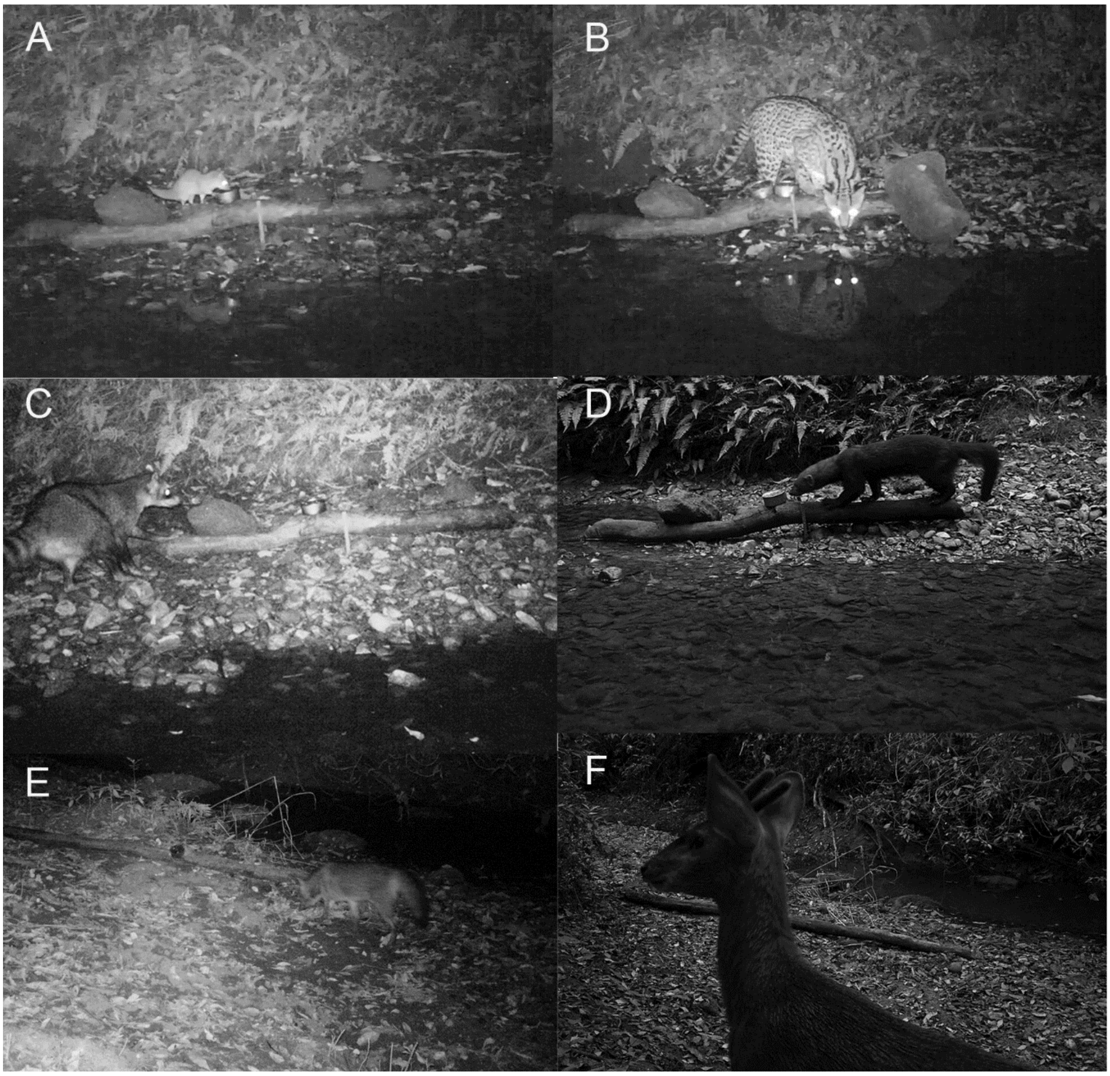

Figure 4. Other species of medium and large-sized mammals recorded in the same forest patch of piedemont of Yungas in the Caspichango property: A) Massoia weasel (*Lutreolina massoia*), B) ocelot (*Leopardus pardalis*), C) crab-eating raccoon (*Procyon cancrivorus*), D) tayra *(Eira barbara*), E) crab-eating fox (*Cerdocyon thous*), and F) gray brocket (*Mazama gouazoubira*)

The neotropical river otter recently was considered present in the province of Tucuman (Barquez et al., 2006), but with only four records of its presence (Fig. 1, Table 1). Two of them, from the Colorado River (Leales Departament) and Concepcion (Chicligasta Departament) are reliable records of this species since they belong to specimens of the Lillo Mammals Collection (CML 00065 and 00208, respectively). However, these records, frequently repeated in the literature (e.g. Lucero, 1987; Mares et al., 1996) are old, corresponding to collections made in 1979 and 1925, respectively. Heinonen Fortabat and Chebez, (1997) also mentioned this species on the Campo de los Alisos National Park, probably on the basis of skins of this species observed in an area known as "Los Chorizos" at 1100 m altitude (Jayat et al., 2009). An additional record, which until now was not properly documented, corresponds to mentions by settlers who noted the presence of this species at the stream "El Salton" in the Santa Ana Provincial Reserve (Jayat et al., 1999).

Records obtained in the present study confirm the presence of this species in the Piedemont of Southern end of Yungas of NWA, and are the only reliable current citation of the species for the area. This finding is important because it comes from a region recently considered as a priority for studies of species' presence (Rheingantz et al., 2014). This record is not only important due to the scarcity of information, but also because it is found of the species Southern limit distribution, and for being considered a taxón "almost threatened" internationally (http://www.iucnredlist.org/details/12304/0) and "endangered" nationally (Ojeda et al., 2012), and coming from a natural drastically changed environment. The piedemont constitutes the altitudinal floor of Yungas that has historically experimented great anthropic pressure, representing the most threatened environment of this ecoregion and one of the most compromised forests at a national level (Brown et al., 2006; Brown and Malizia, 2014). Although this environment presents a significant area (approximately 900000 ha) with a proper state of conservation according to ACRB, at the Southern end the situation is completely different. In Tucuman this environment persists as relatively small patches and corridors immersed in a crops matrix, usually sugar cane and citrus, which dominate the landscape. According to our studies, these areas despite being small, strongly fragmented, and at different states of conservation, seem to be a key refuge for many species of mammals. In this context, the establishment of baselines of the species diversity found there is an essential condition for the implementation of conservation polices. Knowledge about the presence and status of mammal population in these areas is important in the conservation of this ecosystem, since their presence is an indication of healthy environmental conditions. The specific case of river otter would allow inferring physicochemical conditions of water, habitat structure and food availability of appropriate resources (Rheingantz et al., 2014).

The cameras trap surveys actually have become a valuable tool to perform inventories and monitoring of cryptic species (Moraes and De Miranda, 2003; Karanth et al., 2004; Tobler et al., 2008). The effectiveness of this approach to the study large and medium size mammals, especially those most elusive species has been demonstrated in research carried out in moist forest areas, (Tobler et al., 2008; Rovero et al., 2014) incluiding environments of Yungas (Jiménez et al., 2010; Di Bitteti et al., 2013; Albanesi et al., in press). The records obtained in this study confirm their usefulness and encourage to think about the possibility of new and interesting findings.

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RÉSUMÉ

NOUVEAUX ENREGISTREMENTS DE LA LOUTRE DE RIVIERE (*Lontra longicaudis* olfers, 1818) A L'EXTREME SUD DU YUNGAS AU NORD OUST DE L'ARGENTINE

La loutre à longue queue (*Lontra longicaudis*) a peu d'enregistrements concernant sa distribution au nord-ouest de l'Argentine (NOA) ; la plupart d'entre eux sont vieux, erronés, et/ou provenant de témoignages pas très bien corroborés. Nous amenons de nouveaux enregistrements vidéos et photos de cette espèce de loutre du piedemont du Yungas du sud-ouest du NOA obtenus dans des fragments d'une forêt riveraine situés dans des fermes d'agrumes de la province du Tucumán. Ces enregistrements sont importants au regard du peu de données disponibles, mais aussi parce que cette loutre a sa plus importante distribution dans la partie ouest de cette zone. De plus ce taxon présente un intérêt de conservation et ces enregistrements proviennent d'environnements naturels fortement modifiés.

RESUMEN

NUEVO REGISTRO DE NUTRIA DE RIO (*Lontra longicaudis* Olfers, 1818) EN EL EXTREMO SUR DE YUNGAS AL NOROESTE DE ARGENTINA

El lobito de río (*Lontra longicaudis*) presenta escasos registros de distribución en el noroeste argentino (NOA); la mayoría antiguos, imprecisos, y/o provenientes de menciones no

confirmadas. Reportamos registros fílmicos y fotográficos de esta especie en el pedemonte de Yungas del extremo sur del NOA obtenidos en cordones boscosos riparios localizados en propiedades citrícolas de la provincia de Tucumán. El registro es importante por la escasez de información al respecto, pero también por tratarse de una especie que se encuentra en el límite austral de su distribución occidental en Yungas, por ser considerado un taxón con problemas de conservación, y por provenir de un ambiente natural fuertemente modificado.

ARTICLE

SEASONAL CHANGES IN THE BEHAVIOUR AND ENCLOSURE USE OF CAPTIVE ASIAN SMALL CLAWED OTTERS *Aonyx cinereus*

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Abstract: The influence of seasonal changes in temperature on the behaviour of tropical mammals kept in zoos and aquaria in temperate climate regions is very little studied. This article describes seasonal differences in the behavioural time budget and enclosure use of two male Asian small-clawed otters (*Aonyx cinereus*) held in an indoor enclosure at the Blue Reef Aquarium Tynemouth in the North-East of England (55°N). The otters studied spent significantly more time in the water in summer (water temperature 18-19°C) than in winter (water temperature 11-12°C). Swimming represented 33.4% of the total summer observation time, compared to only 14.1% in winter. In summer, the otters were seen in water at 33.7% of the sampling times, in the deep or shallow pool or in the river in the enclosure, compared to 15% in winter. In both seasons, the time budget also included 32-34% active behaviours on land, 15-17% maintenance, 5-8% affiliative social interaction and 2-3% being out of sight. In winter, the otters were more aggressive (winter 2% > summer 1%) and less active, with significantly more time spent lying down resting or sleeping (winter 11% > summer 4.6%) or being vigilant, looking around or 'begging' at the keeper or visitors (winter 12.2% > summer 5.8%). Feeding anticipatory activity was seen in both seasons. Affiliative social interaction occurred mainly between feeds, linked to rest periods. The relevance of these observations is discussed in relation to thermoregulation and possible effects on reproduction.

Keywords: swimming; feeding anticipation; temperature; thermoregulation.

INTRODUCTION

Asian small-clawed otters (*Aonyx cinereus*) are small semi-aquatic animals, with distinctive hand-like front paws with reduced claws, well adapted for catching and handling small prey and other objects (Larivière, 2003). In the wild, they have a large distribution range in the tropics, from southern and south-eastern mainland Asia, through to Indonesia, Taiwan and Philippines, in diverse habitats, including coastal and freshwater wetlands, and rivers and lakes in forested areas (Wright et al., 2015). The species has been listed on CITES Appendix II since 1977, has 'vulnerable' status on the IUCN Red List since 2008 and is at risk of becoming regionally extinct in some areas, due to rapid population decline and loss of genetic variation, caused mainly by habitat destruction, water pollution, decline in suitable prey and direct exploitation by humans (Wright et al., 2015). In situ conservation actions include establishing networks of Protected Areas and Protected Species status for *Aonyx cinereus* in many range countries (Wright et al., 2015).

Zoos, aquaria and wildlife parks around the world also play an important role in species conservation and public education (Moss et al., 2015). Asian small-clawed otters (ASCO) are attractive displays due to their playful and curious nature (Foster-Turley and Markowitz, 1982; Anderson et al., 2003) and are the most common captive otter species in the United Kingdom (Wright, 2003). They cope well with different regional climatic patterns, in both indoor and outdoor enclosures, provided that they have dry shelter and a source of radiant heat in the cold season (AZA, 2009). Temperatures of 22.2-24.4°C for air and 18.3-29.4°C for water are recommended, as well as diverse water and land enclosure features, to provide adequate complexity and stimulate naturalistic behaviours (Lombardi and O'Connor, 1998; Heap et al., 2008). Successful breeding occurs in many zoos (Sivasothi, 1998; Kruuk, 2006), while in other zoos no offspring is ever produced (Foster-Turley, 1990). Mating occurs mostly in shallow water and observations suggested that otters spend more time swimming in warmer water (AZA, 2009). In 2007, there were 86 European zoos that housed a total of 434 ASCO, mostly in outdoor enclosures (62.7%), all with water features, but water temperatures were not specified (Dornbusch and Greven, 2009). In an earlier survey, most North American zoos reported having climate controlled environments for ASCO, with ambient temperatures of 21-23°C, while some institutions reported heating only the pool water for ASCO to 21.1°C because they felt this stimulated more swimming (Reed-Smith and Polechla, 2002).

While widely acknowledged that ambient temperature is an issue for tropical species, there is little quantitative information available about the influence of seasonality on the behaviour of captive tropical otters and other mammals (Reed-Smith and Polechla, 2002; Hosey et al., 2013). The metabolic costs for thermoregulation of ASCO (body temperature 37-38°C) are higher than expected compared to other Mustelids and semi-aquatic mammals, especially in water below 16°C (Borgwardt and Culik, 1999). Studies on other Mustelids showed both positive and negative correlations between water temperature and swimming activity. *Lutra lutra* at a zoo in Germany used the unheated pool mainly during the summer months (Längle and Jorga, 2003), while captive and free-ranging *Lutra lutra* (Kruuk et al., 1994a; Kruuk et al., 1997) and free-ranging mink *Mustela vison* (Hays et al., 2007) living in Scotland performed longer dives and were more active in colder water. Farmed mink swam more frequently in an outdoor pool during the warmer months of the year in Denmark (Hansen and Jeppesen, 2001), but warmer water up to 32°C in indoor conditions did not induce more swimming (Hansen and Jeppesen, 2003).

This study provides quantitative information for the changes from summer to winter in the behavioural time budgets, enclosure use and diurnal activity pattern of the ASCO at the Blue Reef Aquarium, Tynemouth (BRAT), England (55°N latitude; temperate climate), over a period of time when no changes in husbandry practices were implemented. The main hypothesis tested was that the otters would spend more time in the water and be more active during the warm season, due to lower overall thermoregulatory costs. The work was part of a longer-term project aiming to establish behavioural indicators of welfare for different species at this Aquarium (Cuculescu-Santana et al., 2014).

MATERIALS AND METHODS

Otters, Enclosure and Enrichment

The two Asian small-clawed otters studied were 7-8 years old male siblings (captive born in autumn 2005), around 3 kg weight, housed in an indoor enclosure of approximately 100m^2 surface area, 3:2 land to water ratio, with concrete ground. Structural enrichments included a river, shallow pool and large pool (0.8 m depth; 18,000 l volume; filtered recirculated water), climbing structures, log bridges, wooden blocks with a heat lamp above them and a den (Figure 1). The otters were fed three times a day at 9am, 1pm and 4pm, on a diet of fish, day-old chicks and red meat, plus smaller random scatter feeds (monkey nuts, chopped carrot and apples, crustacean claws, molluscs) (approximately 600g/ otter/ day in total; same schedule and range of food items all year round; slightly larger random scatter feeds in the cold season). The feeds were delivered on time, as recommended by AZA (2009), to minimize stress. Feeding enrichment strategies included varying the form of delivery of the main feeds (scattered or hidden in different areas of the enclosure, to encourage foraging, or keeper-fed during training) and the type of food. A training session and public talk took place daily, combined with the 1pm feed and occasionally with the 4pm feed (Blue Reef Aquarium, 2013).

The enclosure area was not climatised, apart from the heat lamp above the otters' preferred sleeping area, and the air and water temperatures varied in correlation with the outdoor fluctuations. In 2013, the average outdoor temperatures for Tynemouth (55°N) were 16-17 °C for July-August (above the historic averages of 14-14.5 °C) and 6-7 °C for November-December (historic averages of 4-6 °C) (ClimatEvo, 2016). The otter pool water temperatures (recorded daily) varied between 14.8-20°C in summer and 4.6-16.4°C in winter months. Natural light entered only through a small window. Artificial light was provided 8:00am-6:00pm (10 hours light:14 hours dark; metal halide bulbs with UVB qualities).

Figure 1. The otter enclosure at the Blue Reef Aquarium Tynemouth, UK.

Data Collection

Data were collected by the same observer on four random days in July-August 2013 (water temperature 19.1±0.1°C) and four random days in November-December 2013 (water temperature 11.4±1.1°C), at nine different times each day, for 20 minutes at a time (described as 'summer' and 'winter' data, respectively), using instantaneous time sampling: focal for state behaviours (Table 1) and scan for location in the enclosure (Table 2) (Martin and Bateson, 2007). At the start of each observation period the otter nearest to the observer was chosen as the focal animal and its behaviour recorded every 15 seconds. The location of each otter was recorded every 60 seconds (two locations/ sampling time). The event behaviours (Table 1) were recorded using continuous observation and the one-zero rule for each 1-minute interval of observation time (Rees, 2015). The approximate visitor numbers were recorded for each 1-minute interval using a ranked score from 1 to 5 (1=a few; 2=several; 3=many; 4=full room; 5=crowded room). The methods of data collection and the ethogram (Table 1) were developed through shorter-term projects (Bowe, 2013; Briggs, 2013; Geraughty, 2014).

Table 1. Otter ethogram. State behaviours and event behaviours (adapted from Hawke *et al*., 2000 and Williams *et al*., 2012).

State Behaviours	**Description of Behaviour**
Swimming	Locomotion in water, with the head in or out of water, including looking for food in the water;
Running	Faster locomotion on land (with head up);
Walking/Climbing	Slower locomotion on land, on flat areas or climbing on higher structures (with head up);
Foraging	Moving on land with the head down and the nose close to the ground, interpreted as searching for food;
Scent Marking	Rubbing a body part against the ground, a structure or a wall, including sprainting;
Aggression	Rough fighting or other aggressive displays towards another otter;
Maintenance	Eating, drinking and self-grooming (using paws or mouth to clean, dry or smooth fur; gentle scratching);
Playing	Non-aggressive playful interaction with another otter, including play fighting, or with an object other than food, e.g. pebble, plastic toy;
Vigilance	Being alert, looking around while stationary either sitting or standing on hind limbs;
Body Rubbing	Rubbing own body against the body of another otter; non-aggressive body contact; including sexual behaviour;
Social Grooming	Grooming another otter (using paws or mouth to clean, dry or smooth fur);
Resting & Sleeping	Lying down with head down, eyes open or closed; occasionally looking around when a noise occurs;
Out of Sight	Hidden from the view of the observer
Event Behaviours	**Description of Behaviour**
Begging	Standing on hind limbs, forepaws held in front of body; repetitive up and down movements;
Short Calls	Short and fairly sharp repetitive sounds;
Long Squeals	Longer, higher pitched sounds or long mewling sounds;
Keeper Interaction	Direct contact with the keeper; responding to instructions from the keeper during training;
Yawning	Opening the mouth wide to take in air (presumed involuntary action);

Table 2. Areas of the otter enclosure and their estimated biological relevance, based on their similarity to natural habitat features and compliance to the husbandry guidelines for the species (AZA, 2009).

Location	**Description**	**Biological Relevance**
Ground Area	Pebble-like concrete surface around the enclosure (no areas with soft substrate for digging in 2013);	Neutral
Climbing Structures	Long tree branches, in a pyramid over the small shallow pool, platform at the top; thicker logs linking the ground area to the log bridges and to a large bridge over the river; wall around small pool; rocks;	High
Log Bridges	Three horizontal thin logs, supported by artificial tree stumps immersed in the large pool, forming a 'path' over the large pool;	High
Sleeping Places	Wooden blocks stacked under a heat lamp, backed against a wall; wire mesh open cage;	Moderate
Den	A small house providing shelter for the otters out of sight of the visitors, with straw bedding inside;	High
River	Shallow flowing water with waterfall to the small pool;	High
Small Pool	Shallow round pool, with waterfalls to the large pool;	High
Large Pool	Deeper curved shoreline pool, with clear side for underwater viewing.	High

Data Processing and Data Analysis

State behaviour data were converted into times spent engaged in each behaviour, during each observation period, and used to produce average behavioural budgets (n=36) and day-time patterns of activity (n=4) for each season (presented as % of observation time). The event behaviour data were processed as frequency of 1-minute intervals during which they occurred per observation period (presented as % of total number of 1-minute intervals per season or per time of day/season). The frequency and length of swimming and resting bouts were estimated by counting the total number of 1-minute intervals during which these behaviours were recorded 4, 3, 2, 1 or 0 times, for each season. Location data were processed as frequency of occurrence at each location per observation period (presented as % of total number of locations recorded per season or per time of day/season). The data were also combined to calculate the total number of sampling times at which the otters were in or out of water, and together or in different places (shown as % of total sampling times). Visitor data were processed as average scores per observation period, time of day and season.

The Mann-Whitney U test for the influence of season and Kruskal-Wallis test for the influence of time of day on otter behaviour were carried out in SPSS V22, at level of significance $P<0.05$, using the actual time and frequency values. The influence of season on location frequency data was analysed using the two-way chi-square test in Microsoft Excel 2010, at $P<0.05$ level of significance.

Ethical Considerations

The project received ethical approval from the Ethics Commission of Northumbria University and was carried out with consent from and in collaboration with the Displays Manager and the Keepers at the Blue Reef Aquarium Tynemouth. The data were collected from outside the enclosure, without any direct interaction between observer and otters.

RESULTS

Seasonal Differences in Otter Behaviour and Enclosure Use

The seasonal time budgets of the otters studied are presented in Figure 2. The otters spent significantly more time swimming (33.4%) in summer, compared to winter (14.1%) (Z=-3.892, *P*<0.001). In contrast, in summer the otters spent less time resting and sleeping (4.6%) compared to winter (11%), and significantly less time engaged in aggressive behaviour (Z=-1.967, *P*<0.05) and vigilance (Z=-2.837, *P*<0.01). Other behaviours that increased from summer to winter were land locomotion (running, walking and climbing), foraging, affiliative social interactions (body rubbing and social grooming) and maintenance behaviours. Scent marking and being out of sight decreased slightly from summer to winter. Playing with objects was seen only in summer.

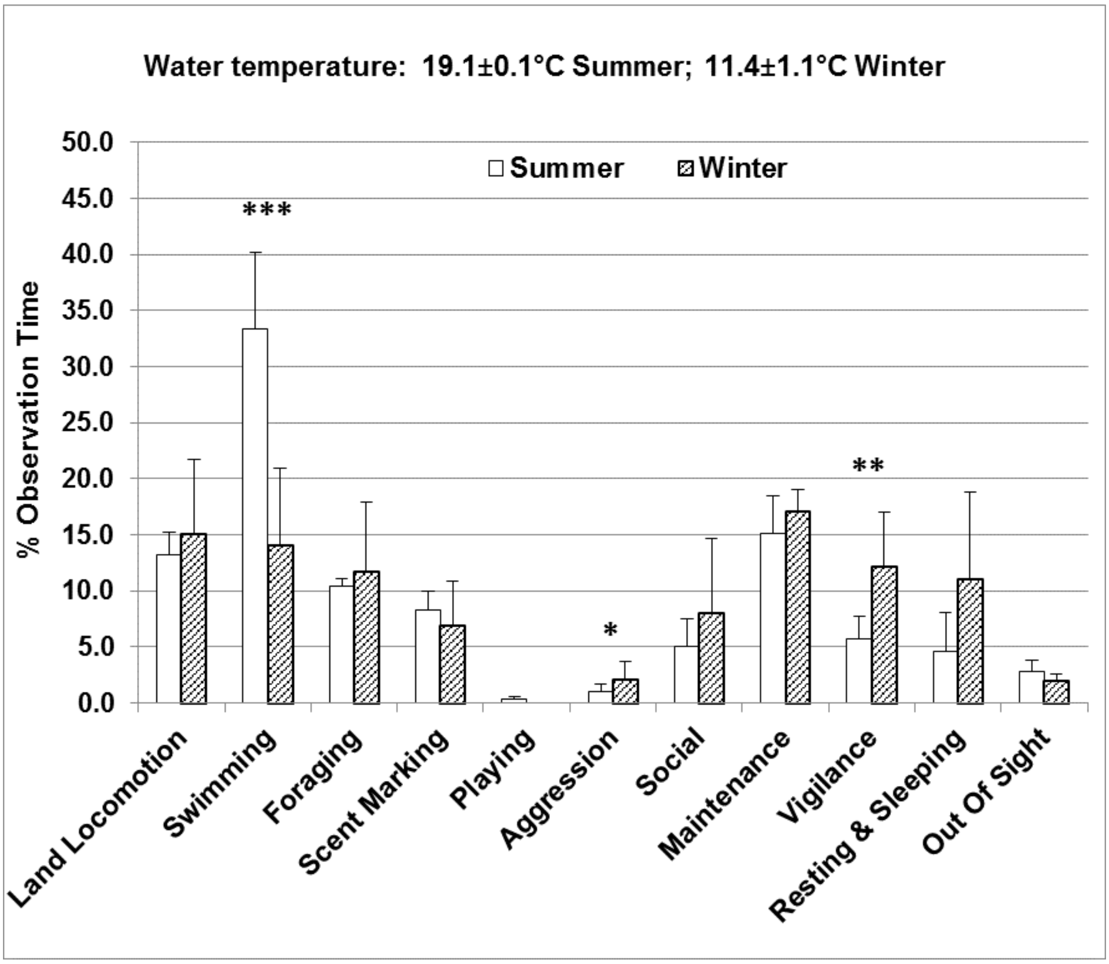

Figure 2. Seasonal behavioural time budgets for state behaviours: average percentage of observation period, standard deviations for percentage values, n=36. Asterisks denote statistical significance at *P*≤0.05*, *P*≤0.01**, *P*≤0.001***.

While awake and active, the otters changed behaviour frequently. Swimming usually occurred in short bouts, of 10-30 s, interspersed with 5-30 s of other active behaviours on land (e.g. walking, running or eating). The total number of 1-min intervals during which swimming was recorded 3 or 4 times (focal instantaneous time sampling every 15 s) was significantly higher than expected in summer (Figure 3), while in winter there were more than expected 1-min intervals with no swimming or swimming recorded only once (Chi-square=176.9, *P*<0.001, d.f.=4).

The number and length of the 'blocks' of two or more consecutive 1-min intervals during which swimming was recorded 3 or 4 times were much greater in summer than in winter (Table 3). The opposite was seen for periods of inactivity. When the otters settled down to rest and sleep, the passive state was maintained for around 20-30 minutes, occasionally interrupted by short bouts (5-30s) of grooming, body rubbing, or looking around. The periods of continuous rest were slightly more frequent and much longer in winter (Table 3).

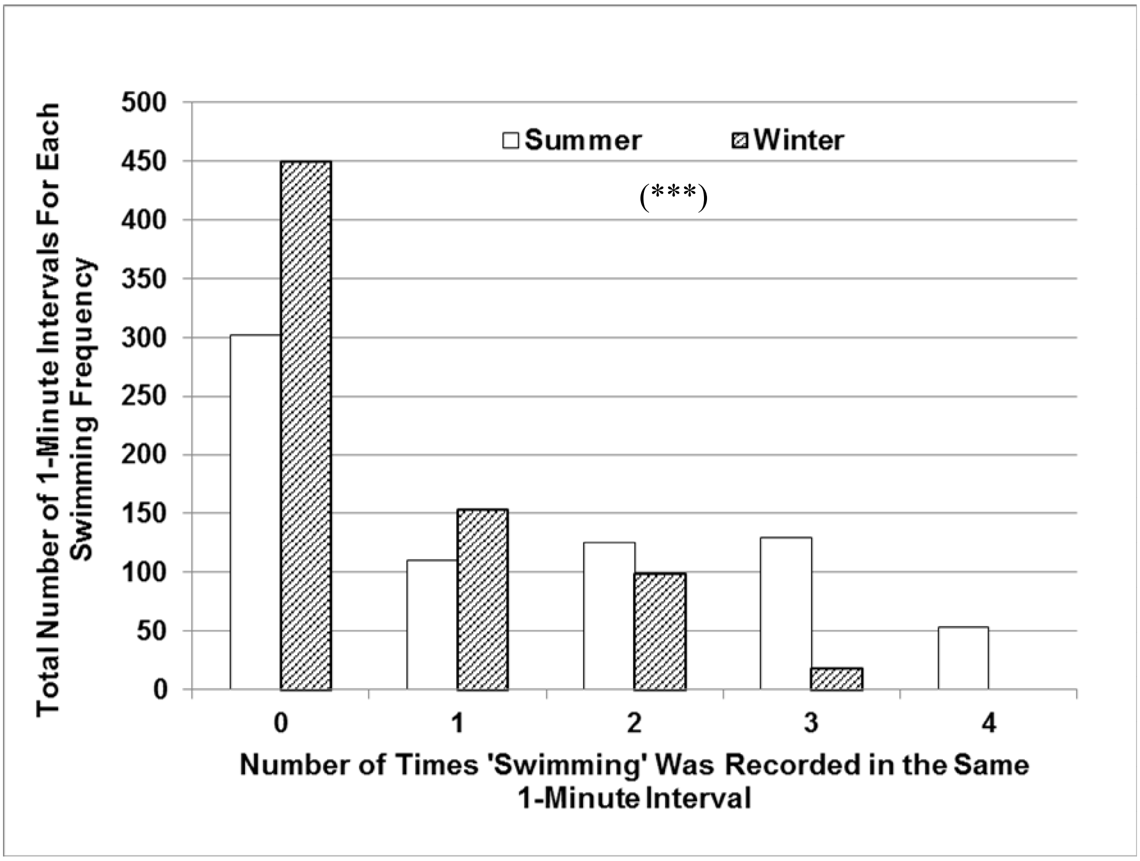

Figure 3. Analysis of the frequency of recording the 'swimming' behaviour during the summer and winter observation periods (720 x 1-Minute intervals/ season; focal instantaneous time sampling every 15 s). Asterisks denote statistical significance at $P \leq 0.001$***.

Table 3. Estimated duration of periods of swimming and inactivity during summer and winter: Number and length of 'blocks' of two or more consecutive 1-min intervals during which the behaviour was recorded 3 or 4 times (720 x 1-Minute intervals/ season).

Season	Swimming	Resting & Sleeping
Summer	**Recorded 4 times/min:** 11 ' blocks' (10 x 2 min; 1 x 3 min); **Recorded 3 times/min:** 32 'blocks' (8 x 2 min; 14 x 3 min; 6 x 4 min; 2 x 6 min; 1 x 9 min; 1 x 10 min)	**Recorded 4 times/min:** 5 'blocks' (1 x 2 min; 2 x 4 min; 1 x 6 min; 1 x 7 min);
Winter	**Recorded 4 times/min:** 0 'blocks'; **Recorded 3 times/min:** 1 'block' (1 x 2 min);	**Recorded 4 times/min:** 7 'blocks' (2 x 3 min; 1 x 4 min; 1 x 5 min; 1 x 12 min; 1 x 16 min; 1 x 17 min)

The otters were seen ‘begging’ significantly less frequently in summer (Figure 4), during 3.8% of the total number of 1-minute intervals, compared to 20% of all 1-minute intervals in winter (Z=-2.255, p<0.05). Short calls also occurred less frequently in summer, during 38.1% of all 1-minute intervals, compared to 47.8% in winter.

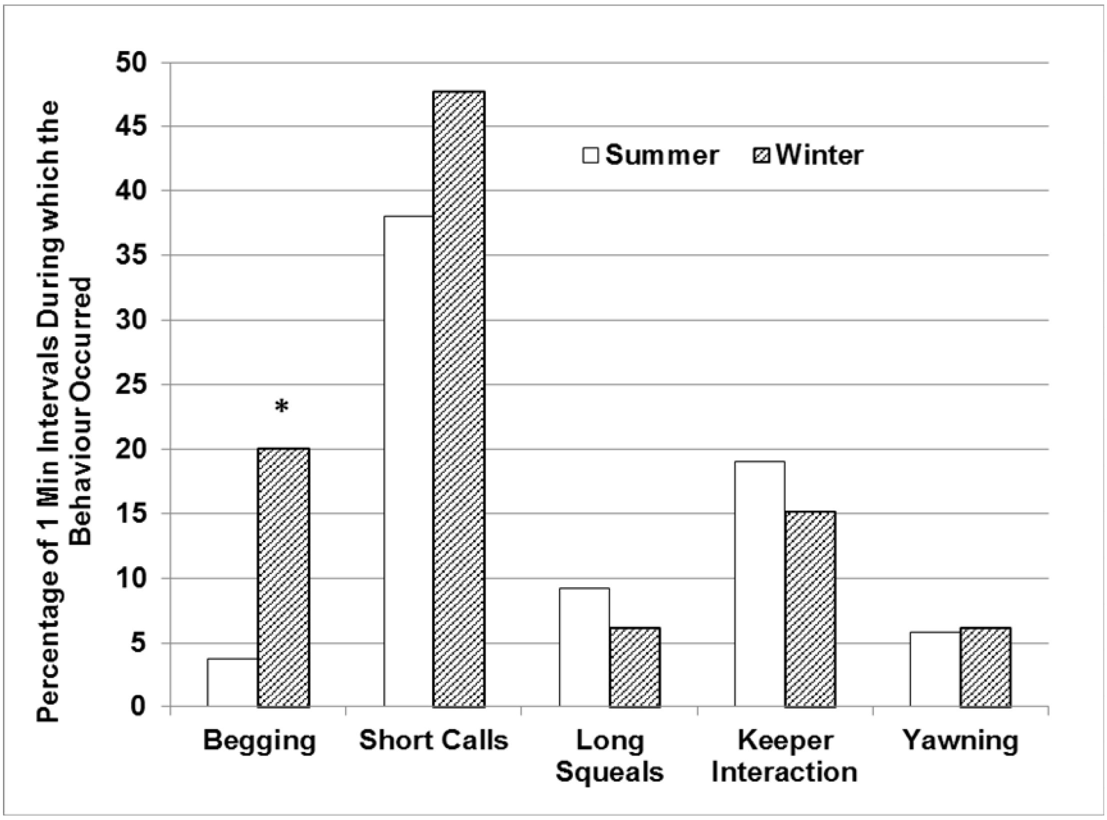

Figure 4. Seasonal differences in the relative frequencies of event behaviours (720 x 1-Minute intervals/ season). Asterisks denote statistical significance at $P \leq 0.05$*.

The seasonal differences in enclosure use (Figure 5) correlated well with the main differences in behaviour described above. In summer, the otters were seen in the water, in the large pool, small pool or river at 33.7% of the sampling times, which was more than double the value for winter (15%), and significantly more frequently than expected, while the climbing structures, log bridges and the sleeping places were used less frequently than expected (Chi-square=199.2, $P<0.001$, d.f.=7).

The season also had a significant influence on the frequency of occurrence of all the possible combinations of relative locations of otters to each other, in or out of water (Chi-square=132.9; p<0.001, d.f.=4). In summer, they were seen either both in the water (same or different places) or one in water and one out more frequently than expected. The otters were seen in different places at the majority of the sampling times (Figure 6) in both seasons (76.4% in summer > 65.8% in winter).

Day-Time Activity and Enclosure Use Patterns

The otters displayed a fairly consistent activity pattern on the days when data collection was carried out, with peaks in locomotion (running, walking climbing, swimming) and vigilance prior to the feeding times in both seasons, as well as peaks in the frequencies of ‘begging’, short calls and long squeals (Table 4, Figures 7 and 8). The peaks in vigilance and in the frequencies of short calls and ‘begging’ were higher in winter than in summer for the majority of the time intervals monitored.

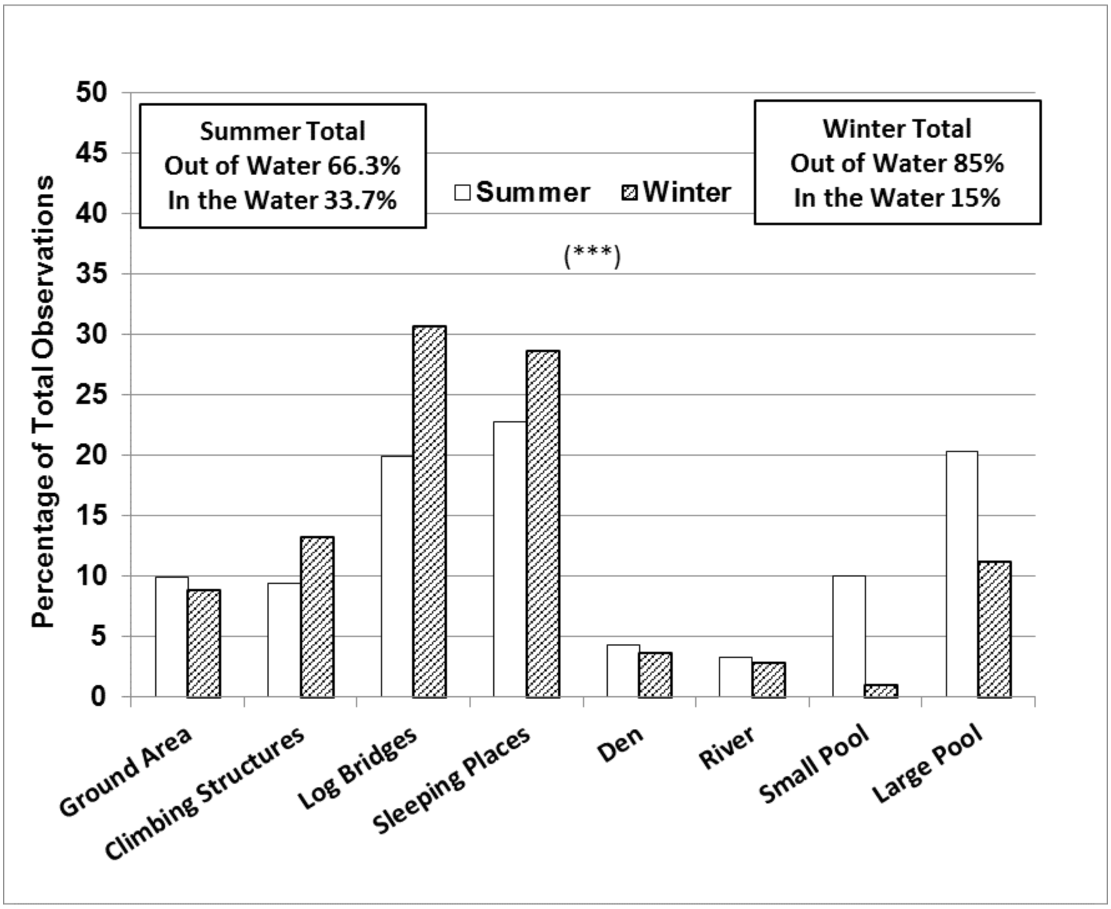

Figure 5. Seasonal differences in enclosure use (720 observations/ season/ otter = 1440 observations/ season). Asterisks denote statistical significance at $P \leq 0.001$***.

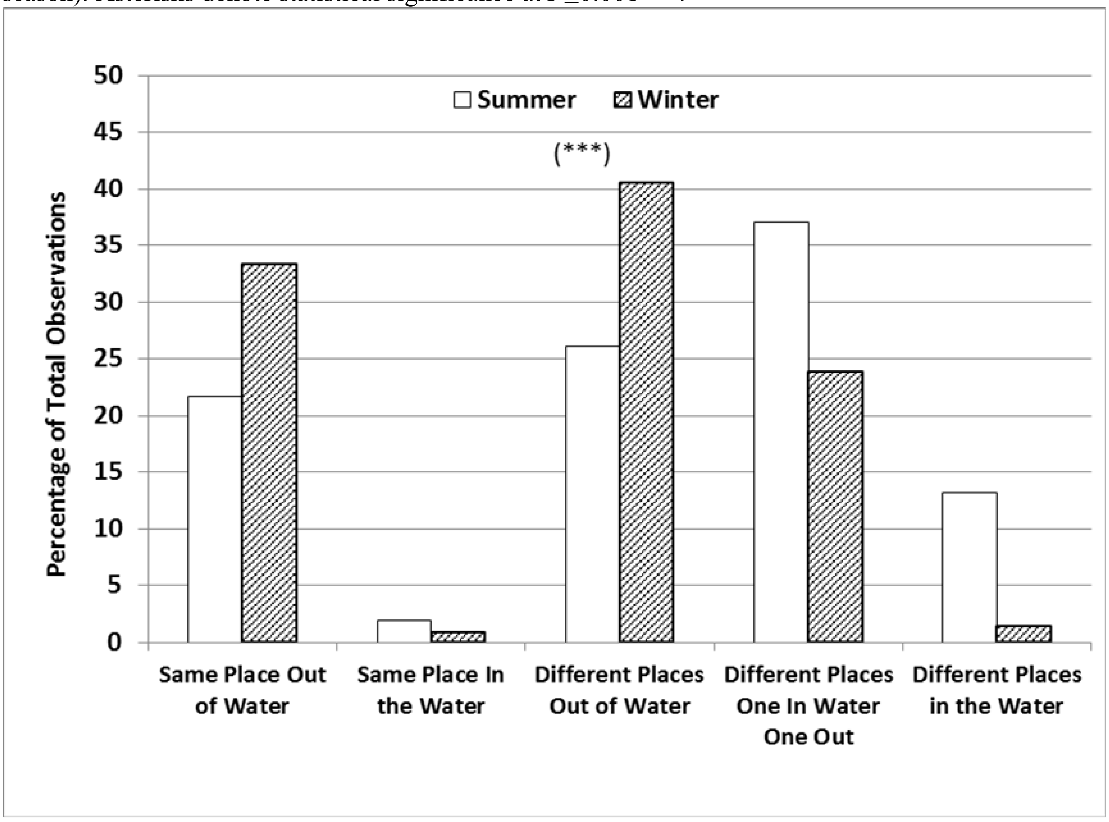

Figure 6. Seasonal differences in otter location in the enclosure relative to the other otter (720 observations/ season). Asterisks denote statistical significance at $P \leq 0.001$***.

Table 4. The influence of time of day on otter state behaviours in summer and winter 2013 (4x20 min/ season at each time of day). Asterisks denote statistical significance at p≤0.05*, p≤0.01**.

	Time Interval (Hours:Minutes)								
Season	Before 2nd Feed **12:40-13:00**	During 2nd Feed **13:00-13:20**	Just After 2nd Feed **13:20-13:40**	Between Feeds 1 **14:10-14:30**	Between Feeds 2 **14:30-14:50**	Between Feeds 3 **14:50-15:10**	Before 3rd Feed **15:40-16:00**	During 3rd Feed **16:00-16:20**	Just After 3rd Feed **16:20-16:40**
	Running, Walking & Climbing (% of time budget for each time interval)								
Summer**	32.2	20.9	2.5	8.4	7.5	12.2	20.6	7.8	6.6
Winter**	36.9	21.9	8.4	6.3	10.0	19.1	21.6	8.1	3.1
	Swimming (% of time budget for each time interval)								
Summer*	40.9	11.9	3.4	29.1	48.8	48.1	53.8	28.8	35.9
Winter	25.9	8.4	13.1	4.1	9.7	25.9	20.3	13.4	5.9
	Foraging (% of time budget for each time interval)								
Summer	1.3	13.8	10.9	10.0	20.3	6.6	5.0	15.0	11.3
Winter	7.5	15.9	25.9	5.6	2.2	5.3	9.7	19.4	13.4
	Scent Marking (% of time budget for each time interval)								
Summer	10.0	6.6	17.5	6.6	4.1	11.6	3.1	5.6	10.0
Winter*	1.3	0.6	9.1	4.7	12.5	2.2	4.1	4.4	22.8
	Playing (% of time budget for each time interval)								
Summer	0.0	0.3	0.3	0.3	0.0	0.0	0.6	0.3	0.9
Winter	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Aggression (% of time budget for each time interval)								
Summer	2.5	0.9	0.0	0.0	1.3	1.3	0.6	0.0	2.2
Winter	5.0	1.9	0.3	1.9	0.9	1.3	4.7	2.5	0.3
	Affiliative Social Interaction (% of time budget for each time interval)								
Summer*	0.0	0.0	25.9	3.8	1.3	2.8	0.0	0.6	11.3
Winter*	0.0	0.0	12.5	15.6	18.8	1.3	0.3	2.2	21.6
	Maintenance (% of time budget for each time interval)								
Summer*	0.6	38.1	23.4	8.4	7.2	3.1	4.1	33.1	17.8
Winter*	2.8	41.9	18.4	10.9	5.6	3.8	7.5	36.6	26.3
	Vigilance (% of time budget for each time interval)								
Summer*	10.9	6.3	0.6	1.9	5.3	11.3	10.9	3.8	0.9
Winter	18.1	8.4	7.2	15.9	9.4	6.9	28.8	10.9	3.8
	Resting & Sleeping (% of time budget for each time interval)								
Summer**	0.0	0.0	14.1	26.6	0.0	0.6	0.0	0.0	0.0
Winter*	0.0	0.0	0.0	35.0	30.0	32.8	0.0	0.3	1.3
	Out of Sight (% of time budget for each time interval)								
Summer	1.6	1.3	1.3	5.0	4.4	2.5	1.3	5.0	3.1
Winter	2.5	0.9	5.0	0.0	0.9	1.6	3.1	2.2	1.6

During feeding times, the main activities were eating, drinking and self-grooming (maintenance), foraging around the enclosure, and interaction with the keepers, with a decrease in the frequency of the short calls and the ‘begging’ displays. Foraging, drinking and self-grooming continued into the periods of time described as ‘Just After Feed’, with more foraging in winter (25.9% winter > 10.9% summer after 2^{nd} feed). The maintenance activities recorded during the ‘Between Feeds’ periods in both seasons consisted mainly of self-grooming, carried out while the otters were settling down to sleep or had just woken up. Occasionally, scattered food was consumed between the main feeds.

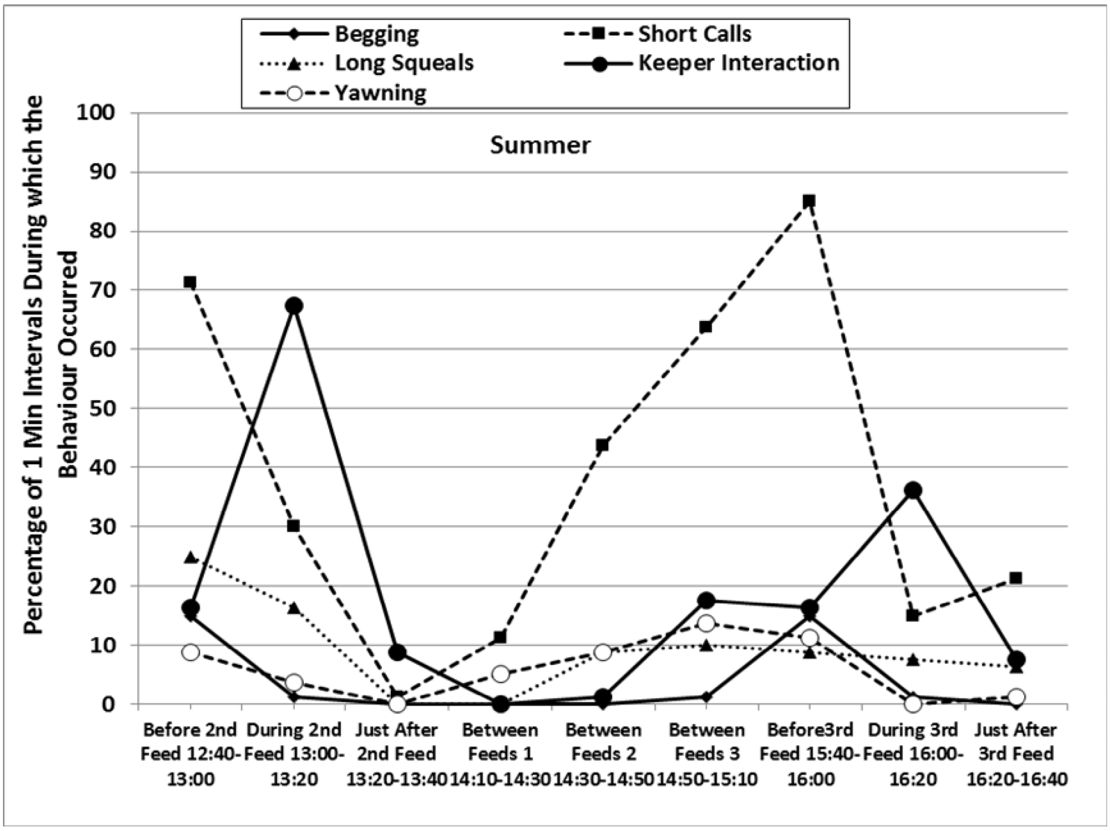

Figure 7: The influence of time of day on the frequency of event behaviours in summer. Begging* (Chi-square=17.0, d.f.=8), Short calls** (Chi-square=21.8, d.f.=8), Keeper Interaction** (Chi-square=22.8, d.f.=8), Yawning* (Chi-square=16.6, d.f.=8). Asterisks denote statistical significance at $P \leq 0.05$*, $P \leq 0.01$**.

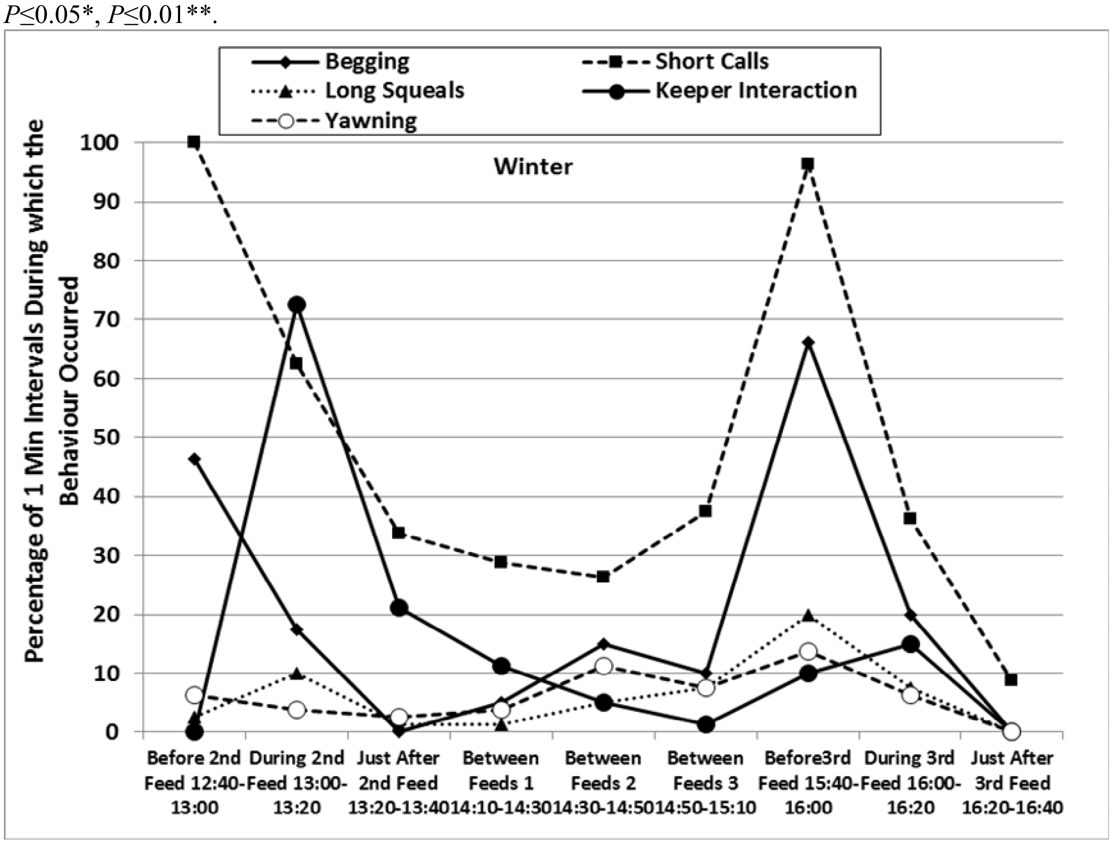

Figure 8. The influence of time of day on the frequency of event behaviours in winter. Short calls* (Chi-square=18.5, d.f.=8), Keeper Interaction** (Chi-square=22.5, d.f.=8). Asterisks denote statistical significance at $P \leq 0.05$*, $P \leq 0.01$**.

The otters were in different places almost all the time before and during the feeds, in both summer and winter. They were in the same place for most of the time during the 'Between Feeds 1' periods in both seasons (68.8% in summer; 61.3% in winter) (Table 5). In summer they were also seen in the same place for most of the 'Just After 2nd Feed' period (67.5% summer > 41.3% winter), when they usually settled down to rest sooner after the feed than in winter. In winter, the otters were seen in the same place more frequently than in summer, correlated with longer periods of rest and social interaction between the feeds and sooner after the 3rd feed than in summer.

Table 5. The influence of time of day on otter location in the enclosure relative to each other and in or out of water in summer and winter 2013 (80 sampling times/ season at each time of day). Asterisks denote statistical significance at $p \leq 0.05$*, $P \leq 0.01$**.

	Time Interval (Hours:Minutes)								
Season	Before 2nd Feed **12:40-13:00**	During 2nd Feed **13:00-13:20**	Just After 2nd Feed **13:20-13:40**	Between Feeds 1 **14:10-14:30**	Between Feeds 2 **14:30-14:50**	Between Feeds 3 **14:50-15:10**	Before 3rd Feed **15:40-16:00**	During 3rd Feed **16:00-16:20**	Just After 3rd Feed **16:20-16:40**
Location relative to the other otter (%Total Sampling Times)									
	Same Place Total								
Summer**	0.0	13.8	67.5	68.8	36.3	7.5	1.3	6.3	11.3
Winter	7.5	5.0	41.3	61.3	61.3	38.8	18.8	13.8	60.0
	Different Places Total								
Summer**	100.0	86.3	32.5	31.3	63.8	92.5	98.8	93.8	88.8
Winter	92.5	95.0	58.8	38.8	38.8	61.3	81.3	86.3	40.0
Location in or out of water and relative to the other otter (%Total Sampling Times)									
	Same Place Out of Water								
Summer**	0.0	12.5	58.8	68.8	36.3	3.8	1.3	5.0	8.8
Winter	5.0	5.0	41.3	60.0	61.3	37.5	18.8	12.5	58.8
	Same Place In the Water								
Summer	0.0	1.3	8.8	0.0	0.0	3.8	0.0	1.3	2.5
Winter	2.5	0.0	0.0	1.3	0.0	1.3	0.0	1.3	1.3
	Different Places Out of Water								
Summer**	42.5	57.5	6.3	13.8	18.8	11.3	31.3	33.8	20.0
Winter	47.5	78.8	33.8	30.0	22.5	31.3	56.3	48.8	16.3
	Different Places One in Water One Out								
Summer	42.5	26.3	18.8	17.5	36.3	43.8	53.8	48.8	46.3
Winter	42.5	15.0	23.8	8.8	16.3	30.0	23.8	32.5	22.5
	Different Places in the Water								
Summer**	15.0	2.5	7.5	0.0	8.8	37.5	13.8	11.3	22.5
Winter	2.5	1.3	1.3	0.0	0.0	0.0	1.3	5.0	1.3
Location in or out of water [%(Total Sampling Times x 2 otters)]									
	Out of Water Total								
Summer*	62.5	83.1	75.6	91.3	73.1	36.9	59.4	63.1	51.9
Winter	73.8	87.5	86.9	91.9	91.9	83.8	86.9	77.5	85.0
	In the Water Total								
Summer*	37.5	16.9	24.4	8.8	26.9	63.1	40.6	36.9	48.1
Winter	26.3	12.5	13.1	8.1	8.1	16.3	13.1	22.5	15.0

Visitor Numbers

Visitor numbers, recorded as a score (Figure 9), were higher around feeding times, especially around the second feed at 1:00pm, when otter training and a public talk were also delivered. In summer, the visitor numbers were higher than in winter at all times of day, with the exception of the interval around 3:00pm, the time of the seal and sea-lion show, when they were low in both seasons.

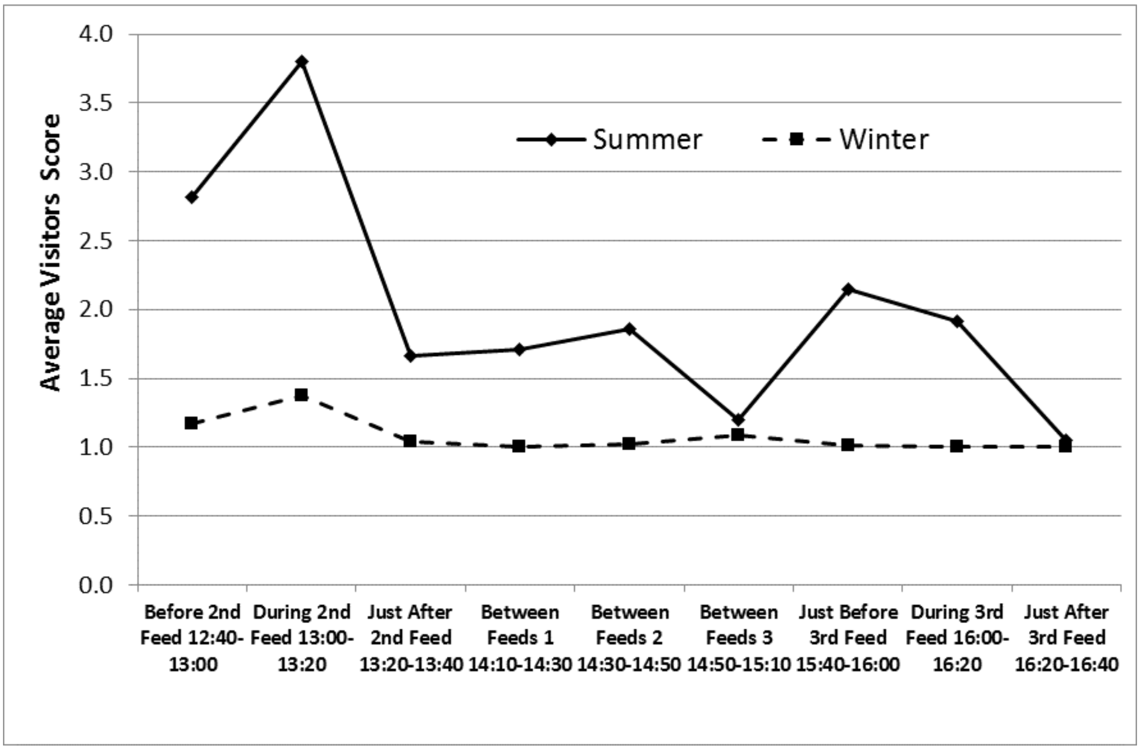

Figure 9. Fluctuations in approximate visitor numbers at the otter enclosure (80 sampling times/ season at each time of day). The visitor score was recorded on a scale from 1 to 5 (1=a few; 2=several; 3=many; 4=full room; 5=crowded room).

DISCUSSION

The indoor otter enclosure at the Blue Reef Aquarium Tynemouth (BRAT) provides various land and water features, in good compliance with the care recommendations for Asian small-clawed otters (ASCO) (AZA, 2009). Both the air and water temperatures were subject to seasonal variations, influenced by the outdoor air temperatures.

The otters studied performed mainly active behaviours and used well the space in the enclosure. As expected, they spent significantly more time swimming in summer compared to winter (33.4% > 14.1%). In winter they spent more time resting or sleeping (11% > 4.6%), displaying vigilance (12.2% > 5.8%) and being aggressive (2% > 1%). These findings were consistent with the analysis of the enclosure use. While in summer the otters were seen more frequently in the water (33.7% > 15%), in winter they were seen more frequently at the sleeping places (28.7% > 22.8%) and on the climbing structures and log bridges preferred for land locomotion and vigilance (52.7% > 39.2%). The sleeping places were also used for grooming, body rubbing and scent marking, which took place prior to settling down for resting and sleeping close to each other, usually in direct body contact, as reported by other authors for captive (Zgrabczynska and Ziomek, 2002) and wild otters (Reed-Smith et al., 2014).

In addition, our location data provided quantitative support for the keepers' observations that one of the otters spent more time swimming than the other. The combination 'different places, one in water one out' was the most frequent occurrence in summer (37.1% of sampling times) and relatively frequent in winter (23.9%).

Overall, the active behaviours represented 87-92.4% of our total observation time. Apart from swimming, the otters displayed 32-34% active behaviours on land, 15-17% maintenance (eating, drinking and self-grooming), and 5-8% affiliative social interaction. They were out of sight for only 2-3% of the time.

In November-December 2012, the same two otters spent 10.2-13.1% of the observation time swimming, with a total of 68.8-81% active behaviours (Bowe, 2013; Briggs, 2013), similar to the winter 2013 data presented in this article. Most other studies of captive ASCO behaviour focused on the effects of feeding enrichment on foraging and stereotypic behaviour and reported lower proportions of time spent engaged in active behaviours, of 21-35%, including 8% swimming (Hawke et al., 2000; outdoor enclosure at Adelaide Zoo, 34.9°S), 27-41% (Ross, 2002; indoor enclosure at Lincoln Park Zoo, Chicago, 41.8°N) and 64-69% (Gothard, 2007; outdoor enclosure), depending on the phase of their study. The remainder of the time budgets presented by these authors comprised of inactivity or being out of sight. The periods of data collection in these studies were longer, from early morning until late afternoon, while our observations at the BRAT were carried out from midday until late afternoon, when the otters were more active. The closest value to our data was that reported for ASCO in an outdoor enclosure at Poznan Zoo, Poland (52.4°N), of approximately 80% active behaviours during observations before and after the single feed of the day (Zgrabczynska and Ziomek, 2002). ASCO in an outdoor enclosure at Chester Zoo, England (53.2°N) displayed 63-64% active behaviours, with swimming representing only 3-4% of the otters' time budget (Owen, 2004), around three times lower than our winter values for the indoor otters at the BRAT.

Data on enclosure use by ASCO are not available from other authors. The otters in this study spent the majority of the time (62-67%) in areas of the enclosure described as biologically relevant, 23-29% at preferred sleeping places, in full view of visitors and keepers, and 9-10% in neutral areas (concrete ground). The small proportion of time spent out of sight in the den (4% of the location data) was associated with defecation. In the wild, ASCO spraints are also found predominantly in areas with forest cover and less human activity (Hussain et al., 2011).

We observed that the otters used the water features frequently in both seasons, but they rarely spent more than 10-30 seconds at a time in water in winter, while in the summer there were more periods of continuous or almost continuous swimming of 1-2 min, possibly longer. The average winter water temperature on the days when the data were collected (11.4±1.1 °C) was below the recommended range of 18.3-29.4 °C (AZA, 2009), while in summer it was just above the lower extreme of this range (19.1±0.1 °C). ASCO can cope well with air temperatures of 10-15 °C, if they have a heated indoor area, but many observations suggested they swim more in warmer water (AZA, 2009), with potential beneficial effects on their health (Petrini, 1998). A female ASCO was seen swimming for up to 8 minutes at Singapore Zoo in May (1.3°N; air temperatures 26-30 °C) (Nair and Agoramoorthy, 2002). The AZA Otter Care Manual states that some otters, but not all, were reported by their keepers to have reduced activity or increased food consumption during the cold season (AZA, 2009), to compensate for the higher thermoregulatory costs, but no quantitative data were given in support of this statement.

Our results provide quantitative information to support these statements and represent a potentially important observation in the context of husbandry practices that aim to foster high welfare and species conservation (Bishop et al., 2013). ASCO take well to captivity in zoos and aquaria at several locations outside the natural range of the species, in indoor and outdoor enclosures (Kruuk, 2006; Dornbusch and Greven, 2009), but reproduction is not always successful (Reed-Smith, 1998).

In the wild, ASCO live in habitats ranging from coastal wetlands to mountain streams at 2000m altitude, demonstrating high climatic and trophic adaptability (Rosli et al., 2014) and there are also reports of them living in the wild in England, after escaping from captivity (Jefferies, 1989, 1991, cited in Wright et al., 2015). Although not much is known about mating in the wild, captive ASCO are known to mate mostly in shallow water and only occasionally on land (Hussain et al., 2011) and to be able to reproduce all year round (Bateman et al., 2009). After the initiation of a Species Survival Plan (Foster-Turley et al., 1990) and an international studbook for ASCO (Foster-Turley and Engfer, 1988), about half of the zoos with captive ASCO reported successful reproduction, with around 40 births/year and 75% cub survival (Sivasothi, 1998). An increase in the amount of energy required for thermoregulation during the cold season in zoos outside the tropical area is very likely to affect the otters' energy budget, with consequences on behaviour, nutritional needs, and possibly reproduction.

Borgwardt and Culik (1999) showed that while ASCO had similar metabolic rates to other otters on land, in water they had much higher metabolic rates than sea otters and river otters (Pfeiffer and Culik, 1998), reflecting higher thermoregulatory costs, possibly due to poorer insulative properties of the fur and underlying skin and less well-developed heat saving mechanisms in the vascularisation of their appendages (Borgwardt and Culik, 1999) or pattern of movement during swimming (Fish, 1994). The metabolic rate of ASCO with a body mass of around 3 kg was 5.0±0.8 W kg^{-1} during rest on land at 16 °C, almost doubled to 9.1±0.8 W kg^{-1} during rest in colder water at 12 °C, and increased further to 14.2±3.9 W kg^{-1} during swimming, and 17.6±1.4 W kg^{-1} during foraging and feeding in water at 12 °C (Borgwardt and Culik, 1999).

In spite of the special features of the hairs of Mustelids that can interlock and trap an effective insulating air layer around the body (Kuhn and Meyer, 2010; Liwanag et al., 2012), the heat loss from the skin increases rapidly through forced convection during movement in cold water (Hind and Gurney, 1997), and the heat generated in muscles during locomotion cannot fully compensate for the lost heat (Humphries and Careau, 2011).

The metabolic rate of the much larger *Lutra lutra* also increased in cold water (Kruuk et al., 1994a), but the length of time spent foraging in water (mean bout length 32.5 min) and the rate of decrease in body temperature (2.3 °C hr^{-1}) were not significantly influenced by water temperatures in the range 2-16 °C (Kruuk et al., 1997). The smaller wild mink *Mustela vison* were also more active and dived more in cold water (4-6°C), but with shorter dive durations up to 60s (Hays et al., 2007; Harrington et al., 2012).

Kruuk et al. (1997) showed that *Lutra lutra* increased their body temperature through more activity on land before a foraging dive, then exited the water when their body temperature decreased again to a critical value, equivalent to their average resting value. A similar regulatory mechanism in ASCO may explain the less frequent shorter swimming bouts we observed in water at 11-12 °C (winter), compared to water at 19 °C (summer) and may also contribute to the poor reproductive success of this species in captivity (Foster-Turley, 1990). Copulation is known to last 5-30 minutes in shallow water (Heap et al., 2008). No management practices were reported to significantly increase the chance of successful breeding (Reed-Smith, 1998), but rapid heat loss in cold water may determine some ASCO to exit water before successful insemination occurs. The faster rate of heat loss of ASCO may represent an evolutionary adaptation to the tropical range (Kruuk, 2006), where overheating during activity may be a more frequent occurrence than unfavourable heat loss. Thermal imaging showed that another tropical species, the giant otter *Pteronura brasiliensis*, lost heat through the entire body surface, including the tail, while the Eurasian otters *Lutra lutra* dissipated excess heat only through their feet (Kuhn and Meyer, 2009).

The patterns of activity and enclosure use presented in this study appear to support this idea. The greatest difference between summer and winter was recorded for the observation periods after 2:00pm, when swimming represented 2-7 times more of the time budget (28.8-53.8%) than during the same time periods in winter (Table 4). These were also the periods when the longer bouts of swimming occurred in the summer, when the otters were seen more frequently in the water at the same time (8.8%-37.5%), usually one swimming in the large pool and the other sitting in the shallow pool, and when the indoor air and water temperatures were warmer by 1-2 °C and 0.5-1 °C, respectively, compared to the morning values. This suggested that, in spite of different tendencies to swim, both otters were using the water for thermoregulation in the summer, to keep cool or to cool down after land locomotion. In winter, the otters were seen in the water significantly less frequently, and they were rarely both in the water at the same time (0-5% of sampling times).

Our results also showed that while active, the two male otters usually kept their distance, both on land and in water, in both seasons, suggesting a tendency for territoriality or dominance. This was associated with frequent scent marking after the enclosure was cleaned. Scent marking plays an important role in the communication of identity and social and reproductive status between otters and in establishing and maintaining territories, with several reports of territorial and mutual avoidance (Hussain et al., 2011; Rostain et al., 2012). Recent studies demonstrated that the acoustic and olfactory identities of male ASCO were more important for their recognition by females than their visual appearance (Lemasson et al., 2013), although ASCO have the ability to discriminate color cues (Svoke et al., 2014). A group of all female ASCO at Chester Zoo, England, displayed very little scent marking, much less than a mixed sex family group at the same zoo (Foster and Fletcher, 2007).

Individual differences in tendency to swim were documented in both captive and free-ranging otters (Kruuk et al., 1994a; Kruuk et al., 1997) and mink (Hansen and Jeppesen, 2001; Hays et al., 2007; Vinke et al., 2008; Harrington et al., 2012). In the wild, swimming is mainly associated with looking for food and ASCO, although otherwise highly social and gregarious, were often seen foraging on their own (Kruuk, 2006). Captive mink also appeared to choose to swim for increased foraging and behavioural choices, rather than thermoregulation (Vinke et al., 2008).

This could be related to our observations that swimming was also part of the feeding anticipatory activity (FAA) of ASCO at the BRAT, in both seasons. FAA started at least 20 minutes before the scheduled feeding times and included running, walking, swimming, frequent 'begging' displays and short calls and occasional long squeals and aggressive displays. Although the door banging and hair plucking described by Ross (2002) were not seen, the otters' movements followed fairly repetitive trajectories, and could be considered stereotypic behaviour (Gothard, 2007; Morabito and Bashaw, 2012). One otter spent more time swimming in the large pool, while the other spent more time running and 'begging' on the log bridges.

Similar patterns of FAA were described for captive ASCO (Hawke et al., 2000; Ross, 2002), and for farmed mink (Hansen and Møller, 2008; Axelsson et al., 2009). In captive carnivores, feeding anticipatory activity is entrained primarily by the regularity of feeding times (Mistlberger, 2011). Several studies showed that fixed feeding times align the circadian clock gene rhythms in peripheral organs and in many areas of the brain with the daily rhythm of food intake (Carneiro and Araujo, 2012).

The resulting FAA, often associated with abnormal behaviours, is usually interpreted as a sign of poor welfare (Waitt and Buchanan-Smith, 2001). However, the biochemical and physiological changes triggered serve to prepare the animals' organs for the expected nutrient intake (Mistlberger, 2011) and were shown to have an overall positive effect on the health of many species (Carneiro and Araujo, 2012).

The peaks in locomotory activity prior to feeding at the BRAT were interpreted as appetitive behaviour associated with good welfare, as proposed by Watters (2014), and they also attracted and retained the visitors' interest. More visitors stopped at the otter enclosure just before and during feeds in both seasons. Other studies also showed that visitors spent longer times at the otter enclosures when the animals were more active and a public talk was taking place (Anderson et al., 2003; Bowe, 2013; Briggs, 2013). Circadian patterns of activity and vocalisation exist in wild otters and are most likely synchronised with prey availability, as well as climatic conditions and degree of human interference (Hussain, 2013). ASCO were heard 'chirping' during the night and were occasionally seen early in the morning and around dusk (Foster-Turley, 1992; Castro and Dolorosa, 2006). The larger smooth-coated otters *Lutrogale perspicillata*, a closely related (Rosli et al., 2015) sympatric species (Kruuk et al., 1994b), had two periods of high activity during the night, separated by a longer period of relative inactivity during the day in the summer (daytime temperatures up to 46 °C) and were more active and more diurnal during winter, with three peaks of activity (Hussain, 2013). The spotted necked otter *Lutra maculicollis* (Lichtenstein, 1835), a diurnal African otter of comparable weight to ASCO, had activity peaks during morning (33% of time budget) and late afternoon (23% of time budget) (Reed Smith et al., 2014). The main activities seen were travelling, foraging and grooming (Hussain, 2013; Reed-Smith et al., 2014) or playing, running and swimming (Castro and Dolorosa, 2006).

The higher peaks in 'begging' and calling prior to feeding times observed at the BRAT in winter, combined with the extended foraging after the 1pm feed, suggested that these were more likely to be signs of hunger, as proposed by Gothard (2007), and that introduction of another feed or more substantial scatter feeds in the cold season would be beneficial. Standing on hind limbs to look around was observed in wild ASCO and smooth coated otters, and was associated with a state of alarm and vigilance to threats (Kruuk, 2006). Gothard (2007) and Owen (2004) showed that ASCO "begged" and called more in the presence of visitors, which is similar to our observations for each season. However, in our study, the visitor numbers were much higher in summer, during the school holidays, when the overall frequency of 'begging' was significantly lower than in winter. Otters have a complex vocal repertoire that can convey biologically important messages (Lemasson et al., 2014) and pre-feeding short calls were categorised as signs of stress in captive ASCO (Scheifele et al., 2015), consistent with the fact that otters have high metabolic rates and fast food transit and become hungry again soon after being fed (Hawke et al., 2000). If the higher nutritional requirements associated with higher thermoregulatory costs during the cold season (Henry et al., 2012) are not fully met, this is likely to lead to increases in stereotypic and passive behaviour from summer to autumn-winter, as those described in this article and those reported by Ahola et al. (2011) for captive mink. In addition, play behaviour that has been proposed as an indicator of favourable energy balance and high otter welfare (Gothard, 2007), was seen at the BRAT only in the summer.

Conclusion

1. This is the first quantitative study demonstrating a significant influence of seasonality on the behaviour and enclosure use of *Aonyx cinereus* in captivity at a location outside the species natural range;
2. The otters at the BRAT spent significantly more time swimming and significantly less time displaying stereotypical behaviours during the warm season, compared to the cold season, suggesting that captive *Aonyx cinereus* kept in non-climatised indoor enclosures in zoos and aquaria in temperate regions may benefit from having at least partially heated pools during the cold season, to stimulate activity all year round and increase visitor display value;
3. Access to warmer water in such enclosures may also have a positive influence on their reproductive success in zoos in temperate climate regions;
4. Further studies on a larger number of ASCO at different establishments, including some with outdoor enclosures, and for longer periods of time would be required to reach stronger conclusions regarding these aspects of captive behaviour.

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RÉSUMÉ

SEASONAL CHANGES IN THE BEHAVIOUR AND ENCLOSURE USE OF CAPTIVE ASIAN SMALL CLAWED OTTERS *Aonyx cinereus*

L'influence des variations saisonnières de la température sur le comportement des mammifères tropicaux maintenus dans les zoos et les aquariums dans les régions du climat tempéré est très peu étudiée. Cet article décrit les différences saisonnières dans le budget de comportement et dans l'utilisation de l'enceinte de deux loutres asiatiques de petites griffes (*Aonyx cinereus*) détenus dans une enceinte intérieure à l'aquarium Blue Reef de Tynemouth, au nord-est de l'Angleterre (55°N). Les loutres étudiées ont passé significativement plus de temps dans l'eau en été (température de l'eau 18-19°C) qu'en hiver (température de l'eau 11-12°C). La natation représentait 33,4% du temps total d'observation en été, contre seulement 14,1% en hiver. En été, les loutres ont été observées dans l'eau à 33,7% des temps d'échantillonnage, dans une de piscines ou dans la rivière dans l'enceinte, contre 15% en hiver. Dans les deux saisons, le budget du temps comprenait aussi de 32-34% de comportements actifs sur terre, 15-17% d'entretien, 5-8% d'interaction sociale affiliée et 2-3% étaient hors de vue. En hiver, les loutres étaient plus agressives (hiver 2%> été 1%) et moins actives, avec significativement plus de temps allongé au repos (hiver 11%> été 4,6%) ou vigilants, regardant autour d'eux ou 'mendiant' aux gardiens ou aux visiteurs (hiver 12,2%> été 5,8%). L'activité d'anticipation alimentaire a été observée dans les deux saisons. L'interaction sociale affiliative s'est produite principalement entre les temps d'alimentation, liés aux périodes de repos. La pertinence de ces observations est discutée en relation avec la thermorégulation et les possibles effets sur la reproduction.

RESUMEN

SEASONAL CHANGES IN THE BEHAVIOUR AND ENCLOSURE USE OF CAPTIVE ASIAN SMALL CLAWED OTTERS *Aonyx cinereus*

La influencia de los cambios estacionales de temperatura en el comportamiento de los mamíferos tropicales mantenidos en zoos y acuarios en regiones de clima templado es muy poco estudiada. Este artículo describe las diferencias estacionales en el presupuesto de tiempo de comportamiento y en el uso del recinto de dos nutrias asiáticas de garras pequeñas (*Aonyx cinereus*) mantenidas en un recinto interior en el Acuario Blue Reef de Tynemouth, en el noreste de Inglaterra (55°N). Las nutrias estudiadas pasaron significativamente más tiempo en el agua en verano (temperatura del agua 18-19°C) que en invierno (temperatura del agua 11-12°C). La natación representó el 33,4% del tiempo total de observación en verano, en comparación con sólo el 14,1% en invierno. En verano, las nutrias fueron observadas en agua en 33.7% de los tiempos de muestreo, en una de las piscinas o en el río del recinto, en comparación con el 15% en invierno. En ambas temporadas, el presupuesto de tiempo también incluyó 32-34% de conductas activas en tierra, 15-17% de mantenimiento, 5-8% de interacción social afiliada y 2-3% fuera de la vista. En invierno, las nutrias fueron más agresivas (invierno 2%> verano 1%) y menos activas, pasando significativamente más tiempo acostadas, descansando o durmiendo (invierno 11%> verano 4,6%), y siendo vigilantes, mirando alrededor o 'mendigando' al guardián o visitantes (invierno 12,2%> verano 5,8%). La actividad anticipatoria de alimentación se observó en ambas estaciones. La interacción social afiliada ocurrió principalmente entre las comidas, vinculada a los períodos de descanso. Se discute la relevancia de estas observaciones en relación con la termorregulación y los posibles efectos sobre la reproducción.

REPORT

PHOTOGRAPHIC RECORD OF SYMPATRY BETWEEN ASIAN SMALL-CLAWED OTTER AND SMOOTH-COATED OTTER IN THE NORTHERN WESTERN GHATS, INDIA

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Abstract: Sympatry was recorded between a family of Asian Small-clawed otters and a family of Smooth-coated otters was observed in Goa, a region in the northern Western Ghats of India. A camera trap was used to monitor otter behaviour for a period of 74 days, during which Asian Small-clawed otters were recorded 17 times and Smooth-coated otters were recorded once.

Keywords: Photographic evidence, Trail Camera, Goa, habitat use

Two species are said to be sympatric if they occupy same or overlapping geographic areas. In this case, we describe sympatry between two closely related otter species. Sympatry between a family of Smooth-coated Otters *(Lutrogale perspicillata)* and a family of Asian Small-clawed Otters *(Aonyx cinereus)* was recorded using a trail camera in Sonal, Goa, falling in the foothills of northern region of the Western Ghats in India. This is the first time that sympatry between the two otters has been documented with photographic evidence in India.

L. perspicillata and *A. cinereus* have overlapping ranges in certain parts of India according to the IUCN Red List species distribution map (www.iucnredlist.org). Overlapping ranges indicate possibilities of sympatry. Previous studies have also indicated sympatry, mainly through indirect signs such as spraint comparison. This paper is to confirm their sympatry in the northern Western Ghats through photographic evidence.

Although found in linear riverine habitats, both otter species have different micro and macro habitat preferences. In the Eravikulam region of Western Ghats in Kerala, *A. cinereus* were found to use pools more extensively than cascades and riffles in the stream types, and 2nd-order streams were preferred over 1st and 3rd-or higher-order streams (Perinchery et al., 2011). Stream substrate, grass cover, and ground cover along banks did not play an important role in influencing *A. cinereus* presence (Perinchery et al., 2011). *L. perspicillata* in Periyar Lake in Kerala, Western Ghats were confined to the shallower and narrower regions of the lake, where the bank was gradually sloping mud, and were usually found at the mouths of small streams that join the lake (Anoop and Hussain, 2004).

L. perspicillata is the larger of the two otter species, weighing between 7-11 kg. It is characterized by a very smooth, sleek pelage (Francis, 2001; Hwang and Lariviere, 2005). Colour varies from dark to reddish brown, with the undersides slightly lighter. Upper lip, cheeks, sides of neck, and throat are whitish or gray (Tate, 1947; Hwang and Lariviere, 2005). Underfur and guard hairs are 8 mm and 12 mm in length, respectively. Tail is flattened dorsoventrally, with a distinct lateral keel distally. The rhinarium is black, naked, and situated anteriorly; its dorsal border is barely convex. Vibrissae are well developed, white, and < 90 mm in length. Eyes and ears are small. Limbs are short, strong, with broad feet. All feet are fully webbed (Harrison, 1968; Hwang and Lariviere, 2005). *A. cinereus* is the smallest otter in the world, weighing less than 3.5 kg. Its head is small, neck is larger than head, legs are short, and tail is flattened dorsoventrally. Pelage is typically brown but sometimes cream coloured or with a reddish tinge (Foster-Turley, 1992; Hwang and Lariviere, 2005).Undersides are paler brown, and edge of upper lips, chin, throat, and sides of neck and face are grayish white. In South India, pelage is darker than elsewhere (Corbet and Hill, 1992; Tate, 1947; Hwang and Lariviere, 2005). Rhinarium is bare. Posterior border of rhinarium is variable in shape from straight to undulated (Yoshiyuki, 1971; Hwang and Lariviere, 2005).

The two otter species differ in terms of their diet as well. *A. cinereus* feeds mainly on crabs, crustaceans, and other mollusks (Foster-Turley, 1992; Sivasothi and Nor, 1994). It supplements its diet with rodents, snakes and amphibians as well, but these form a small component of its diet (Hussainet al., 2011). *L. perspicillata* is largely piscivorous, it also known to feed on rats, insects, snakes and a variety of other prey occasionally (Foster-Turley, 1992).

Although there are differences between *L. perspicillata* and *A. cinereus* in their macro-habitat, micro-habitat and food preferences (Kruuk, 1994), their apparent range overlap suggests possibilities of overlapping territories and possible interactions as well. Here we give an instance where both the otter species were recorded by the same camera at the same location, albeit on different days.

The study location (Figure 1) is on the bank of a small stream within an areca nut plantation, in the buffer area of Mhadei Wildlife Sanctuary. This stream leads to Mahadayi river. Previous surveys of the area revealed the presence of a latrine site that was used actively as indicated by the presence of fresh spraint (Figure 2). The spraints were provisionally identified to be that of *A. cinereus* due to the presence of crustacean remains, which are usually finely macerated. *A. cinereus* is known to feed extensively on crustaceans (Foster-Turley, 1992; Sivasothi and Nor, 1994).

In order to get more insight of the behaviour of these elusive otters, a trail camera was placed near the latrine site (Figure 3).

Figure 1. Google image of study location

Figure 2. *A. cinereus* spraint found at study location, characterized by crustacean remain.

Presence of *A. cinereus* was recently described in this region (Punjabi et al., 2014). We used a Bushnell HD Trail Camera to capture photographs. The camera was set from 23rd December 2014 to March 8th 2015. The total duration of study was 74 days. The camera was set to monitor all 24 hours a day. It was also set such that it would record a photograph as well as a video upon being triggered. *A. cinereus* was recorded seventeen times during the study duration, with a maximum family size of three individuals. *L. perspicillata* was recorded once, with a family size of three individuals (Table 1).

74 days after the camera was set, it was removed and the recorded videos and photos showed that not one, but in fact two species of otters visited the study site (Figure 4 and Figure 5).

Figure 3. Trail camera placed at the study location

Figure 4. Camera picture of a male *Lutrogale perspicillata* at the study area

The camera records clearly show that the latrine site is visited often by *A. cinereus*, mainly to defecate and smear its spraint. Three *L. perspicillata* individuals were recorded at same the location as well. *L. perspicillata* did not seem to react to the scent or spraint left behind by *A. cinereus*. The camera record merely shows that the same habitat could be used by both otter species; it gives no further account of their interaction. Although there is evidence that otter species are attracted to the spraint of the other otter species per se, rather than to the same kind of places (Kruuk et al., 1993), this incidental video record shows no specific behaviour to acknowledge this.

Figure 5. Camera picture of *Aonyx cinereus* at the study area

Table 1. Camera recordings of the two otter species

No.	Date	Time	Otter Species	No. of Otters
1	December 26, 2014	06:03	*Lutrogale perspicillata*	3
2	December 31, 2014	02:47	*Aonyx cinereus*	3
3	January 5, 2015	01:46	*Aonyx cinereus*	3
4	January 5, 2015	03:16	*Aonyx cinereus*	3
5	January 6, 2015	22:27	*Aonyx cinereus*	2
6	January 10, 2015	05:30	*Aonyx cinereus*	3
7	January 14, 2015	01:33	*Aonyx cinereus*	2
8	January 25, 2015	22:54	*Aonyx cinereus*	3
9	January 25, 2015	22:55	*Aonyx cinereus*	3
10	January 25, 2015	23:18	*Aonyx cinereus*	3
11	February 1, 2015	04:57	*Aonyx cinereus*	2
12	February 9, 2015	00:20	*Aonyx cinereus*	2
13	February 11, 2015	23:45	*Aonyx cinereus*	2
14	February 21, 2015	00:06	*Aonyx cinereus*	2
15	February 21, 2015	01:05	*Aonyx cinereus*	3
16	February 22, 2015	01:11	*Aonyx cinereus*	1
17	February 22, 2015	04:56	*Aonyx cinereus*	2
18	February 27, 2015	02:07	*Aonyx cinereus*	3

When different otter species occur in the same site, there was some evidence for a difference in use of habitat. *A. cinereus* tracks were often found wandering further away from the river than *L. perspicillata*, between patches of reeds and river debris (Kruuk, 1994). However, *L. perspicillata* are not restricted to deep water and often forage in small, shallow rivers (Anoop and Hussain, 2004; Kruuk, 1994). Since the

study location is 60m from the main river and surrounded by areca nut plantations on either side, perhaps *L. perspicillata* headed further inland in search of more terrestrial prey such as crabs; overlapping their territory with that of *A. cinereus*.
Further studies could reveal a better understanding about behavioural interactions between the two sympatric otter species. There is still much to learn about their habit use in different seasons, especially in landscapes threatened by human-modification.

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RÉSUMÉ

DES ENREGISTREMENTS PHOTOGRAPHIQUES DE LA SYMPATRIE ENTRE LA LOUTRE NAINE D'ASIE ET LA LOUTRE AU PELAGE LISSE PROVENANT DES GHATS DU OUEST EN INDE

La sympatrie a été enregistrée entre les loutres naines d’Asie et les loutres à pelage lisse, et fut observée en Goa, une région dans les Ghats du nord-ouest en Inde. Une vidéo surveillance a été utilisée pour surveiller le comportement des loutres sur une période de 74 jours, au cours de laquelle les loutres naines asiatiques furent enregistrées 17 fois conte une seule fois pour les loutres à pelage lisse.

RESUMEN

REGISTRO FOTOGRÁFICO DE SIMPATRÍA ENTRE LA NUTRIA ASIÁTICA DE UÑAS PEQUEÑAS Y LA NUTRIA LISA EN LOS GHATS DEL NORTE, INDIA

Se registró la simpatría entre una familia de nutrias asiáticas de uñas pequeñas y una familia de nutrias lisas en Goa, una región en los Ghats nor-occidentales de India. Fue usada una cámara-trampa para monitorear el comportamiento de las nutrias durante un período de 74 días, durante el cual las nutrias asiáticas de uñas pequeñas fueron registradas 17 veces y las nutrias lisas una vez.

SHORT NOTE

RECORDS OF SMOOTH-COATED OTTER *Lutrogale perspicillata* (GEOFFROY, 1826) FROM THE KRISHNA RIVER DELTA OF SOUTH INDIA

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Abstract: There have been no detailed studies on distribution and status of Smooth-coated Otter *Lutrogale perspicillata* from the Krishna river delta in coastal Andhra Pradesh of South India, although the area holds a population potentially important for the species' conservation. Some interactions between local fishing communities and Smooth-coated Otters in the region have led to retaliatory killings. This negative situation beckons for conservation attention. Smooth-coated otters were observed in a few locations along the river banks and mangrove areas of Krishna Estuary. The potential threats for its survival highlight the need to prioritize this region as an important conservation area through further intensive surveys.

Key Words: Smooth-coated Otter, Krishna River, Mangroves, Andhra Pradesh.

The eastern coastal plain of the state of Andhra Pradesh in South India is vast with highly fertile deltas of the Godavari and Krishna rivers flowing through the Eastern Ghats hill ranges. The Smooth-coated Otter is distributed throughout India from Himalayas southwards and has been reported from the states of Karnataka, Kerala, Andhra Pradesh, Madhya Pradesh, Maharastra, Gujarat, Punjab, Himachal Pradesh, Uttar Pradesh, Bihar, West Bengal and Mizoram (Prater, 1971; Hussain and Choudhary, 1988; Hussain, 1993; Foster-Turley and Santiapillai, 1990). It is seen to inhabit large rivers and their associated tributaries, estuaries and coastal mangrove swamps, and requires undisturbed forest or scrub adjacent to the water (Mason, 1990).However, all three species of otters found in India are becoming increasingly rare outside protected areas and are threatened in many locations by a reduction in prey biomass, poaching and loss of habitat (Foster-Turley et al., 1990; Hussain, 2002). There is also lack of information on the status of otter populations in India (Hussain, 1993). We present a few incidental sightings, camera trap images and indirect evidences (tracks, spraints and den sites) of Smooth-coated Otter along the

Krishna River Delta which came out as ancillary observations during a species targeted survey for the fishing cat (Table 1).

Table 1: Details of smooth-coated otter records from Krishna Delta in South India.

Latitude	Longitude	Habitat	Observations
16°24'38.69"N	80°42'34.80"E	Sandy river bank with riparian vegetation	Direct sightings of live individuals, tracks and spraint.
16°24'24.54"N	80°42'32.19"E	River Island with tall grasses and shrubs	Direct sightings of live individuals, tracks, spraint and dens
16°25'5.87"N	80°42'24.13"E	Concrete road with paddy fields and irrigation canals on either side	Road kill
16° 4'38.93"N	80°52'44.93"E	River island with vegetation	Camera trap photos, tracks and spraint
15° 80'56.36"N	80°86'39.04"E	Tidal forest	Camera trap photo
15°51'36.50"N	80°53'18.86"E	Estuarine back waters	Tracks and spraint.

The Krishna River originates from Mahabaleshwar in Western Ghats at height of approximately 1337 meters above mean sea level and flows 1400 kilometres eastwards through the Eastern Ghats to meet Bay of Bengal in Andhra Pradesh. Tropical mangrove forests spread out over 250 Square kilometres that lay at the river mouth along the east coast of Central Andhra Pradesh form the Krishna Wildlife Sanctuary (Figure 1). The sandy banks with native riparian vegetation as well as the tidal habitat towards the coast provide an ideal refuge for smooth-coated otters in the area. We report the records from unprotected areas around the Krishna Wildlife Sanctuary.

Figure 1. A view of the Krishna River along the east coast of South India.

From April 2015 to October 2016, we directly sighted smooth-coated otters in small family groups of 3-5 individuals at few locations along the river bed, on isolated river islands and in the mangrove creeks outside the protected areas. Indirect evidences like den sites, spraints and tracks were also recorded at some locations along the river banks. Smooth-coated otters are social carnivores that forage in groups and use communal sites for defecation (Hussain, 1996; Hussain and Choudhury, 1997a). A video of an otter family returning to the same latrine site regularly to defecate was recorded on a LED flash camera trap, which was originally installed to capture small wild cats.

Figure 2. A Smooth-coated Otter rests on a sandy river bank near Krishna Wildlife Sanctuary in South India.

Figure 3. Camera trap photo of Smooth-coated Otter on a river island in Krishna River

Figure 4. Smooth-coated otter family in the tidal mangrove forest outside Krishna Wildlife Sanctuary

Smooth-coated Otters play a key role in the freshwater ecosystem as top carnivores that help control the populations of species they prey on and therefore, contribute to the overall health and functioning of the ecosystem over a period of time (Khan et al., 2014).The species is listed as Vulnerable (VU) by the International Union for the Conservation of Nature (de Silva et al, 2015) and Natural Resources and is on appendix II of the Convention on International Trade in Endangered Species. However, informal interactions with our local informants revealed that as many as 40 otters were killed by fish farmers near Rajula Cheruvu and Lankavani Dibba areas in the past two years due to perceived threat to their economy since otters predate on commercial fish stocks in aquaculture ponds and their meat was also consumed by the locals We also documented otter road kills on the Krishna River left flood bank road which runs parallel to the main stream river from Vijayawada city to Puligedda town. Indiscriminate sand mining from the river bed has also been observed. Furthermore, the local villagers confirmed poaching of otters in the region by organized gangs who are nomadic and operate seasonally. Therefore, we propose immediate conservation measures to address predation conflict in the area and initiation of otter population distribution surveys coupled with awareness generation activities among all the stakeholders in the region.

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RÉSUMÉ

ENREGISTREMENTS DE LOUTRES À PELAGE LISSE *Lutrogale perspicillata* (GEOFFROY, 1826) PROVENANT DU DELTA DE LA RIVIÈRE KRISHNA DU SUD DE L'INDE

Il n'existe pas d'études détaillées sur la distribution et le statut des loutres à pelage lisse concernant le delta de la rivière Krishna dans la zone côtière Andhra Pradesh du sud de l'Inde, même si cette zone accueil une population potentiellement importante pour la conservation de l'espèce. Quelques interactions entre les communautés locales de pécheurs et les loutres à pelage lisse ont mené à des tueries de représailles. Cette situation négative attire l'attention à la conservation. Les loutres à pelage lisse ont été observes au niveau de quelques emplacements le long des berges de la rivière et des zones de mangrove du delta de la rivière Krishna. Les potentielles menaces pour la survie de ces loutres soulignent le besoin de faire de cette région une zone prioritaire quant à la conservation au travers de nombreuses veilles.

RESUMEN

REGISTROS DE LA NUTRIA LISA *Lutrogale perspicillata* (GEOFFROY, 1826) DEL DELTA DEL RÍO KRISHNA, INDIA DEL SUR

No ha habido estudios detallados sobre la distribución y status de la nutria lisa *Lutrogale perspicillata* del delta del río Krishna, en la parte costera de Andhra Pradesh, Sur de la India, aunque el área alberga una población potencialmente importante para la conservación de la especie. Algunas interacciones entre las comunidades locales de pescadores y las nutrias lisas en la región, han conducido a matanzas retaliatorias. Esta situación negativa requiere atención desde la conservación. Las nutrias lisas fueron observadas en unas pocas localizaciones a lo largo de las barrancas del río y áreas de manglar en el Estuario Krishna. Las amenazas potenciales para su supervivencia refuerzan la necesidad de priorizar esta región como un área importante para la conservación, a través de ulteriores relevamientos intensivos.

OSG MEMBER NEWS

Since the last issue, we have welcomed 29 new members to the OSG: you can read more about them on the Members-Only pages.

Kelsey Baird, USA: I am interested in the human dimensions of conservation, such as the attitude of sport anglers towards otters and other piscivorous predators, and what informs and influences their views.

Adi Barocas, Peru: I have just completed my doctorate studying coastal river otters (*Lontra canadensis*) in Alaska. I am now moving to Peru to work on the effects of mining and cattle ranching on giant otters (*Pteronura brasiliensis*). http://adibarocas.wixsite.com/adibarocas

Dhruba Bijaya, Nepal: I am an assistant professor at Tribhuvan University, Pokhara. Since 2006, I have conducted surveys and conservation research on otters in the lakes of Nepal, working with Dr Jyoti Bhandari; this included drafting and preparing booklets, pamphlets and reports. In future I hope to involve my undergraduate and postgraduate students in this work.

Carlos Calvo Mac, Peru: As a wildlife veterinarian, I am interested in marine ecosystems health. I have been working with marine otters as health indicator species of the Peruvian coast ecosystem, as part of "Proyecto Lontra Felina" in Peru

Mike Chong, Hong Kong: I am a freelance naturalist and guide carrying out biodiversity surveys in Malaysia. I am interested in surveying for Smooth Coated and Asian Small-Clawed Otters in unprotected wetland areas, especially in the currently threatened and some severely threatened peat and freshwater swamp forest areas.

André Coelho, Brazil: I work on population dynamics of giant otters, and the analysis of geographical patterns of otter sites, as well as modelling distribution in some regions of the Brazilian Amazon. I intend to elaborate the models incorporating environment overlap between otters and humans, human attitudes to otters and possible alternative income sources from scientific tourism.

Simone Giovacchini, Italy: For my graduate thesis, I surveyed the boundaries of the Italian otter population in south-central Italy and found that two formerly isolated populations are now connected. I am currently working with Anna Loy on testing capture techniques and GPS devices on captive and wild otters in central Italy for future ecological studies in southern Italy.

Max Khoo De Yuan, Singapore: My main research interest lies in mammal ecology, conservation biology and wildlife management. My research so far has been focused on smooth-coated otters. I have been involved in various documentaries from National Geographic, BBC and Channel News Asia that featured Singapore's otters. I am part of the OtterWatch team in Singapore that is actively promoting the conservation of otters.

Adrian Loo, Singapore: I am the Director (Terrestrial) at the National Biodiversity Centre in the National Parks Board of Singapore, where I establish conservation policies and coordinate conservation efforts for native terrestrial biodiversity. I am the Chair of the Otter Working Group which oversees the conservation of native otters in Singapore. It consists of representatives of different stakeholders, from government agencies, the scientific community and members of the public. We keep track of emerging issues in relation to otters and respond in a multi-disciplinary, multi-partner approach.

Izabel Laurentino, Brazil: I have been researching the ecology and behaviour of *Lontra longicaudis* since 2011, and published the first confirmation of the species being found on the east coast of Rio Grande do Norte do Brasil. I now have a voluntary initiaitve called "Projeto Lontra Viva", which carries on this work, and also does environmental education to encourage conservation of the neotropical otter.

Roman Lyach, Czech Republic: My research covers areas of otter feeding ecology, cormorant feeding ecology, kingfisher feeding ecology and nesting availability, mink feeding ecology, sports and commercial fisheries, fish yields in flowing waters, stable isotope analysis of fish, fish hiding from predators, fish movement in streams and rivers, conflicts between environmental protection, fisheries management, and society.

Thabang Madisha, South Africa: I am enthusiastic about otters, and have been working for a number of years on genetic aspects of otters, especially for elucidating population structure, such as species differentiation from spraint with South African otters, and population structure, genetic diversity and demographic history of otters in Hungary.

Sharne McMilan, China: I am currently undertaking a PhD at the University of Hong Kong studying the 'Ecology and conservation of Eurasian Otter (*Lutra lutra*) in Hong Kong'. This study aims to establish the baseline status of the otter population in Hong Kong including number of individuals, sex ratio, genetic diversity, distribution and home/activity ranges by spraint survey, faecal DNA analysis, and camera trapping. The study findings would also inform our understanding of potential threats and habitat requirements, as well as the approach for future monitoring.

Angelina Mela, Italy: Since 2006, I have been surveying for otters in the south of Italy. I currently work as an environmental educator, and am working on the otter census in Parco Nazionale dell'Appenino Lucano

Nobuhiro Ohnishi, Japan: I study Smooth Coated Otter *Lutrogale perspicillata* in Myeik, southern part of Myanmar. Groups of Smooth Coated Otter occur in the mangrove area. The ecological and behavioural survey is prepared with Myeik University. I try to reflect these ecological knowledge for Otter Watching which is planned with the local tour agent. I will try to develop both of the ecological research and the eco-tourism for the conservation by the local people.

Yumiko Okamoto, Japan: A former zoo keeper in Japan, I am currently a researcher at Hsinchu Zoo, Taiwan, and an external researcher at the Korean Otter Centre. I am particularly interested in hormone analysis in captivity and international interacton of otter-related institutions and researchers.

Thais Pereira, Brazil: I am a biologist and I have worked for over 8 years with *Lontra longicaudis* and *Pteronura brasiliensis* in Brazil. Currently I work at the Araguaia Institute monitoring the population of otters.

Matthias Rinke, Germany: I am a veterinary pathologist, lately retired as head of Toxicological Pathology at a major German pharmaceutical company. I am now seeking to systematically investigate the histopathology of otters in order to establish what are normal, and pathological changes, comparing samples from animals of different ages side by side.

Chuck Roe, USA: I am a first year Ph.D. student at the University of Florida College of Veterinary Medicine looking to research calcium oxalate urolithiasis in Asian small-clawed otters. My background is in nutrition and I hope to look at dietary differences, the microbiome, as well as the metabolome.

Mohan Bikram Shrestha, Nepal: I am a Conservation Officer with Wildlife Conservation Nepal and a charter member of the Nepal Otter Network. My work focuses on the illegal trade in wildlife, notably otters, in Nepal.

Purna Man Shrestha, Nepal: I am a field biologist who has worked on surveys and conservation of various species in Asia, including snow leopards and red pandas. I attended the Asian Wetland and Otter Conservation Training Workshop in China in 2016, and joined the Himalayan Otter Network as I wish to contribute to knowledge and survival of the otter species of Nepal.

Akshit Suthar, India: I am working on status, distribution, conservation and threats to Smooth-coated otters in the Mahi and Purna rivers of Gujarat. This is first systematic work on Otters of Gujarat.

Jeffery Teo, Singapore: I am co-administering OtterWatch Facebook, am a member of Otter Working Group (OWG, Singapore) and informally chairing an active social otter watching group comprising of Photographers, videographers, individuals from media, film-making, research and public agencies, and many passionate retirees. I am also mentor to various students from National University of Singapore who study otters. We count every otter because every otter counts.

Sanjan Thapa, Nepal: I have been engaged in field work on fishing cats in wetlands in the foothills of the Himalayas, and plan to extend this work to otters in this area. I am also involved in outreach to local communities and school children, and have published an educational poster of the Otters found in Nepal. I am a member of the Nepal Otter Network and the Himalayan Otter Network.

Krunal Trivedi, India: I am an otter surveyor working on Smooth-Coated otters in South Gujarat. I am also involved in conflict resolution with prawn farmers who suffer stock losses due to otter predation.

Fernando Trujilo , Colombia: I have worked in otter conservation since 1998. I am director of Omacha Foundation, which has produced action plans in Colombia, Equador and Venezuala, including Red List assessments for Colombia. We have also rescued, rehabilitated and released 6 giant otters and 3 neotropical otters. http://www.omacha.org/

Rinaldo Verdi, Chile: I am director of NGO Chinchimén, which is focussed on the protection of coastal habitats and fauna, with the Marine Otter, Lontra felina, as the flagship. I have been involved in raising , rehabilitating and releasing otters brought to us, and currently care for a young otter orphaned as pup and due for release shortly. Chinchimen Facebook Page

Christina Ward, Guyana: I started working with otters at Zoo Atlanta around 3 years ago; both small clawed and giants. The giants completely stole my heart and changed the course of my life. I have collaborated with Dr. Lucy Spelman for the past couple of years on otter research. We travelled to Guyana last January and completed an otter census and are headed back down to Guyana in January to pick up the otter survey once again. Creature Conserve, the non-profit, which Dr. Lucy started and I help manage, aims to travel to Guyana every January in order to keep the otter research going.

Sarah Walkley, USA: Since 2016, I have been studying river otter vocalizations in wild and human care populations through my organization Wild Otter Acoustics. My doctoral dissertation will be on the vocalizations of North American river otters in the wild. I will be collaborating with Megan Isadore of Wild Otter Ecology Project to analyze differences in call quality and quantity among different locations and populations.