



# How do Common Otters (*Lutra lutra*, Linnaeus 1758) Interact? Behavioral Study on a Pair of Otters in Captivity

Olga M. Azevedo<sup>1</sup>, Ana M. Correia<sup>2</sup>, Ana I. Magalhães<sup>1,3</sup>, and Liliana M. de Sousa<sup>1</sup>

<sup>1</sup>University of Porto

<sup>2</sup>Interdisciplinary Centre of Marine and Environmental Sciences

<sup>3</sup>Institute for Molecular and Cell Biology

\*Corresponding author (Email: olgamazevedo@gmail.com)

**Citation** – Azevedo, O. M., Correia, A. M., Magalhães, A. I., & de Sousa, L. M. (2015). How do Common Otters (*Lutra lutra*, Linnaeus 1758) interact? Behavioral study on a pair of otters in captivity. *Animal Behavior and Cognition*, 2(2), 124-131. doi: 10.12966/abc.05.02.2015

**Abstract** - Common Otter is a fairly well-known species, however few studies have focused on their behavior. This is related with the challenges inherent to the observation of otters in the nature. For that reason, in the present work, a male and a female of this species in a captivity environment were observed. The aim was to provide an ethogram of *Lutra lutra* behavior and explore their interaction behaviors, investigating their dynamics. The otters were in “Aquamuseu do Rio Minho”, Portugal, and were observed for about 5 months at different time points and their behaviors were registered and video recorded. The ethogram developed has two main behavioral categories: 1) individual behaviors with 13 entries and 2) interaction behaviors with 19 entries. Considering the full time of videos analysis, the female spent 36.31% of the time in individual behaviors and 12.22% in interaction, while the male spent 36.45% in individual behaviors and 13.44% in interaction. Male was observed initiating the interaction behaviors more often than the female (115 against 62 times). This study constitutes an approach on Common Otter behavior repertoire and pair interaction for the species, and we suggest this work should be used to support other studies on otters in captivity, and a starting point for their study in the wild.

**Keywords** – *Lutra lutra*, Ethogram, Behavior, Interaction, Captivity

According to the International Union for the Conservation of Nature Red List of Threatened Species (Ruiz-Olmo, 2008), the Common Otter or Eurasian Otter (*Lutra lutra*, Linnaeus 1758) is a “Near Threatened” species. However, in Portugal, the status of this species is “Least Concern” (Cabral et al., 2005), being one of the few European countries where there is still a stable and viable population. Considering the actual scenario of decline in otter populations, Portugal has a high responsibility in the study of the biology and ecology of the species (Trindade, Farinha, & Florêncio, 1998) in order to contribute to the world conservation. To efficiently develop management and conservation plans, the understanding of otter behavior is demanding (Chanin, 2003; Conroy, Yoxon, & Gutleb, 2000; Kruuk, 2006). Nonetheless, though Portugal highly contributed to the published knowledge on Common Otter (see Beja, 1996; Cabral et al., 2005; Farinha, 1996; Trindade et al., 1998), so far no study has been carried out focusing on the behavioral aspects. This is related with the challenges inherent to the observation of otters in the nature. In Portugal, the access to the places frequented by these animals is very difficult, which is aggravated by the nocturnal and elusive behavior often described for the species (Beja, 1996). For these reasons, most of the studies are based on spraints and footprints that provide information on distribution, territory, feeding and communication (for revision, see Kruuk, 2006), being the only indirect data to analyze their behavior (Hutchings & White, 2000). To overcome the existing challenges in study

Common Otter behavior, the captivity environment presents an alternative, as it provides a constant source to observe the otters, in contrast with the wild environment (Kruuk, 2006), especially for a preliminary analysis when a gap of knowledge exists. Another advantage in using captivity environments is the possibility to observe interaction behaviors, events that are rare to observe in the wild. In fact, according to the existing literature, *Lutra lutra* is a very solitary animal in the nature, associating with a social partner only for mating, being the mother/cubs the most important social unit within the population (Heap, Lafontaine, & Field, 2010). On the contrary, when dealing with zoos, the interaction among otters may be easily observed, even within rare social units in the wild, such as a male/female pair, given the otters are confined to a closed space.

In the present work, a pair of Common Otters in captivity was studied in order to: a) provide an ethogram of *Lutra lutra* behavior in semi naturalistic captivity, as a practical tool to be use in other research projects with this species; b) explore male/female interaction behaviors, investigating its dynamics.

## Method

### The Study Species

The researchers observed two adult otters *Lutra lutra* (Linnaeus, 1758) together in captivity in the “Aquamuseu do Rio Minho” (Zoo License number 21/2009; NIR: PT01021Z) at Vila Nova de Cerveira, Portugal. At the beginning of the observations, the female was two years and two months old, the male was two years and eleven months old and they were together for eight months. Both animals were discovered in nature and raised by other institutions until they get to the “Aquamuseu do Rio Minho.” The female was one month old and the male two months old when they were found. The animals were not domesticated, however they were accustomed to human presence both from keepers and visitors of the zoo.

### The Captivity Environment

The enclosure was naturally enriched and large enough to provide welfare to the animals following the captivity guidelines for Common Otter (Melissen, 2000). Therefore, the animals did not present any signs of poor health. In fact, while it is known that animals can develop fixed sequences of behavior with no defined objective when confined to an artificial habitat for several time (Manning & Dawkins, 1998), this was not the case. On the contrary, the animals showed quite common behaviors, some of them already observed in other species of otters in the wild (Blundell, Ben-David, & Bower, 2002; Kruuk, 2006; Shannon, 1989).

### General Approach

The present study comprised an exhaustive review of the otter biology and ecology literature and an observation stage that included about 2300 min of naturalistic observation.

### Observations

The observer was placed on the passage corridor, usually frequented by visitors, were he was able to visualize the entire space, with no interaction with the animals.

First, *ad libitum* observations were made in situ, in three non-consecutive days for a week, from 9.30h to 19.30h, allowing to determine the schedule for the systematic observations. Then, systematic observations were made to: a) elaborate the ethogram; b) describe daily individual and interaction activities. Based on otters activity accessed by *ad libitum* observations, we selected to perform systematic observations between 16.20h and 18.50h, since otters were more active during this time of the day.

Behaviors were registered and recorded during 10 min a day (16.20h – 16.30h; 17.30h – 17.40h; 18.40h – 18.50h), distributed between three non-consecutive days per week, with a video camera (Sony HDR – CX520VE). All observations occurred from January to May 2011. This period was selected as it was the time of year with less visitors, and therefore, it was expected otters would have a more spontaneous behavior. Moreover, sampling period encompassed both winter and spring seasons (i.e., different environmental/weather conditions), so otters would be exposed to different external environmental stimuli.

## Analysis

Videotaped trials from systematic observations were analyzed in order to define the animal's behavior and create the general ethogram, with individual and interaction categories; and processed using The Observer XT 7.0 (Noldus information Technology, Wageningen Netherlands) software to quantify (frequency and duration) the behaviors.

Budgets of individual and interaction behaviors were calculated. The behaviors sleep and sleep together were not included in the budgets of individual and interaction behaviors, as otters were considered to be resting in these periods. A percentage for non-defined behaviors was assessed, encompassing the time: a) where both animals were not sleeping but were not seen in the videos, therefore not allowing to define whether they were engaging in individual or interaction behaviors; b) spent in the feeding area, where the interaction behaviors were substantially increased due to the expectancy for food. As for clapping behavior, as it only occurred in the feeding area, this was maintained as an individual behavior in the activity class. Statistical tests were performed to compare the time spent in each category of behavior (individual/interaction) between male and female (Mann-Whitney test for independent variables), and to compare the time spent between categories in each gender (Wilcoxon test for paired variables). The level of significance was set to 0.05 ( $\alpha = 0.05$ ), i.e., differences were considered statically significant whenever  $p < 0.05$ .

To further explore the interaction behaviors, we identified the interaction behaviors initiated either by the female or the male, and the responses from the social partner. Some interaction behaviors were only observed as: a) initiated behaviors (approach, approach with open mouth, mating position and chase), b) responses (avoiding approach, avoiding mating, escape and deviate) and c) both initiated behaviors and responses (smell the other, touch, social rubbing, paw, steal, expression antithesis and play); finally, some behaviors implied the same interaction behavior as response (run together, swim together, scent marking and sleep together). Frequencies of these behaviors were assessed.

## Results

The ethogram of the Common Otter in captivity was catalogued and classified into two main categories: individual with 13 entries (Table 1) and interaction with 19 entries (Table 2).

Table 1

*Ethogram of the Common Otter in Captivity for the Individual Category of Behaviors*

<b>Behavior</b>	<b>Description</b>
Run	The animal moves quickly, slightly jumping, alternating the anterior with the posterior limbs.
Swim	The animal moves underwater or at the surface, with the belly up or down. At the surface, the otter slides moving the tail smoothly and sideways. When the belly is up, the animal is floating with the limbs still, the anterior ones resting on the body. With the belly down, one cannot say how the limbs are positioned, as well as the swimming underwater which does not allow to specify how the otter behaves.
Feeding	The animal is standing on the four limbs or lying with belly down and the head up. Both anterior limbs hold the food on the floor. The otter moves the head to reach the food and eat.
Spraint	The animal urinates and/or defecates.
Sniff	The animal directs its snout, with smooth vertical oscillations, to the air, ground or other stimulus.
Rub	The animal leans on the ground moving smoothly the all body against the floor, sometimes coiling, but always moving forward. The body may be with the belly up, down or sideways.
Grooming	The animal licks, bites and scratches the fur.
Shake	The animal oscillates very quickly its body, horizontally, starting from the neck towards the tail, to remove the water from its fur.
Dig	The animal uses its anterior limbs, alternatively, from up-down and front-back, to open a hole in the ground. The otter is supporting the weight on the posterior limbs, leaning the body towards the floor, with the tail up or down. Sometimes, the animal may fall down, lying on the floor sideways or with the belly up, but soon returns to the original position.
Clapping	The animal places itself on top of its posterior limbs, moving its anterior limbs against each other repeatedly. Sometimes the animal jumps slightly.
Still	The animal is stopped, standing on the four limbs, with the belly touching the floor or not, staring fixedly in one direction or observing to the surrounding environment. Sometimes the behavior “sniff” occurs.
Yawn	The animal involuntarily opens its mouth and/or slowly stretches its body and limbs to the fullest of their extension.
Sleep	The animal is lying in a resting moment, with eyes open or closed. The body may be stretched or curled in fetal position. The otter may be lying on the side or with the belly up or down. The head may be laying on the body or on the floor, but if there is a strong noise, the otter may raise the head, resting again immediately after.

Table 2

*Ethogram of the Common Otter in Captivity for the Interaction Category of Behaviors*

<b>Behavior</b>	<b>Description</b>
Run together	Male and female move in the same direction, with or without physical contact.
Swim together	Male and female move in water in the same direction, close to each other, with the belly up or down, with or without physical contact.
Scent marking	The animal urinates and/or defecates. The other animal approaches the urine and/or feces, smelling and/or touching it. Sometimes the second animal may urinate and/or defecate on top of the first urine and/or feces.
Smell the other	The animal directs its snout to the mate with smooth vertical oscillations, at a very close distance, sometimes touching the other animal.
Approach	The animal moves towards the other.
Approach with open mouth	The animal moves towards the other with the open mouth.
Avoiding approach	The animal lifts its anterior limbs directing them towards the other, avoiding its approach. There can be physical contact.
Touch	The animal touches quickly the other with the snout and/or the anterior limbs, not for fighting, playing, rubbing or smelling.
Social rubbing	The animal leans on the other animal's body and can move smoothly against the other.
Mating position	Male places itself on top of the female, involving her with the anterior limbs and biting her on the neck. Female can also show this behavior.
Avoiding mating	The animal rejects the attempt of mating by the other animal, changing the position, moving or even running away.
Chase	The animal runs or swims quickly towards the other to reach the mate.
Escape	The animal quickly moves far away from the other otter.
Deviate	The animal swerves from the other, moving the body or even take a few steps back.
Paw	The animal kicks the other, supporting the weight on the anterior limbs and moving the posterior limb in the direction of the other otter, hitting the animal, not for fighting or play.
Steal	The animal takes away, with the mouth, an object or food that the other possesses.
Expression antithesis	The animal exposes the neck in the presence of the other.
Play	Male and female involve with each other physically. They can roll entangled, smell, touch, push, grab, rub in each other or on the ground.
Sleep together	Male and female are lying in a resting moment in the same place. The heads may be laying on their own or on each other bodies or on the floor.

Considering the full time of video, the female spent 48.42% sleeping, 36.31% in individual behaviors and 12.22% in interaction behaviors. As for the male, 47.06% of the time was spent sleeping, 36.45% in individual behaviors and 13.44% in interaction behaviors. While differences between genders were not statistically significant, for the time engaged in each category of behavior (interaction:  $U = 2354.00$ ,  $p = 0.73$ ; individual:  $U = 1285.00$ ,  $p = 0.91$ ), differences between time spent in each category of behavior (individual/interaction) were statistically significant, for both genders (male:  $Z = -3.14$ ,  $p < 0.01$ , female:  $Z = -3.03$ ,  $p < 0.01$ ).

When analyzing interaction as a pair of initiated/response behavior (Table 3), male had more initiated behaviors than the female (115 against 62 initiated behaviors), and female presented more variety of responses to the male behaviors. Frequently, female did not react to the male initiated behaviors and the contrary was much less frequent (39 against 3 times). Also, while male chase the female 23 times, the opposite only happened 7 times. The response to this behavior was always escape or deviate. The most common behavior initiated by male was approach (52 times), while the female more frequently initiated the play (32 times). For both genders, play was the most common response (33 times by the male and 41 times by the female). Considering interaction behaviors that imply the same initiated and response behavior (therefore, not presented in Table 3), there were 4 events of run together, 12 of swim together, 3 of scent marking and finally 13 of sleep together.

A)		Female Initiated Behaviors										
		SO	Ap	Ap M	Tc	SR	MP	Cs	Pw	St	EA	Py
Male Response Behaviors	SO	6	0	0	0	2	0	0	0	0	1	0
	AA	0	0	0	0	0	0	0	0	0	0	0
	p	0	0	0	2	3	0	0	0	0	0	0
	Tc	0	0	0	2	3	0	0	0	0	0	0
	SR	1	0	0	0	0	0	0	0	0	0	0
	AM	0	0	0	0	0	0	0	0	0	0	0
	Ep	0	0	0	0	0	0	7	0	0	0	0
	Dv	0	3	0	0	0	0	0	0	0	0	0
	Pw	0	0	0	0	0	0	0	0	0	0	0
	St	0	0	0	0	0	0	0	0	0	0	0
	EA	0	0	1	0	0	0	0	0	0	0	0
	Py	0	1	0	0	0	0	0	0	0	0	32
	MNR	1	1	0	0	0	0	0	1	0	0	0

B)		Male Initiated Behaviors										
		SO	Ap	Ap M	Tc	SR	MP	Cs	Pw	St	EA	Py
Female Response Behaviors	SO	6	1	0	0	1	0	0	0	0	0	0
	AA	0	1	0	0	0	0	0	0	0	0	0
	p	0	0	0	2	0	0	0	0	0	0	0
	Tc	0	0	0	2	0	0	0	0	0	0	0
	SR	0	0	0	3	2	0	0	0	0	0	0
	AM	0	0	0	0	0	5	0	0	0	0	0
	Ep	0	0	1	0	0	0	22	0	0	0	0
	Dv	7	10	0	0	2	0	1	0	0	0	0
	Pw	0	0	0	0	0	0	0	0	0	0	0
	St	0	0	0	0	0	0	0	0	0	0	0
	EA	1	3	0	0	0	0	0	0	0	0	0
	Py	0	8	0	0	0	0	0	0	0	0	33
	FNR	7	29	0	0	2	0	0	0	1	0	0

Figure 1. Interaction data sequences as frequencies of initiated/response behavior. A) Female initiated behaviors with male responses (62 times); B) Male initiated behaviors with female responses (115 times). SO - Smell the other; Ap – Approach; ApM - Approach with open mouth; Tc - Touch; SR – Social rubbing; MP – Mating position; Cs – Chase; Pw – Paw; St – Steal; EA – Expression antithesis; Py – Play; AAp – Avoiding approach; AM – Avoiding mating; Ep – Escape; Dv – Deviate; MNR – Male no-reaction; FNR – Female no-reaction.

### Discussion

So far, studies on Common Otters in Portugal are mainly based on observations in nature and not focusing on their behavior (Beja, 1996; Farinha, 1996; Trindade et al., 1998). In the present work, the observation of otters in a captivity environment proved to be an efficient way to collect data on behavior, in order to develop a general ethogram on the species, and to analyze the dynamics of the interaction between a pair of otters (male/female), a social unit difficult to observe in the wild, given the solitary nature of the species (Heap et al., 2010).

Though an ethogram on *Lontra canadensis* has been developed before (Rostain, Ben-David, Groves, & Randall, 2004), describing similar behaviors to the ones presented and Green (2000) has described sexual differences in the behavior of young Common Otters, this is the first published ethogram on *Lutra lutra*, providing the description of two categories of behavior: individual and interaction

behaviors. Considering the existing lack of knowledge and challenges in studying this species in nature, we suggest this ethogram should be used as tool to support other studies on otters in captivity, and a starting point for their study in the wild.

Both male and female engaged significantly more in individual behaviors than in interaction behaviors. This was to expect given the solitary nature described for this species (Beja, 1996). Conversely, in this study, a high diversity of interaction behaviors was observed. Although it is true that a confined space for two animals may encourage interaction, this can also be linked with the constant availability of resources, corroborating the idea presented by Kranz (1995): solitary behavior of Common Otters is probably induced by the irregular distribution of food resources in the wild rather than an individual choice. However, grooming, a behavior often described as a social activity in several species, and specifically in River Otters, to stimulate social connections and release stress (de Waal, 2009; Rostain et al., 2004; Shannon, 1989), was always observed as an individual behavior and never as an interaction. This raises the question if grooming as an activity with the only purpose of cleaning the fur, rather than engaging in social interaction, is a characteristic of the species, or merely a characteristic of these individuals, conditioned by the captivity environment. Therefore, we believe this issue needs further investigation both in captivity and in the wild, and for different individuals and social units.

Besides inducing interaction, the captivity environment may have influence on the frequency of several behaviors. For example, scent marking was observed less than expected for this species. Scent marking is a commonly described for otters in the wild and several studies are based on spraints (Hutchings & White, 2000; Rostain, et al., 2004; Trindade et al., 1998). Probably, otters use spraints and scent marking to mark the territory and/or to communicate (Kruuk, 2006). In a confined space, marking the territory may become irrelevant, hence the low frequency of scent marking observed. On the contrary, play was more frequent than expected. Playing is a behavior comprising predatory, anti-predatory and mating homologous conducts. It is a secure time where transgressions and mistakes not accepted in other social contexts are allowed (Beckoff, 2002). Given the observed frequency of this behavior, it is likely that it represents an important part of otters live in captivity. As otters in such environment have all the basic needs for survival (i.e., food, shelter), the need to spend time in activities such as hunting and searching for shelter is reduced (Kruuk, 2006), and probably the need to engage in playful behaviors increased.

The male initiated more interaction behaviors than the female, inducing a more variety of responses. Male was often observed approaching and chasing the female, who frequently did not react or escaped and deviated from it. Also, male always initiated the mating position, always avoided by the female. This difference between genders on the initiated and response behaviors should be explored in studies with other Common Otters, both in captivity and in the wild.

There were two behaviors only observed from one of the genders: steal and paw. Male was observed stealing the food from the female, and the female pawing the male, but these were very rare events (only happened once each) and always without an aggressive response. This is in agreement with Kruuk (2006) who states that fight among otters is rare even for resources competition.

In conclusion, the present work constitutes an approach on Common Otter behavior repertoire, encompassing an analysis on the dynamics of the interaction between a pair of otters (male/female), therefore providing an important support for other studies in captivity and in the wild. Given the lack of knowledge on Common Otter behavior and the declining populations in Europe, we, like several other authors (for revision, see Hosey, 1997), suggest observational studies in captivity environments for preliminary research on this species behavior.

### **Acknowledgements**

The “Aquamuseu do Rio Minho” provided the facilities and logistics to this project. We want to thank Doctor Carlos Antunes and staff, whose support was fundamental throughout the sampling process. Finally, we wish to acknowledge the two anonymous reviewers, whose comments, suggestions and recommendations were essential for the final version of this work.

## References

- Beckoff, M. (2002). *Minding animals – Awareness, emotions and heart*. New York: Oxford University Press.
- Beja, P. R. (1996). Temporal and spatial patterns of rest-site use by four female otters *Lutra lutra* along the southwest coast of Portugal. *Journal of Zoology*, 239, 741-753.
- Blundell, G. M., Ben-David, M., & Bower, R. T. (2002). Sociality in river otters: Cooperative foraging or reproductive strategies? *Behavioral Ecology*, 13, 134-141.
- Cabral, M. J., Almeida, J., Almeida, P. R., Dellinger, T., Ferrand de Almeida, N., ...Santos-Reis, M. (2005). *Livro vermelho dos vertebrados de Portugal*. Lisbon: Instituto da Conservação da Natureza.
- Chanin, P. (2003). *Ecology of the European Otter, Lutra lutra. Conserving Natura 2000 Rivers, Ecology Series No. 10*. Peterborough, UK: Life in UK Rivers.
- Conroy, W. H., Yoxon, P., & Gutleb, A. C. (2000). Proceedings of the first otter toxicology conference. *Journal of the International Otter Survival Fund No1*. Broadford: International Otter Survival Fund.
- de Waal, F. (2009). *The age of empathy – Nature’s lessons for a kinder society*. New York: Harmony Books.
- Farinha, N. (1996). *Distribuição e ecologia da Lontra (Lutra lutra Linnaeus, 1758) na Reserva Natural do Estuário do Tejo*. Portugal: ICN/LIFE.
- Green, R. (2000). Sexual differences in the behavior of young otters (*Lutra lutra*). *IUCN Otter Specialist Group Bulletin*, 17(1), 20-30.
- Heap, C. J., Lafontaine, L., & Field, D. (2010). *Summary of husbandry guidelines for the Eurasian Otter in captivity*. United Kingdom: IUCN/SSC Otter Specialist Group, Otters in Captivity Task Force.
- Hosey, G. R. (1997). Behavioural research in zoos: aAcademic perspectives. *Applied Animal Behaviour Science*, 51, 199-207.
- Hutchings, M. R., & White, P. C. L. (2000). Mustelid scent-marking in managed ecosystems: Implications for population management. *Mammal Review*, 30, 157-169.
- Kranz, A. (1995). *On the ecology of otters (Lutra lutra) in central Europe*. (Unpublished doctoral dissertation). Institute of Wildlife Biology and Game Management, University of Agriculture, Vienna, Austria
- Kruuk, H. (2006). *Otters: ecology, behavior and conservation*. New York: Oxford University Press.
- Manning, A., & Dawkins, M. S. (1998). *An introduction to animal behaviour*. New York: Cambridge University Press.
- Melissen, A. (2000). *Husbandry guidelines of European Otter (Lutra lutra)*. Leuwaarden: Otterpark Aqualutra.
- Rostain, R. R., Ben-David, M., Groves, P., & Randall, J. A. (2004). Why do river otters scent-mark? An experimental test of several hypotheses. *Animal Behaviour*, 68, 703-711.
- Ruiz-Olmo, J., Loy, A., Cianfrani, C., Yoxon, P., Yoxon, G., de Silva, P. K., ... Zemanova, B. (2008). *Lutra lutra*. The IUCN red list of threatened species. Consulted in 15<sup>th</sup> September, 2011 at: <http://www.iucnredlist.org/details/12419/0>
- Shannon, J. S. (1989). Social organization and behavioural ontogeny of otters (*Lutra canadensis*) in a coastal habitat in northern California. *IUCN Otter Specialist Group Bulletin*, 4, 8-13.
- Trindade, A., Farinha, N., & Florêncio, E. (1998). *A distribuição da lontra Lutra lutra em Portugal – Situação em 1995*. Lisbon: Estudos de Biologia e Conservação da Natureza, 28. Instituto de Conservação da Natureza.