

# RECENT RECORDS OF THE EURASIAN OTTER (*Lutra lutra*) IN THE MERCURE-LAO RIVER VALLEY, SOUTH ITALY

GIOVANNI N. ROVIELLO\*<sup>a</sup> and VALENTINA ROVIELLO<sup>b</sup>

<sup>a</sup>Istituto di Biostrutture e Bioimmagini – Consiglio Nazionale delle Ricerche, Naples, Via Mezzocannone 16, I-80134, Italy

<sup>b</sup>University of Naples Federico II, Analytical Chemistry for the Environment and CeSMA (Centro Servizi Meteorologici Avanzati), Corso N. Protopisani, 80146, Naples, Italy

\*Corresponding author. giroviel@unina.it

## Abstract

*Here we report recent evidence of the presence of Eurasian otter (*Lutra lutra*) in the Mercure-Lao River valley, an area of great ecological interest situated in South Italy for which the last otter reports referred to spraints collected in 2002. This work contains information and a selection of photographs of otter footprints and spraints found from October 2005 to January 2019, and photographs of both a cub and an adult otter from the Mercure-Lao River area.*

**Keywords:** *Eurasian otter; *Lutra lutra*; Italian population; Mercure-Lao River*

## INTRODUCTION

The population of the Eurasian otter (*Lutra lutra*) in Italy is less than 300 adult individuals (**Prigioni et al., 2006**) occurring in the Southern part, mainly Basilicata, Calabria, Campania and Puglia regions. Here a larger population exists, while a smaller number is found in the Abruzzo and Molise regions (**Balestrieri et al., 2016**). Recent records of otters in Northern Italy (**Balestrieri et al., 2016**) were attributed to individuals probably originating from Austria and Slovenia. This is of great interest from the point of view of a possible otter recolonisation there. Based on previous data, the otter is currently listed in the Red List of Endangered Species in Italy, although there seems to be some signs of recovery. This is probably due to improved river water quality and fluvial habitat restoration. Earlier environmental degradation caused the population decline and, in some cases, disappearance in vast areas of the country (**Prigioni et al., 2007**). Pollution, mainly associated with bioaccumulable contaminants affected otter reproduction and/or food availability. As the otter is a top aquatic predator it accumulates polychlorinated biphenyls (PCBs), which are also toxic to humans, through the food chain, even in environments with relatively low contamination (**Leonards et al., 1997**). This makes the species very vulnerable to pollution and so it is often used as a bioindicator species (**Ruiz-Olmo et al., 1998**). It is not surprising therefore that the Italian otter survived apparently undisturbed within inner areas of southern Italy, which are characterised by vast wild natural areas, very low urbanisation and a progressive human population decline, still underway today. It is generally accepted that the Calabria region represents the Southern limit of otter distribution in Italy. The last records in Sicily date to the nineteenth century and, to the best of our knowledge, there are no more recent reports on the island (**Gariano & Balestrieri, 2018; Cavazza, 1911**).

In Calabria, the otter is mainly present in the province of Cosenza and in the North (Prigioni et al., 2005). A population in the Sila Massif is also well documented (Gariano & Balestrieri, 2018). The most recent Southern report in Calabria was of a road-killed otter from the Angitola river mouth, in Vibo Valentia province, more than 100km South of the Mercure-Lao valley (Balestrieri et al., 2016).

## STUDY AREA

The Lao river takes its name from the Greek word Λαοί (meaning “people”) and is the name of an ancient Greek settlement on the coast surrounding the Lao river mouth. The river originates in the Basilicata region, where it is called the Mercure, hence the use of “Mercure-Lao” for the water course from its origin to the mouth.



Figure 1. Mercure-Lao River

The source is on the Serra del Prete in the Pollino massif, at an altitude of more than 2000m above sea level, and it runs Southwestwards toward the Tyrrhenian sea in a mountainous area with scarce urbanisation (Figure 1). It flows through the Mercure-Lao valley in the territories of several towns such as Viggianello (where it is called Mercure), Laino Borgo and Laino Castello (where the Jannello and Battendiero tributaries join the river which is now called Lao), Papisidero (where the tributary waters of the Saint Nocaio river flow into the main river), Santa Domenica Talao, Orsomarso (at the confluence with the Argentino tributary), Santa Maria Del Cedro and Scalea (at the river mouth).

It is 61km long but with its tributaries the total length is 143km and it has a drainage basin of about 600km<sup>2</sup>. It has an average discharge of 12m<sup>3</sup>/s and maintains its water flow during the dry season with a discharge generally never below 4m<sup>3</sup>/s. The main tributaries are the Iannello, Battendiero and Argentino. The river bed consists mainly of stones and rocks with occasional little sandy shores

A river nature preserve (Riserva Naturale Orientata Valle del fiume Lao) was created to protect both the flora and fauna of the river, whose valley is part of the Pollino National Park. This is the largest Italian national park, covering nearly 200,000ha.

Riparian vegetation along the river banks comprises willow trees (*Salix* sp.), alders (*Alnus glutinosa*) and poplars (*Populus alba*, *P. nigra*). Roach (*Rutilus rubilio*), brown trout (*Salmo trutta*) and European eels (*Anguilla anguilla*) live in the river, and the latter two are favourite prey of the otters. This was ascertained by Prigioni group Remonti et al., (2008), who estimated the number of otters at 26–29 in the study area, i.e. ~0.2 otter/km abundance, based on data collected more than 10 years ago (Prigioni et al., 2006).

For local villagers the presence of otter is not a novelty nor a surprise and many report otter sightings, including recent records. These are mainly from fishermen but farmers also quote old stories of otters trying to steal fish from fishermen, or eating carcasses of dead livestock thrown by villagers from bridges into the river below.

The river flows mainly in canyons or in remote areas far from roads and this is why, to the best of our knowledge, there are no reports of road-killed otters in the area to date. However, proposed projects for fast roads, including close to the Lao River mouth, were recently presented (Mollica, 2015) These should be carefully evaluated before being given approval to ensure the otter population does not suffer as a result of changes to the water flow or to the riparian habitat.

Human pressure on the territory has been significantly reduced compared to the recent past. The population in the core research area almost halved from 1971-2011 (Table 1) and inhabitant density for 2011 was about 26 inhabitants/km<sup>2</sup>, and even less (15 inhabitants/km<sup>2</sup>) for Papisidero, which is part of the reserve. The resident human population is still decreasing, but the lack of inhabitants does not mean that the river and its valley are exempt from any human activity. In fact, a biomass thermal plant (ENEL Mercure thermal plant, recently acquired by F2i SGR [[https://it.wikipedia.org/wiki/Centrale\\_del\\_Mercure](https://it.wikipedia.org/wiki/Centrale_del_Mercure)] that uses biomass from forests of the National Park) has been authorised to use Mercure-Lao river waters ([http://regione.calabria.it/sviluppo/allegati/autorizzazioni\\_387/biomassa/centrale\\_mercure/aia/relazione\\_tecnica\\_152\\_mercure\\_modificata\\_mag\\_2008\\_rev\\_3.pdf](http://regione.calabria.it/sviluppo/allegati/autorizzazioni_387/biomassa/centrale_mercure/aia/relazione_tecnica_152_mercure_modificata_mag_2008_rev_3.pdf)). Furthermore, part of the Mercure-Lao spring waters were bottled in 2014 by the San Benedetto company, and in recent months they have been authorised to bottle more water from a new point of the same springs (Aurilio, 2018). We hope that these authorisations followed accurate studies on the impact of these activities on the otters. However, eco-friendly tourist rafting companies have complained about significantly reduced river water levels in the last few years. We hope the river waters are being monitored for flow and quality and that these decreases in water flow, if real, were not caused by the above activities.

**Table 1. Decline of human population in the core of the research area (numeric data from ISTAT statistics. Statistiche I.Stat – ISTAT; 28-12-2012)**

Town	number of inhabitants in			Territory (km <sup>2</sup> )
	1971	2001	2011	
Laino Borgo	2,951	2,275	2,027	57.08
Laino Castello	1,439	901	879	37.33
Papisidero	1,641	1,019	808	55.22
Santa Domenica Talao	1,451	1,314	1,272	36.12
Orsomarso	2,230	1,498	1,338	90.41
<b>Total</b>	<b>11,683</b>	<b>7007</b>	<b>6324</b>	<b>240.04</b>

The last published scientific records of otters in the Lao river were dated December 2002 (**Prigioni et al., 2006**), and we aim with our recent evidence to show how the otter is still present and trying to survive in this area. Our evidence is based on footprints, spraint and also photographs of two otter individuals found in the river valley. We do not have numeric data that can give indications of the current status of the otter population but we can testify that there is a healthy population of otters in this area. This area still needs to be studied by wildlife specialists, and protected in order to ensure the conservation of local high value flora and fauna.

## METHODS

Monitoring was conducted from October 2005 to January 2019. Otter footprints are very distinct with their peculiar five-toed shape, and they were used to indicate only otter presence and not abundance. A 200m length of river was selected and searched at least twice a year for evidence of otter footprints. Spraints and photographs of otters were used on a stretch from the mouth to 25km upstream of the Mercure-Lao river. Measurements of footprints and spraints were performed using free software ImageJ (Wayne Rasband, National Institute of Health, USA) using metric references (coins, keys, etc.) shown for scale in the photo. Footprint widths were measured and ascribed to sex and age classes as follows: cub/juvenile <5cm; adult female 5–6cm; adult male 6.5–7cm (**Devon Biodiversity Records Centre**). The photo of a swimming otter was taken by Antonio Galiano using an action camera attached to his helmet during a river rafting trip in July 2015. The cub photographs (November 2018) were kindly provided by A. Colucci and G. Cirelli (WWF Policoro Herakleia).

## RESULTS



We examined several five-toed footprints found in the study area. By comparison with metric references we could estimate track sizes. We could then tentatively assign them to adult (males or females) or cubs by considering that footprints >7cm were adult males, those with a width of ~5–6cm were females, whereas cubs and juveniles were <5cm.

A





**Figure 2. Otter footprints photographed on 31 October 2005 (A). These were prints of different adult individuals (at least one adult male – B left; and one or more females – B right, C)**

In October 2005 we found for the first time numerous otter tracks which were in the wet sand of the river beach (Figure 2). These all clearly showed the five toes and some also showed webbing and claws. Interestingly, their different sizes suggested that at least two otters visited the site and one of the two, with tracks wider than 7cm, was probably an adult male. To the best of our knowledge, this was the first report of otter footprints in the river Mercure-Lao, where otter presence had been previously identified by other indirect signs, mainly spraints. Since 2005, at least 60–70% of the subsequent surveys of the same river tract were positive, testifying that otters continued to use the area regularly. Below are some examples of this evidence:



**A**

**B**

**Figure 3.** Otter tracks (A) found in August 2006 (50 Euro cent coin for scale). Footprints (January 2006) showing a mother and cub walking together (B), details of cub tracks in right part of Figure 3B

In August 2006 we found 6.5–7cm wide five-toed footprints (Figure 3) well impressed in the wet sand that could have been left by an adult male otter. Very interestingly, five months later a double footprint path formed by five-toed tracks was found in the same site. This showed a much smaller otter (track size <5cm) walking next to an adult one. Thus, we supposed these two parallel tracks were left by a female and her cub.



**Figure 4.** Holes in the river sand near otter tracks observed in December 2007 (left) and October 2018 (right)

In December 2007 we also found 6.5–7cm sized tracks that we attributed to an adult individual, probably male. Nearby, we noticed a hole in the sand which was approximately 25cm wide (Figure 4 left). We believed that it was either a resting site or, more probably, the result of a search for crabs or toads which are found hidden under the sand in this zone. Another similar hole dug in the sand very close to the otter footprints was noticed by us also in October 2018 (Figure 4 right).

Other tracks were found in subsequent years at the same site:

- May 2008 – width 7cm so probably male
- April 2013 – width 5.5cm – female or subadult male

- December 2015 – width <6.5cm – female or subadult male
- July 2016 – width ~6cm – female or subadult male
- August 2017 – width ≤6.5cm – female or subadult male
- December 2017 (underwater footprints) –width ~6cm – female or subadult male
- November 2018 – width ~6cm – female or subadult male
- 8 and 29 December 2018 – width 5.8–6cm – female or subadult male

Finally, on 1 January 2019 we were very surprised to find same-sized otter footprints inside one of our own shoe prints left in the sand during the previous visit of 31 December 2018 (Figure 5).



*Figure 5. Otter footprints inside human footprint left in the night between 31 December 2018 and 1 January 2019 (10 Euro cent coin for scale)*

This meant that the same otter (possibly female), visited our study area during December 2018 and also during the night between 31 December 2018 and 1 January 2019.

Other evidence of otter presence in the Mercure-Lao came from spraints found frequently on a rock in the river, where our surveys had more than 70% positive results. This was situated some hundreds of metres North of the beach with many footprints mentioned above. By visual inspection of some of these spraints it was confirmed that the otters mainly feed on fish, but amphibians, crabs and birds are also taken (Figure 6). This has also been described and carefully analysed in the scientific literature, such as **Natchev et al. (2015)**.







**B**

**Figure 6. Otter spraints found at an otter latrine site in the Mercure-Lao River in August 2015 (A), August 2017 (B left) and July 2018 (B right)**



**Figure 7. Eurasian otter (probably adult or subadult) photographed by A. Galiano in 2015 during a river rafting trip**

Despite the typical crepuscular habits of otters in freshwater habitats, an otter (probably an adult or subadult individual) was seen and photographed in daylight by Mr Antonio Galiano during a river rafting trip in July 2015 (Figure 7). To the best of our knowledge, this is the first report in a scientific paper of a photographed otter in the Mercure-Lao River.

Even more recently, in November 2018, an otter cub (Figure 8) was found near the Lao mouth, not far from an urban zone.



**Figure 8. Eurasian otter cub (three-month-old female) found in November 2018 near the mouth of the Mercure-Lao River**



Note: These photos are a kind gift of WWF Policoro Herakleia Centre headed by A. Colucci and G. Cirelli.

This cub, a three-month-old female, had probably lost her mother after local flooding in the river which followed intense rain in preceding days. After initial care provided by the staff of WWF Policoro Herakleia at their wildlife care centre (in the Basilicata region), the cub was transferred to the specialised otter centre in Caramanico (Centro Lontra, Abruzzo) where she is currently growing under appropriate conditions to prepare this young otter for her future release into the wild.

## DISCUSSION

Taken all together, even though mainly limited to a restricted area, the above evidence testifies that a population of otters survives in the Mercure-Lao area. We have examined mainly footprints of otters found in a short but central tract of the river since 2005, where the presence of the mustelid was ascertained in 60–70% of our surveys. By comparing track sizes we could conclude that the study area is populated by different otter individuals, mainly those having 6cm-wide tracks (probably females and/or subadult males), but also larger otters (probably males), as well as mothers with their cubs.

The river habitat is of great importance for the conservation of otters, and human activities using waters from the initial river tract (Mercure) should be given due attention in order to ensure that the habitat is not affected. In addition to the obligatory studies and authorisations necessary for such activities, more work should be carried out by otter specialists to obtain more quantitative data on the population and compare this with the data collected by the team of Prof. Prigioni up until 2002. Until this is done, the above-mentioned activities should not be authorised.

Encouraging signs come from the interest of local people in the protection of the otter. Recently there have been articles published in local newspapers, and following otter sightings in the Argentino river (one of the most important tributaries of Mercure-Lao River), there have been appeals to the Italian Ministry for Environment and Pollino National Park President asking for more concrete actions for habitat protection in the area in the interest of the otters (**Ansa 2018**).

## LIMITATIONS

The data obtained by measuring the widths of the footprints cannot be used to give a precise sex. If the print is more than 7cm it is probably male but between 6 and 7cm it could be a female or subadult male. However, where there are prints with a clear difference in size it can be assumed that there is more than one individual. Where the track was of two individuals, one larger and one small, it can be assumed it is mother and cub.

Population figures quoted have been largely obtained from spraint survey but it has been demonstrated that the number of spraints or sprainting points is not related to population size (**Yoxon & Yoxon, 2014**). However, this method has been used in many studies and is often used as a baseline figure.

Otter footprints can sometimes be confused with mink but as there are no mink in this area, this is not a limitation.

## ACKNOWLEDGEMENTS

We are grateful to A. Galiano for his photograph of the adult otter in the Lao river and A. Colucci and G. Cirelli (WWF Policoro Herakleia) for the photographs of the otter cub found near Scalea in November 2018.

## DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

## AUTHOR BIOGRAPHIES

Dr Giovanni Roviello graduated with honours in Chemistry from Federico II University (2002, Naples - Italy) and received his PhD in Biotechnology from the same University in 2006. He works as a researcher at the Institute of Biostructure and Bioimaging (IBB) of Italian National Council for Research (CNR) in Naples, Italy.

Dr Valentina Roviello graduated with honours in Environmental and Land Sciences from Second University of Naples (2009, Caserta - Italy) and received her PhD in Innovative Physical Methodologies for Environmental Research from the same University in 2013. She carries out environmental and chemistry research activities at Federico II University in Naples, Italy

## REFERENCES

- Ansa Calabria** 2018. ‘Lontra nel Pollino, necessari interventi’ [http://www.ansa.it/calabria/notizie/2018/03/13/lontra-nel-pollino-necessari-interventi\\_1955daa1-ffa2-4000-86d0-e31e8663a2e6.html](http://www.ansa.it/calabria/notizie/2018/03/13/lontra-nel-pollino-necessari-interventi_1955daa1-ffa2-4000-86d0-e31e8663a2e6.html)
- Aurilio, G,** 2018. Acqua e politica: in Basilicata le assunzioni precedono le autorizzazioni. *La Siritide*, 27 March 2018, art 15281, <http://www.lasiritide.it/art.php?articolo=15281>
- Balestrieri, A, Remonti, L and Prigioni, C,** 2016. Towards extinction and back: decline and recovery of otter populations in Italy. In *Problem solving and decision-making in project management of problematic wildlife: a review of some approaches and conceptual tools*, ed. FM Angelici, Springer International, 91–105, doi:10.1007/978-3-319-22246-2\_5.
- Cavazza, F,** 1911. Dei Mustelidi Italiani. *Ann. Mus. civ. St. nat. Genova* 5, 170–204.
- Devon Biodiversity Records Centre.** Otter surveying, <http://www.dbr.org.uk/otter-and-mink-signs/>
- Gariano, P, and Balestrieri, A,** 2018. “Otter, come out!”: taking away the stone on the Southernmost Italian *Lutra lutra* population. *Ecoscience* 25, 287–294.
- Leonards, PEG, Zierikzee, Y, Brinkman, UAT, Cofino, WP, van Straalen, NM and van Hattum, B,** 1997. The selective dietary accumulation of planar

polychlorinated biphenyls in the otter (*Lutra lutra*). *Environ Toxicol Chem* 16, 1807–1815.

**Mollica, V, 2015.** Scalea-Mormanno una strada da 10 milioni. Rete Difesa Territorio: “Chi proteggerà i boschi?” *Iacchite*, 6 November 2015, <http://www.iacchite.com/scalea-mormanno-una-strada-da-10-milioni-rete-difesa-territoriochi-proteggera-i-boschi/>

**Natchev, N, Petkov, Z, Dashev, G, Atanasoval, I and Chipev, N, 2015.** Dietary specifications reflect the feeding behaviour of the European otter (*Lutra lutra*) in “Strandzha” Natural Park (Bulgaria). *Acta Scientifica Naturalis* 2, 12–22.

**Prigioni, C, Remonti, L, Balestrieri, A, Sgroso, S, Priore, G, Misin, C, Viapiana, M, Spada, S and Anania, R, 2005.** Distribution and sprainting activity of the otter (*Lutra lutra*) in the Pollino National Park (Southern Italy). *Ethology Ecology & Evolution* 17, 171–180.

**Prigioni, C, Balestrieri, A, Remonti, L, Sgroso, S and Priore, G, 2006.** How many otters are there in Italy? *Hystrix* 17, 29–36.

**Prigioni, C, Balestrieri, A and Remonti, L, 2007.** Decline and recovery in otter *Lutra lutra* populations in Italy. *Mammal Rev.* 37, 71–79.

**Remonti, L, Prigioni, C, Balestrieri, A, Sgroso, S and Priore, G, 2008.** Trophic flexibility of the otter (*Lutra lutra*) in Southern Italy. *Mammalian Biology-Zeitschrift für Säugetierkunde* 73, 293–302.

**Ruiz-Olmo, J, Calvo, A, Palazón, S and Arqued, V, 1998.** Is the otter a bioindicator? *Galemys* 10, 227–237.

**Yoxon, P and Yoxon, K, 2014.** Estimating otter numbers using spraints: is it possible? *Journal of Marine Biology*, article ID 430683.