

REPORT

GOOD NEWS FROM THE SOUTH: FILLING THE GAP BETWEEN TWO OTTER POPULATIONS IN ITALY

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Abstract: Following a severe decline in Italy in the second half of the last century, the Eurasian otter (*Lutra lutra*) has been confined in the southern part of the peninsula with two isolated nuclei. Similar to other European populations, a slow recovery of the two disjointed populations started in the 90s. Filling the range gap was set as a main objective of the national action plan released in 2011. To assess the achievement of this target we ran a systematic survey in 2017 in the gap area, searching for otter signs in two river basins and two lakes in the Tyrrhenian (Campania) and Adriatic (Puglia) portions of the gap area. Otters were detected along most of the hydrographic network surveyed in the Tyrrhenian side, and only in few sites in the Adriatic side. Results confirmed the gap filling between the two sub ranges, and highlighted the need for a habitat survey in the Adriatic water courses. Our results have implications for the long-term survival of the small and endangered otter population in Italy.

Keywords: *Lutra lutra*, Volturno river, Candelaro river, recovery.

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INTRODUCTION

The Eurasian otter (*Lutra lutra*) is one of the most threatened mammals in Italy, listed as Endangered in the IUCN Red List of Italian vertebrates (Rondinini et al. 2013). Once widespread in the whole peninsula (Giglioli, 1880; Cavazza, 1911; Ghigi, 1911; Bonelli and Moltoni, 1929), the otter started to decrease in the 1970s. The first national survey undertaken in 1971-1973 showed that the species was still widespread, but decreasing and showing a fragmented distribution in northern regions (Cagnolaro et al., 1975). Later investigations based on interviews with forestry service and hunting associations didn't show any improvement of the otter status (Spagnesi and Cagnolaro, 1981; Pavan and Mazzoldi, 1983). The first direct field surveys run in the late 70s revealed that the otter was decreasing at an alarming rate (Wayre, 1976; Macdonald and Mason, 1983).

This situation led to a more accurate national systematic survey run between 1984 and 1985, coordinated by the WWF and sponsored by the Italian Ministry of Environment (Cassola, 1986). The survey returned an even more dramatic picture: the species was extinct in northern Italy, extremely reduced and fragmented in central Italy, and a viable population only survived in most southern regions (Basilicata and part of Calabria, Puglia and Campania), being completely isolated from any other European population (Cassola, 1986; Beseghi and Donati, 1987).

Thereafter, the use of standard survey techniques (Reuther et al., 2000) became more frequent and independent investigations detected the disappearance of all residual nuclei in central Italy (Prigioni et al., 1989; Reggiani et al., 1995, 2001; Mattei et al., 2001) while new occurrences were detected in some southern river basins (Reggiani and Ciucci, 1994; Agapito Ludovici et al., 1994). Systematic surveys run between 2002 and 2004 in southern Italy confirmed the presence of otters in the most southern regions, and the existence of a small isolated population in the central - southern region of Molise (Loy et al., 2004; Marcelli, 2006) (Fig. 1). To face this dramatic situation a national action plan was set up in 2011, aimed at increasing awareness, reducing threats, and supporting otter recovery (Panzacchi et al., 2011; Loy et al., 2010).

Since 2000s, otters have been recovering in many European countries, likely as a consequence of the coming into force of strict protection and banning of polychlorinated biphenyls (PCBs) by the European Union (Ruiz-Olmo et al. 2000). Evidences of range expansion were also recorded in the last ten years in both portions of the Italian range (Prigioni et al., 2005; De Castro and Loy, 2006; Marcelli and Fusillo, 2009a; Panzacchi et al., 2011; De Castro et al., 2013; Marrese et al., 2014; Balestrieri et al., 2016). Also, otters were recently recorded at the north eastern Italian border, likely following range expansion from Austria and Slovenia (Pavanello et al. 2015). However, the expansion rate of the otter in Italy seems slower compared to that observed in other European countries (Ruiz-Olmo and Delibes, 1998; Janssens et al., 2006; Crawford, 2003), and the southern sub-ranges were still disjointed in the last Habitat Directive EC/43/92 report (Loy et al., 2015; Fig. 1). These two areas are separated by about 100 km of river stretches, covering the medium part of Volturno on the Tyrrhenian side and Candelaro river basin on the Adriatic side (Fig. 2). Recent occasional findings of otter signs in this gap area (Loy et al. 2015; Scorpio et al. 2016) encouraged a new systematic survey aimed at assessing the connection of the two portions of the range, representing a main goal of the national action plan (Panzacchi et al., 2011; Loy et al., 2010).



Figure 1. Current EOO of the otter in Italy (from Loy et al. 2015).

STUDY AREA AND METHODS

The study area covers about 9 300 km² across the Apennine watershed (highest altitude in the area: 1 086 m) in southern Italy (Fig. 2), with streams flowing eastward to the Adriatic Sea and westward to the Tyrrhenian Sea. The Adriatic landscape is characterized by intensive agricultural lowland plains, where water bodies mainly comprise channels and lagoons. The western Tyrrhenian landscape is more heterogeneous and hilly, with rivers flowing in crops, riparian forests and woodlands (CORINE Land Cover, 2012). The average human density is 98/km² in the eastern part (63/km² excluding largest towns) and 148 km² in the western part (124/km² excluding largest towns) (data source: National Institute of Statistics, 2013).

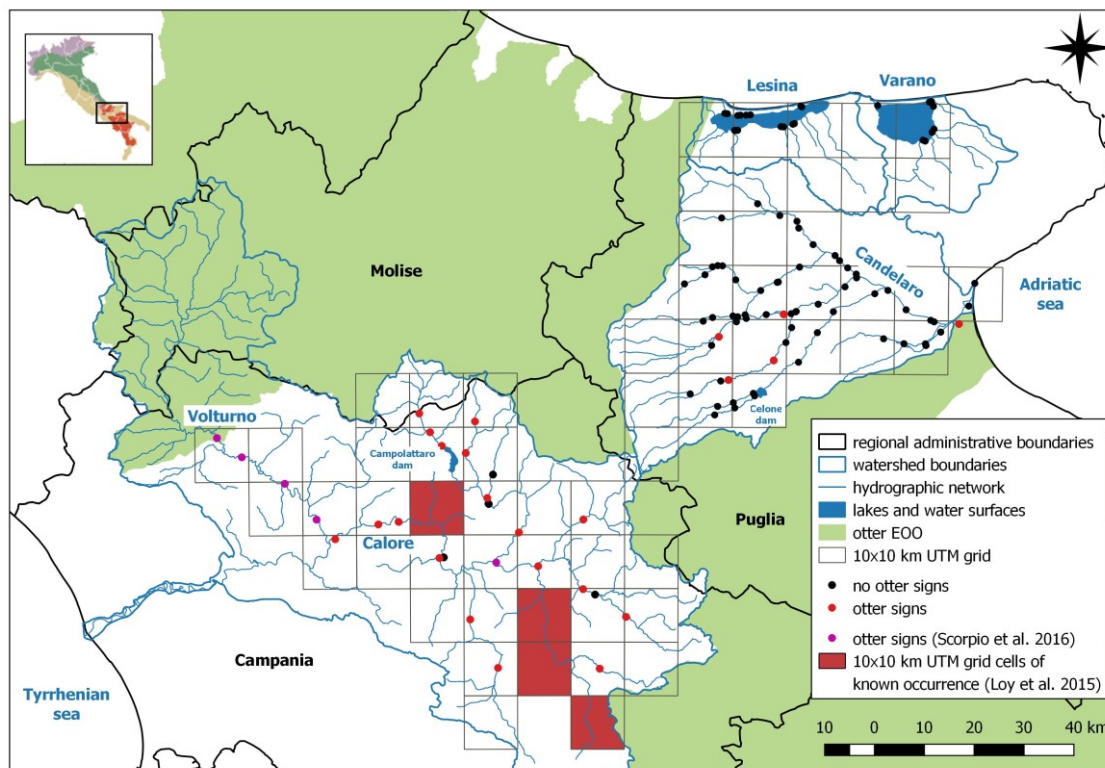


Figure 2. Study area with locations of positive and negative sites overlaid to the UTM grid.

The Volturno is a key river basin for the Italian otters (Panzacchi et al., 2011): it is one of the largest catchments of southern Italy, covering an area of 5 450 km² and connecting 15 different water basins (Regione Molise, 2016). Calore, the main tributary of the Volturno river, and Candelaro are the main rivers flowing respectively in the western and eastern parts of the study area (Fig. 2). Calore covers 3 058 km² and about 500 km of hydrographic network (river flow: 32 m³ s⁻¹). The Calore river is known to host otters only in the upper part, and only occasional signs have been recorded in the middle stretches downstream of the city of Benevento (Loy et al., 2015; Scorpio et al., 2016). The Candelaro water basin covers an area of 2 560 km² and 350 km of hydrographic network (river flow: 2.5 m³ s⁻¹). Additionally, we investigated the Lesina and Varano coastal lakes (51 km² and 60 km²) respectively, where the species has not been detected since the 1990s (Cassola, 1986; Reggiani and Ciucci, 1994; Marrese and Caldarella, 2005). A total of 94 sites were surveyed in 36 Universal Transverse Mercator (UTM) squares: 19 sites in the western Tyrrhenian, and 75 in eastern Adriatic side of the Apennine watershed. Following the standard procedure recommended by Reuther et al. (2000) up to four sites were surveyed for each 10 x 10 km UTM grid cell of the study area. We didn't survey UTM squares where otter signs were found in the last three years by other studies (Loy et al., 2015;

Scorpio et al., 2016). In order to optimize the survey efforts, sites were checked preferably starting from bridges, well vegetated river banks, or pools. We avoided those sites located on headwaters, low order streams (Strahler, 1974), or on dry watercourses. Where dense reedbeds along channel banks prevented the search for marking sites, signs were only searched for under bridges. Rivers were checked for otter signs, especially spraints, along at least 600 m of one bank (Reuther et al., 2000). As soon as a reliable otter sign was found, the transect line was stopped; only when otter signs were found immediately at the beginning of the transect we checked the first 100 metres of the river in order to investigate the prevalent environmental characteristics. The survey was carried out between March and May 2017 avoiding periods of heavy rainfalls in the previous week (Fusillo et al., 2007; Imperi, 2013).

RESULTS

All squares on the western side of the study area were positive for otter presence (Fig. 2). Otter signs were found at 22 sites out of 94 (23%). However, a large difference in relative proportion of positive vs negative sites was observed in the Tyrrhenian (22 out of 27 = 81,4%) vs the Adriatic (5 out of 67 = 7,4%) side. Otters were found in all stretches of Calore River and its tributaries: Tammaro, Miscano, Ufita, Fredane, and Sabato. In 65% of sites of this area, signs were found in the first 100 m of the transect. Moreover, despite the short length of the stretches surveyed (i.e. < 100 m) on some rivers (i.e. Ienga creek, Ufita and Fredane rivers) we found high densities of marking sites (Fig. 3). Otter were also found in the Sabato River, downstream of the densely populated city of Avellino, inside an industrial area and close to a hydroelectric power station (Fig. 4).



Figure 3. One of the stretches showing high density of marking sites found in the study area.

On the Adriatic side only four sites were positive for the presence of otters, and one was doubtful (Fig. 2). All positive sites were found in the Candelaro river basin, along the Salsola and Vulgano creeks, where a latrine was found in front of a waste

water outfall in the suburbs of the city of Lucera (Fig. 4). The riverine vegetation belt of the Candelaro river was narrow (less than 10 m wide) and mainly composed of reedbeds often destroyed by cutting. However, the freshwater fauna of the lower part of the river appeared quite rich.



Figure 4. Sprainting sites in the industrial area (a) and close to a little hydroelectric power station (b) in the suburbs of Avellino (Campania), and in front of a wastewater outfall (c) in the suburbs of Lucera (Puglia).

DISCUSSION

Our results revealed that the gap area between the two portions of the otter range in southern Italy has been filled up, and the species now occurs in one continuous range from Abruzzo to Calabria and Puglia (Fig. 5). Compared with results of surveys conducted in the last decade within the Tyrrhenian side of the gap area (De Castro et al., 2013; Loy et al., 2015; Scorpio et al., 2016), all river stretches previously found to be negative are now positive. This widespread occurrence, the high density of marking sites and the occurrences in suboptimal patches around large cities suggest that on the Tyrrhenian side otters have likely reached the carrying capacity (Fretwell, 1972) of the gap area. These outcomes encourage future surveys in the neighbouring rivers in the Latium region that were recently found still avoided of otters (Giovacchini and Loy pers. obs.).

Conversely, otters are still rare in the Adriatic side of the gap area, concentrated in the Candelaro river basin and clustered in small tributaries. Interestingly, they occur in suboptimal patches and are absent from pristine riverine habitats and high water quality water courses like the San Lorenzo and Celone creeks (ARPA Puglia, 2015). These creeks run into the Celone reservoir, and during the survey period there was no water downstream of the dam. As usually dams do not prevent movements of otters and reservoirs could rather increase survival during periods of drought (Basto et al., 2011; Pedroso et al., 2007, 2014) it is rather the absence of water downstream that might have prevented otters from colonizing the pristine upstream stretches of these creeks. Signs of otter found during opportunistic searching in shallow marshes near the mouth of Candelaro river (Marrese, pers. obs.) suggest that otters arrived from the

southern Cervaro river basin, by moving through a drainage channel connecting both river basins, as other signs were previously found along this water body (Marrese, pers. obs.). As the fish community seems to be quite rich, it is possible that the otter expansion in this water basin is just starting, and future surveys could likely witness a further increase of positive signs.



Figure 5. New EOO of the otter in Italy filling the gap between the two disjointed portions.

Despite otters being sighted in the past in both Lesina and Varano lakes (Marrese and Caldarella, 2005), only a very old spraint was found on an artificial heap of rocks in the Varano lake (maybe a shag (*Phalacrocorax aristotelis*) pellet: Dell’Omo, pers. com.), and none in the Lesina lake. Although numerous fish nets and fish traps suggested good availability of feeding resources, the water quality is classified as ‘Poor’ for the Lesina lake, and ‘Moderate’ for the Varano (ARPA Puglia, 2015). The evidence suggest that the lakes could be frequented only by wandering individuals. However, survey of the lakes may have also suffered from a low detection probability, as most areas were not accessible to survey (soft muddy shores, artificial channels and private properties).

CONCLUSION

The new occurrence records collected during this study indicate that the Italian otter population has been reunified in one single continuous EOO (*sensu* IUCN, 2012). The gap filling between the two portions of the southern Italian range is likely related to improving habitat quality during the last 20 years, e.g. higher water quality, natural recovery of riverbank vegetation (Carone et al., 2014), and lower human impact on streams (Marcelli and Fusillo, 2009b). The rejoining has several implications on the conservation and management of the Eurasian otter in Italy:

- i) it guarantees gene flow across the whole southern range;
- ii) it promotes the metapopulation dynamics and diminishes the risk of extinction of sub populations (Christie and Knowles, 2015), especially in the small

northern portion, safeguarding the ongoing northward expansion (Panzacchi et al., 2011; Imperi, 2013).

Otters have likely reached carrying capacity in the Tyrrhenian portion of the gap area, making a further expansion northward in the near future highly probable, especially in the neighbouring Lazio region, which is still devoid of otters (Giovacchini and Loy, pers. obs.).

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RÉSUMÉ

BONNES NOUVELLES DU SUD: REMPLISSAGE DU GAP ENTRE DEUX POPULATIONS DE LOUTRE EN ITALIE

Après le déclin important de la deuxième partie du XXe siècle en Italie, la loutre (*Lutra lutra*) a été confinée dans la partie sud de la péninsule. Depuis les relevés effectués dans les années 80, la zone d'occurrence de cette espèce a subi une expansion lente mais constante, tout en maintenant deux populations disjointes. Le remplissage de ce gap est un des objectifs du plan d'action nationale publié en 2011. Pour évaluer la réalisation de cet objectif nous avons réalisé une étude systématique dans la zone de connexion, à la recherche de signes dans deux bassins fluviaux et deux lacs des Pouilles et de la Campanie. Signes des loutres ont été détectés le long de la plus grande partie du réseau hydrographique étudié, ce qui confirme le comblement des lacunes entre les deux aires de répartition, qui sont maintenant reliées en une seule zone d'occurrence. Cette réalisation a des résultats pertinents sur la survie à long terme de la petite population menacée de loutres italiennes.

RESUMEN

BUENAS NOTICIAS DEL SUR: LLENANDO LA BRECHA ENTRE DOS POBLACIONES DE NUTRIA EN ITALIA

Después del severo declive ocurrido durante la segunda parte del siglo 20 en Italia, la nutria (*Lutra lutra*) estaba confinada en la parte sur de la península, con dos núcleos aislados. De manera similar a otras poblaciones europeas, en los 90s comenzó una

lenta recuperación de las mismas. Llenar la brecha entre las dos subpoblaciones fue uno de los principales objetivos del plan de acción italiano lanzado en 2011. Para evaluar el logro de este objetivo, realizamos en 2017 un relevamiento sistemático en el área de conexión, en busca de señales de nutrias en dos cuencas fluviales y dos lagos de las porciones Tirrena (Campania) y Adriática (Puglia) del área de la brecha. Se detectaron nutrias a lo largo de la mayoría de la red hidrográfica estudiada en el lado Tirreno, y sólo unos pocos sitios en el lado Adriático. Los resultados confirmaron el relleno de la brecha entre las dos áreas de distribución inconexas, y resaltan la necesidad de un relevamiento de los hábitats en los cursos de agua Adriáticos. Estos resultados tienen implicancias para la supervivencia a largo plazo de la pequeña y amenazada población de nutrias en Italia.