

## HOW MANY OTTERS ARE THERE IN ITALY?

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**ABSTRACT** - Mapping available data about otter (*Lutra lutra*) distribution according to the 10x10 km grid of the IGMI (Italian Geographical Military Institute) national maps on the scale of 1:25000, we evaluated a current otter range of 9900 km<sup>2</sup>, disjoined in two areas: Molise region in central Italy, and Basilicata, Campania, Calabria and Apulia in southern Italy. Considering the results of an otter genetic census performed in the Pollino National Park and surroundings (southern Italy) in 2004, we extrapolated the values of otter density found (0.18-0.20 otters/km of watercourse) to the overall Italian otter range and to the linear development of the watercourses hosting otters (3313 km). The correspondent estimates of the Italian population size amounted to, respectively, 481-523 and 596-663 otters. Considering a correction factor based on the mean sprainting intensity reported, since 2000, for each catchment hosting otters, the estimated population size was reduced to 229-257 otters. We argue that a new extensive otter survey is urgently needed and that monitoring by non-invasive genetic sampling is recommended in order to define the population status and trend.

*Key words:* Otter, *Lutra lutra*, density, distribution, genetic typing, Italy

**RIASSUNTO** - *Quante lontre ci sono in Italia?* I dati disponibili relativamente alla distribuzione della Lontra (*Lutra lutra*) in Italia, sono stati mappati secondo il reticolo 10 x 10 km IGMI (Istituto Geografico Militare Italiano) in scala 1:25000, ottenendo un areale complessivo di 9900 km<sup>2</sup>, suddiviso tra il Molise (Italia centrale) e Puglia, Campania, Basilicata e Calabria (Italia meridionale). I valori di densità della specie (0,18 – 0,20 lontre/km di fiume) ottenuti nel 2004 in un'ampia area, perlopiù compresa nel Parco Nazionale del Pollino, sono quindi stati estrapolati alla superficie complessiva dell'areale italiano e alla lunghezza totale dei corsi d'acqua attualmente frequentati dalla Lontra (3313 km). La consistenza della popolazione italiana oscillerebbe tra, rispettivamente, 481-523 e 596-663 lontre. Applicando un fattore di correzione basato sull'intensità di marcamento (numero di feci/km) rilevata per ogni bacino fluviale, la popolazione complessiva viene ridotta a 229-257 lontre. Questi tentativi evidenziano la carenza di dati attendibili sullo status della specie in Italia, suggerendo la necessità di un censimento a livello nazionale che affianchi ai metodi di rilevamento standard le recenti tecniche non invasive di analisi del DNA.

*Parole chiave:* Lontra, *Lutra lutra*, densità, distribuzione, analisi genetiche, Italia.

## INTRODUCTION

Information about the number and density of otters (*Lutra lutra*) is indispensable for management and conservation, especially in those countries, such as Italy, where, in the 20<sup>th</sup> century, otter populations suffered severe decline in range and are actually threatened of extinction (Macdonald and Mason, 1983a; Cassola, 1986; Prigioni, 1997; Prigioni C., Balestrieri A. and Remonti L., unpubl. data).

Since the first field research in the early '80s (Macdonald and Mason, 1983a), distribution surveys of Italian otters have been carried out using the standard method, at first developed by the Nature Conservancy Council (Lenton *et al.*, 1980) and widely used in Europe with various modifications for specific purposes (Mason and Macdonald, 1994). At a series of sites (stretches of watercourse) distributed along the investigated watercourses, the percentage which is positive for otters and the intensity of sprainting activity (e.g. number of spraints) are useful tools to assess comparatively otter populations range and trend (Mason and Macdonald, 1987 and 2004), but they are not informative about numbers.

For otters showing diurnal or crepuscular activity, direct observation is considered the best method to obtain worthwhile information about density and numbers (see Ruiz-Olmo, 1995), but being labour intensive (several censuses and many hours of observation are needed), this method works better for small census areas. Applying several mathematical models, mean home range size obtained by radiotelemetry

could be used to assess otter numbers in the overall distribution range of the species, but several individuals should be captured and collared in different areas to obtain effective measures. This is particularly difficult where otter density is likely to be low and, moreover, ethical questions are raised by the need of manipulating a significant fraction of the population.

Recent progress in molecular techniques allows isolating and analysing the DNA contained in the epithelial cells shed from the gut of the animals with faeces. Typing highly polymorphic regions of nuclear DNA, a "genetic fingerprint" of individual otters can be obtained (Kohn *et al.* 1999; Pearse *et al.* 2001; Wilson *et al.* 2003). Even if in Mediterranean areas high air temperatures and insolation cause the rapid degradation of DNA, making a high proportion of apparently "fresh" faeces enable to yield reliable genotypes, faecal DNA typing provides a non-invasive efficient census method which can be applied over large areas and easily fitted to standard surveys (Prigioni *et al.*, in press). From April to September 2004, a genetic otter census has been performed in a wide area mostly included in the Pollino National Park (Basilicata and Calabria regions, southern Italy), where the intensity of sprainting activity suggested the presence of one of the main Italian otter populations (Prigioni *et al.*, 2005); the otter population size has been estimated at 34-37 individuals (95% Confidence Interval), corresponding to 0.18-0.20 otters/km of watercourse (Prigioni *et al.*, in press).

The aims of this paper are to outline the

current Italian otter range and, extrapolating the values of density found for the Park, to estimate the overall number of otters in Italy.

## METHODS

To outline the current Italian otter range, available data from several standard field surveys searching for otter signs (Cripezzi *et al.*, 2001; Loy *et al.*, 2003; Prigioni *et al.*, 2005; see also Tab. 2), integrated with those published in a recent synopsis of Italian mammals (Boitani *et al.*, 2003), were mapped according to the 10x10 km grid of the national maps on the scale of 1:25000 (IGMI, Italian Geographical Military Institute). Only recent information (from 2000 onwards) was considered.

The Italian population size was extrapolated from the population size obtained by the genetic census (Prigioni *et al.* in press) using two different approaches. The area covered by the genetic census was compared with the overall otter range, assessed considering the number of positive 100 km<sup>2</sup> grid meshes. On the other hand, the length of all watercourses hosting otters in the Italian range was measured and the overall population size was estimated on the basis of the values of density found by the genetic survey.

This last estimate of otter population size was also weighed considering the mean sprainting intensity, which is somewhat considered correlated to otter density (Conroy and French, 1987; Madsen and Gaardmand, 2000; Ruiz-Olmo *et al.*, 2001; Mason and Macdonald, 2004).

The ratio ( $R_{SI}$ ) between the mean sprainting intensity (number of spraints per 100 m) reported for each catchment hosting otters, and that found in the rivers of the Pollino National Park (3.2 spraints/100 m; Prigioni *et al.*, 2005), was calculated. Research effort influencing the availability of data about the sprainting intensity among differ-

ent sub-areas of otter range, the watercourses hosting otters were then assigned to three classes (class 1:  $R_{SI} = 0-0.4$ ; class 2  $R_{SI} = 0.4-0.8$ ; class 3:  $R_{SI} = 0.8-1.2$ ) and the otter population size in each catchment was corrected multiplying the otter numbers by the mean value of the correspondent  $R_{SI}$  class (class 1: 0.2; class 2: 0.6; class 3: 1). Lacking recent sprainting data (from 2000 onwards) rivers were cautionary assigned to the class 1.

## RESULTS AND DISCUSSION

The Italian otter range amounts to 9900 km<sup>2</sup> (i.e. 99 positive 10x10 km squares; Fig. 1). Assessing in the same way the

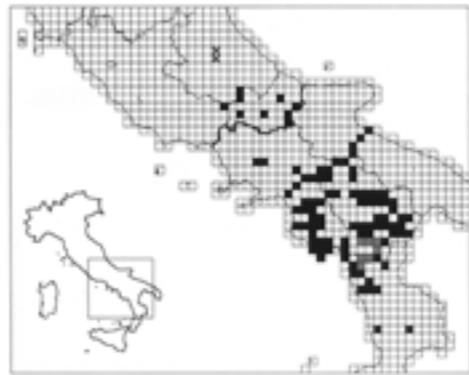


Figure 1. – Current Italian otter range according to IGMI 10x10-km squares. Crossed squares mark reintroduction areas (Prigioni and Fumagalli, 2001; Mattei *et al.*, 2005), grey squares mark the area covered by the genetic census.

area of the genetic census, amounting to 700 km<sup>2</sup> (7%), the correspondent overall otter population size should be 481-523 individuals.

Considering the strength of coupling between otters and riverine habitats, this method, which is currently used for distribution atlases, being otter home

ranges essentially linear is likely to be of little help for assessing with accuracy otter numbers and for carefully planning conservation measures (see also Green *et al.*, 1984).

Within the current otter range, 76 watercourses host otters (Tab. 1), for an overall linear development of 3313 km

(Tab. 2), of which 932 km (5 main rivers and 9 tributaries) occurring in Molise region and 2381 km (13 main rivers and 49 tributaries and neighbouring watercourses) shared among Campania, Apulia, Basilicata and Calabria regions. In the last two decades the species has disappeared

Table 1 - Current otter status for all water-bodies (main rivers, damp areas(\*), and lakes) hosting otters between 1982 and 2000 (D = disappeared; R = reintroduced; P = current presence; (1) = disappeared in a single watercourse; (2) = short neighbouring watercourses flowing into the Tyrrhenian Sea).

MAIN WATER-BODIES	TRIBUTARIES OR STRICTLY SURROUNDING WATERCOURSES	STATUS
Natisone		D
Mezzola lake		D
Ticino		R
Erro		D
Enza	Calamone, Liocca	D
Comacchio valley (*)		D
Ombrone	Farma-Merse	D
Albegna		D
Fiora	Tafone, Timone, Lente, Olpeta, Burano	D
Arrone		D
Aterno-Pescara	Orta, Vella	R
Volturno	Vandra, Calore Irpino, Alimenta	P
Sangro		P
Fortore	Lesina, Sente, Tappino, Cigno, La Catola, Occhito	P
Biferno		P
Ofanto	Orata, Venosa, Osento, Atella	P
Carapelle		P
Sele	La Tenza, Calore, Lucano, Ripiti, Sammaro, Bianco, Melandro, Fasanella, Platano, Tanagro, Temete, L'Isca, La Cosa	P
Vecite-Ceraso		D
Basento		P
Bradano	Lato	P
Cavone		P
Agri	Alli, Cavolo, Maglia Racanello, Sauro, Casale, Maglia's tributaries	P
Mercure-Lao	Abatemarco, S. Nocaio, Schettino, Paraturo, Battendiero, Argentino	P
Sinni	Serrapotamo, Sammarella, Cogliandrino, Frido, Peschiera	P
Raganello		P
Tyrrhenian rivers (2)	Alento Badolato, Palistro, Bussento, Mingardo, Picentino, Lambro, Testene, Solofrone, Noce, La Fiumarella	P
Crati	Rosa, Esaro, Occido, Grondo-Fiumicello (1)	P
Neto		P
Savuto		P

Table 2 – Two different estimates of otter numbers in Italy (see methods). (\*): References: 1-5: Loy pers. com., 2006; 6: Gargaro, 2003; 7, 13: Sangiuliano pers. com., 2000; 9, 10, 12: authors' unpublished data, 2000; 11: Marrese, unpublished data, 2006; 14-17: Prigioni *et al.*, 2003; 8, 18, 19: lacking recent sprainting data, rivers were assigned to class 1.

N	CATCHMENT	MAIN RIVER LENGTH	TRIBUTARIES LENGTH (N)	TOTAL LENGTH (KM)	OTTERS	SPRAINTS/100M (*)	SPRAINTING CLASS (R <sub>SP</sub> )	“WEIGHED” OTTERS
1	Fortore	110	95(4)	205	37-41	0.20	1	7-8
2	Biferno	84	-(0)	84	15-17	0.20	1	3-3
3	Aterno-Pescara	148	48(2)	196	35-39	0.20	1	7-8
4	Volturno	175	155(3)	330	59-66	0.20	1	12-1
5	Sangro	117	-(0)	117	21-23	0.20	1	4-5
CENTRAL RANGE		634	298(9)	932	168-187			33-37
6	Agri	119	118(7)	237	43-47	3.83	3	43-47
7	Tyrrhenian rivers	-	329(11)	329	59-66	0.53	1	12-13
8	Basento	149	-(0)	149	27-30	-	1	5-6
9	Bradano	116	7(1)	123	22-25	0.17	1	4-5
10	Cavone	96	-(0)	96	17-19	0.17	1	3-4
11	Ofanto	170	121(4)	291	52-58	1.40	2	31-35
12	Carapelle	70	-(0)	70	13-14	0.17	1	3-3
13	Sele	75	285(12)	360	65-72	1.15	1	13-1
14	Sinni	101	112(5)	213	38-43	3.17	3	38-43
15	Mercure-Lao	61	82(6)	143	26-29	3.17	3	26-29
16	Crati	91	89(3)	89	32-36	0.42	1	6-7
17	Raganello	38	-(0)	38	7-8	2.74	3	7-8
18	Neto	92	-(0)	92	17-18	-	1	3-4
19	Savuto	60	-(0)	60	11-12	-	1	2-2
SOUTHERN RANGE		1238	1143(49)	2381	429-476			196-220
OVERALL RANGE		1872	1441	3313	596-663			229-257

from 11 rivers of northern and central Italy and from the coastal wetlands between Ferrara and Ravenna, northern Italy (Prigioni C., Balestrieri A. and Remonti L. unpubl. data), where a few isolated populations have been reported in the mid '80s (Cassola, 1986), corresponding to the loss of further 665 km of watercourses.

Applying the density values obtained by the genetic census to the overall development of rivers hosting otters, the Italian otter population should amount to 596-663 individuals, of which 168-187 (28.1%) forming the isolated sub-population of Molise (Tab. 2). These numbers, even if quite similar to those obtained comparing areas, are likely to be overestimated for two reasons: i) otter mean sprainting activity in the Pollino National Park is quite higher than that of most river basins, suggesting the presence of an abundant and well-established otter population; ii) environmental and human factors – fish availability, drought, habitat fragmentation, water contamination – are known to affect otter distribution and numbers (see Macdonald and Mason, 1983b; Barbosa *et al.*, 2001), making hard to extrapolate those densities obtained in a relatively preserved area to more altered habitats.

Weighing the densities found in the Park according to the mean sprainting intensity recorded along each river basin, otter numbers are reduced to about one third, totalling 229-257 individuals (Tab. 2). The isolated population of Molise region, about 33-37 individuals, should be the one suffering the higher risk of extinction, even if, respect to the mid '80s, it seems to have

partially recovered (Prigioni C., Balestrieri A. and Remonti L., unpubl. data).

Even if the use of spraints in the assessment of otter populations is controversial (Kruuk *et al.*, 1986; Jefferies, 1986; Mason and Macdonald, 1987; Kruuk and Conroy, 1987), lacking quantitative otter surveys the sprainting intensity is the only available parameter which can be used to broadly compare the performance of different Italian otter populations. Bearing in mind that the assumptions underlying our calculations make otter numbers for each river catchment quite approximate, the results of Cripezzi *et al.* (2001), who, using a different method, assessed the presence of 24 otters in the basin of the River Ofanto, partially support our inference. Current researches in the basins of the rivers Sele and Agri (southern Italy) and in Molise region (central Italy) will probably allow better estimates of the overall otter population.

What emerges more frankly from these attempts to estimate otter numbers in Italy is the lacking of sound information about the otter status for most of the river catchments included in its current range. The otter recent extinction in the River Fiora catchment, which in the '80s still hosted the main otter population north of Rome, shows that it is necessary to stay on guard since otter survival is still threatened.

We argue that a new extensive otter survey is urgently needed - the last one dates back to 1984-85 -, joining the practical benefits of the standard method to the recent achievements of molecular techniques for the analysis of

faecal DNA.

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