

# Eurasian otter (*Lutra lutra*) density estimate based on radio tracking and other data sources

Lorenzo Quaglietta · Petra Hájková · António Mira · Luigi Boitani

Received: 19 June 2014 / Accepted: 25 January 2015 / Published online: 8 February 2015  
© Mammal Research Institute, Polish Academy of Sciences, Białowieża, Poland 2015

**Abstract** Estimating animal population size is a critical task in both wildlife management and conservation biology. Precise and unbiased estimates are nonetheless mostly difficult to obtain, as estimates based on abundance over unit area are

frequently inflated due to the “edge effect” bias. This may lead to the implementation of inappropriate management and conservation decisions. In an attempt to obtain an as accurate and conservative as possible picture of Eurasian otter (*Lutra lutra*) numbers, we combined radio tracking data from a subset of tracked individuals from an extensive project on otter ecology performed in Southern Portugal with information stemming from other data sources, including trapping, carcasses, direct observation of tagged and untagged individuals, relatedness estimates among genotyped individuals, and a minor contribution from non-invasive genetic sampling. In 158 km of water network, which covers a sampling area of 161 km<sup>2</sup> and corresponds to the minimum convex polygon constructed around the locations of five radio-tracked females, 21 animals were estimated to exist. They included the five radio-tracked, reproducing females and six adult males. Density estimates varied from one otter per 3.71–7.80 km of river length (one adult otter per 7.09–14.36 km) to one otter per 7.67–7.93 km<sup>2</sup> of range, depending on the method and scale of analysis. Possible biases and implications of methods used for estimating density of otters and other organisms living in linear habitats are highlighted, providing recommendations on the issue.

Communicated by: Andrzej Zalewski

**Electronic supplementary material** The online version of this article (doi:10.1007/s13364-015-0216-2) contains supplementary material, which is available to authorized users.

L. Quaglietta (✉) · L. Boitani  
Department of Biology and Biotechnologies, University of Rome ‘La Sapienza’, Rome, Italy  
e-mail: lorenzo.quaglietta@gmail.com

L. Quaglietta  
UBC (Unidade de Biologia da Conservação), University of Évora, Núcleo da Mitra, Évora, Portugal

P. Hájková  
Institute of Vertebrate Biology, Academy of Sciences of the Czech Republic, Brno, Czech Republic

A. Mira  
ICAAM–Mediterranean Agricultural and Environmental Sciences Institute, University of Évora, Évora, Portugal

*Present Address:*

L. Quaglietta  
InBIO/CIBIO (Research Center in Biodiversity and Genetic Resources, University of Porto), Pólo de Lisboa, Jardim Botânico Tropical - IICT (Instituto Investigação Científica Tropical), Lisbon, Portugal

*Present Address:*

P. Hájková  
Department of Zoology, Faculty of Science, Charles University in Prague, Prague, Czech Republic

*Present Address:*

A. Mira  
CIBIO (Biodiversity and Genetic Resources Research Center), Pólo de Évora, University of Évora, Évora, Portugal

**Keywords** *Lutra lutra* · Density estimation · Edge effect · Known-to-be-alive · Linear habitats · Sampling scale

## Introduction

Estimating wildlife population size is a major goal for conservation biologists, who are often called upon to provide policy makers with pertinent data regarding rare or endangered species. Inaccurate estimates, especially overestimations, represent a serious threat to wildlife conservation, in that they may lead to less conservative management practices and conservation strategies. This may result in local extirpations or reserve sizes too small to support viable populations. Estimating