



HYSTRIX
the Italian Journal of Mammalogy

Volume 33 (suppl.) • 2022



Editor in Chief

LUCAS A. WAUTERS

Università degli Studi dell'Insubria

Via J.-H. Dunant 3, 21100 Varese, Italy

email: editor@italian-journal-of-mammalogy.it

Associate Editors

Roberta CHIRICHELLA, Sassari, Italy (*Editorial Committee coordinator*)

Giovanni AMORI, Rome, Italy

Leonardo ANCILLOTTO, Naples, Italy

Francesca BRIVIO, Sassari, Italy

Romolo CANIGLIA, Rome, Italy

Jacopo CERRI, Koper, Slovenia

Paolo CIUCCI, Rome, Italy

Paolo COLANGELO, Rome, Italy

Marcello D'AMICO, Sevilla, Spain

Richard DELAHAY, Exeter, United Kingdom

Mirko DI FEBBRARO, Pesche, Italy

Olivia DONDINA, Milan, Italy

Niccolò FATTORINI, Siena, Italy

Nicola FERRARI, Milan, Italy

Marco FESTA-BIANCHET, Sherbrooke, Canada

Tim FLANNERY, Melbourne, Australia

Stefania GASPERINI, Siena, Italy

Philippe GAUBERT, Toulouse, France

John GURNELL, London, United Kingdom

Fabiola IANNARILLI, Yale, USA

Simona IMPERIO, Ozzano dell'Emilia, Italy

John L. KOPROWSKI, Laramie, USA

Boris KRYŠTUFEK, Ljubljana, Slovenia

Maria Vittoria MAZZAMUTO, Laramie, USA

Nick MILNE, Perth, Australia

Alessio MORTELLITI, Orono, USA

Marco MUSIANI, Calgary, Canada

Jorge M. PALMEIRIM, Lisboa, Portugal

Pasquale RAIÀ, Naples, Italy

F. James ROHLF, New York, United States

Claudia ROMEO, Milan, Italy

Francesco ROVERO, Florence, Italy

Francesca SANTICCHIA, Varese, Italy

Massimo SCANDURA, Sassari, Italy

Clara TATTONI, Trento, Italy

Assistant Editors

Francesca BRIVIO, Sassari, Italy

Roberta CHIRICHELLA, Sassari, Italy

Stefania GASPERINI, Radicondoli (Siena), Italy

Fabiola IANNARILLI, New Haven, USA

Andrea MARCON, Bologna, Italy

Chiara PANICCIA, Bolzano, Italy

Clara TATTONI, Trento, Italy

Bibliometrics Advisor

Nicola DE BELLIS, Modena, Italy

Technical Editor

Damiano PREATONI, Varese, Italy

Impact Factor (2020) 2.017

HYSTRIX the Italian Journal of Mammalogy is an Open Access Journal published twice per year (one volume, consisting of two issues) by Associazione Teriologica Italiana. Printed copies of the journal are sent free of charge to members of the Association who have paid the yearly subscription fee of 30 €. Single issues can be purchased by members at 35 €. All payments must be made to Associazione Teriologica Italiana ETS by bank transfer on c/c n. 001034838399, Bancoposta - Poste Italiane, Italy, banking coordinates IBAN: IT39P0760103200001034838399.

The Association is available to promote exchanges with journals published by other scientific associations, museums, universities, etc.

Associazione Teriologica Italiana secretariat can be contacted at segreteria.atit@gmail.com.

Information about this journal can be accessed at <http://www.italian-journal-of-mammalogy.it>

The Editorial Office can be contacted at info@italian-journal-of-mammalogy.it

Associazione Teriologica Italiana Board of Councillors: Giovanni AMORI (CNR-IRET, Rome) *Honorary President*, Sandro BERTOLINO (Università degli Studi di Torino) *President*, Laura SCILLITANI (MUSE, Trento), *Vicepresident*, Leonardo ANCILLOTTO (Università degli Studi di Napoli Federico II), Paola BARTOLOMMEI (Fondazione Ehoikos, Siena), Dario CAPIZZI (Regione Lazio, Rome), Stefano GRIGNOLIO (Università degli Studi di Sassari), Marco SCALISI (Regione Lazio, Rome), Emiliano MORI (CNR-IRET, Sesto Fiorentino, Italy) *Secretary/Treasurer*, Lucas A. WAUTERS (Università degli Studi dell'Insubria, Varese) *Director of Publications*, Damiano PREATONI (Università degli Studi dell'Insubria, Varese) *Electronic publications*, Chiara PANICCIA (EURAC, Bolzano) *Web sites, social networking*, Andrea BONACCHI (Fondazione Ehoikos, Siena) *Communication Office, Librarian*.



Volume 33 (suppl.) • 2022

XII Congresso Italiano di Teriologia

Cogne, 8–11 Giugno 2022

edited by

Roberta Chirichella and Damiano G. Preatoni

This Journal as well as the individual articles contained in this issue are protected under copyright and Creative Commons license by Associazione Teriologica Italiana. The following terms and conditions apply: all on-line documents and web pages as well as their parts are protected by copyright, and it is permissible to copy and print them only for private, scientific and noncommercial use. Copyright for articles published in this journal is retained by the authors, with first publication rights granted to the journal. By virtue of their appearance in this Open Access journal, articles are free to be used, with proper attribution, in educational and other non-commercial settings. This Journal is licensed under the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 Italy License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/> or send a letter to Creative Commons, PO Box 1866, Mountain View, California, 94042, USA.

Publication information: *Hystrix* the Italian Journal of Mammalogy is published as a printed edition (ISSN 0394-1914) twice per year. A single copy of the printed edition is sent to all members of Associazione Teriologica Italiana. The electronic edition (ISSN 1825-5272), in Adobe® Acrobat® format is published “online first” on the Journal web site (<http://italian-journal-of-mammalogy.it>). Articles accepted for publication will be available in electronic format prior to the printed edition, for a prompt access to the latest peer-reviewed research.

Best Paper Award

Associazione Teriologica Italiana established a Best Paper Award for young researchers. Eligible researchers are leading authors less than 35 years old, and within 7 years from their PhD (but young researcher at an even earlier stage of their career, i.e. without a PhD, are also eligible), who have expressed interest in the award in the Communications to the Editor (step 1 of the online submission procedure; for details, see the Electronic Publication Guide; <http://www.italian-journal-of-mammalogy.it/public/journals/3/authguide.pdf>).

If the eligible leading researcher is not the corresponding author, the latter should express interest on the leading researcher's behalf. Criteria are innovation, excellence and impact on the scientific community (e.g., number of citations).

The award will be assigned yearly, in the second semester of the year following that of reference (i.e., Best Paper Award for 2013 will be assigned in the second semester of 2014). The Editorial Committee is responsible to assign the award. A written motivation will be made public on the journal website.



Parco Nazionale del Gran Paradiso
Centro Congressi "Maison de la Grivola"
Piazza E. Chanoux, Cogne
8-11 Giugno 2022

Riassunti: Comunicazioni e Poster

edited by
Roberta Chirichella and Damiano G. Preatoni

Organizzato da
Associazione Teriologica Italiana ONLUS

In collaborazione con



Parco Nazionale del
Gran Paradiso



Comune di Cogne



COMITATO ORGANIZZATORE

LEONARDO ANCILLOTTO, Università degli Studi di Napoli Federico II
PAOLA BARTOLOMMEI, Fondazione Ethoikos
BRUNO BASSANO, Parco Nazionale del Gran Paradiso
SANDRO BERTOLINO, Università degli Studi di Torino
ANDREA BONACCHI, Fondazione Ethoikos
FRANCESCA BRIVIO, Università degli Studi di Sassari
DARIO CAPIZZI, Regione Lazio
STEFANO GRIGNOLIO, Università degli Studi di Ferrara
EMILIANO MORI, CNR – Istituto di Ricerca sugli Ecosistemi Terrestri
CHIARA PANICCIA, EURAC – Institute for Alpine Environment
DAMIANO G. PREATONI, Università degli Studi dell'Insubria
MARCO SCALISI, ISPRA
LAURA SCILLITANI, MUSE – Museo delle Scienze di Trento
DAVIDE SOGLIANI, Università degli Studi di Pavia
LUCAS A. WAUTERS, Università degli Studi dell'Insubria

COMITATO SCIENTIFICO

GIOVANNI AMORI, CNR – Istituto di Ricerca sugli Ecosistemi Terrestri
LEONARDO ANCILLOTTO, Università degli Studi di Napoli Federico II
PAOLA BARTOLOMMEI, Fondazione Ethoikos
BRUNO BASSANO, Parco Nazionale del Gran Paradiso
SANDRO BERTOLINO, Università degli Studi di Torino
DARIO CAPIZZI, Regione Lazio
ROMINA FUSILLO, LUTRIA Wildlife Research and Consulting
STEFANIA GASPERINI, Fondazione Ethoikos
STEFANO GRIGNOLIO, Università degli Studi di Ferrara
EMILIANO MORI, CNR – Istituto di Ricerca sugli Ecosistemi Terrestri
DAMIANO G. PREATONI, Università degli Studi dell'Insubria
FEDERICA ROSCIONI, Ecomodel
MARCO SCALISI, ISPRA
MASSIMO SCANDURA, Università degli Studi di Sassari
LAURA SCILLITANI, MUSE – Museo delle Scienze di Trento
LUCAS A. WAUTERS, Università degli Studi dell'Insubria

SEGRETERIA

EMILIANO MORI, CNR – Istituto di Ricerca sugli Ecosistemi Terrestri
segreteria@mammiferi.org

Citazione consigliata / Recommended citation

Riassunti: Comunicazioni e Poster

Ogni eventuale errore relativo a contenuti, stile e lingua presente nei riassunti va attribuito esclusivamente agli Autori, che se ne assumono ogni responsabilità.

On the way back home: predicting the natural expansion of the otter in north-eastern Italy using habitat suitability models

Stokel G., Frangini L., Franchini M., Filacorda S.

Department of Agri-Food, Environmental and Animal Sciences, University of Udine, Via Sondrio 2/A, 33100 Udine, Italy



The Eurasian otter (*Lutra lutra*) was once spread throughout Italy, but during the late '900 Century the species gone extinct from all the north and central Regions, mainly due to river pollution, habitat loss and poaching. In recent years, the legal protection of the species as well as habitats in which it lives, allowed a recovery in Europe. Nowadays the otter is classified as "Near Threatened" by the International Union for the Conservation of Nature (IUCN). In NE Italy, the neighbouring Austrian and Slovenian population are increasing, thus allowing the natural expansion in Friuli Venezia Giulia (hereafter, FVG) and other Italian Regions. In FVG, the presence of otters is confirmed in the Alps and Pre-Alps till 2011, and after about 50 years of absence also in the Friulian plain. Using presence-only data obtained from the species monitoring, a Habitat Suitability Model (HSM) was developed to understand which factors mostly affect the presence of the species and, consequently, predict the species' expansion. Considering the increase of neighbouring populations, identifying the ways of expansion used by the species assumes remarkable importance. We would expect that both the Alps and Pre-Alps are the most suitable areas for the species' expansion because of the presence of natural areas. Conversely, lowlands are expected to be less suitable as a consequence of the high anthropic pressure.

To calibrate the HSM for our study area, we used MaxEnt algorithm with presence-only data obtained from systematic surveys conducted between September 2020 and March 2022, as well as opportunistic data. During the surveys, the FVG Region was divided into 113 10×10 km grid cells, and within 53 cells the bridge survey was conducted, searching for signs of presence under four bridges in each cell (on average). Moreover, in 23 grid cells, four transects of 100 or 500 m were conducted for each side of the riverbanks, starting from the surveyed bridge. To avoid model overfitting, the presence-only data were spatially thinned using the `spThin` R package (R Software, v. 4.1), considering a minimum distance of 0.5 km. Considering the species' ecological needs, seven covariates within a 200 m buffer around rivers were used to build the model: land cover; fish communities, using data from surveys and the suitability map for FVG; water quality of the rivers, considering the biological and physiochemical and chemical quality elements; Strahler order, indicating the hierarchy of tributaries; slope of riparian areas; elevation; human population density. The correlation between covariates was assessed through the Variance Inflation Factor (VIF). Covariates were represented as 100 m raster layers. To find the best settings configuration, we tested for different regularization values and feature classes using `ENMeval` R package, resulting in 48 model combinations. We used "checkerboard2" as a partitioning method and sampled 10000 background points. The model with the lowest Akaike Information Criterion corrected for small sample sizes (AICc) value was considered as

the best model and evaluated through the Area Under the Curve (AUC).

From bridge and transect surveys 75 and 69 signs of presence were collected, respectively, mainly spraints (number of spraints: 68 and 55, respectively). Moreover, 39 signs of presence were opportunistically sampled. Overall, 183 signs of presence were collected. Most of these were collected in the Julian Alps (n=90), bordering with Austria and Slovenia, as well as in the morainic hills (n=45). Secondarily, in the Julian Pre-Alps (n=27) and in the eastern part of the Friulian plain (n=14), along the border with Slovenia. As for the covariates, the VIF values were all <5. Therefore, none of these were discarded. The best model had a regularization multiplier set to four, included linear + quadratic + hinge + product feature classes and showed predictive performance based on the AUC (0.828, var=0.004). The covariates with the highest percent contribution to the model were the slope of riparian areas (36.36%), land cover (24.58%), elevation (21.37%) and fish communities (8.86%). The remaining covariates together contributed to less than 10%, with the human population density which did not produced any contribution. The mountain area revealed as suitable (n=44, cells with suitable areas), due to the presence of natural land cover and steep riverbanks. These findings match those reported in other studies realized in Southern Italy. The HSM indicates the upper and medium course of the rivers of the Friulan Alps and Pre-Alps as the most suitable. Some of these, are already inhabited by otters, such as in the Julian area where, as reported in a recent study, a reproductive nucleus is established. Individuals were also reported in the Carnic area, but during our survey no signs of presence were collected, except for a road-killed juvenile. For what concerns the hilly areas, most of the suitable areas (n = 10) include the morainic hills, which are already occupied by otters. However, also a nearby river basin could be considered as attractive because of the presence of fish communities and suitable land cover. In the upper plain there are no natural rivers with constant flow, whereas in the lowland plain there are only three suitable rivers inside n=6 cells, even if an historical colonization was reported, when the area was mainly composed by wetlands. Nevertheless, the landscape has changed since the otter disappeared in the area 50 years ago, mainly as a consequence of urbanization. In this context, the recent colonization of the lowlands bordering with Slovenia (within which the otter population is reported as in expansion) could drive the recolonization of the low plain from its eastern part. To conclude, our model showed that in FVG there are suitable areas for the species, but mainly concentrated in the mountainous areas, where the anthropic pressure is lower. Conversely, in lowlands, suitable areas are scanty. Therefore, there is a lot to be done to encourage the otter expansion.

P085