



***HYSTRIX***  
*the Italian Journal of Mammalogy*

Volume 25 (Supplement) • 2014



**Editor in Chief**

Giovanni AMORI

CNR-ISE, Istituto per lo Studio degli Ecosistemi  
viale dell'Università 32, 00185 Roma, Italy  
email: editor@italian-journal-of-mammalogy.it

**Associate Editors**

Francesca CAGNACCI, Trento, Italy (*Editorial Committee coordinator*)

Andrea CARDINI, Modena, Italy

Paolo CIUCCI, Rome, Italy

Nicola FERRARI, Milan, Italy

Marco FESTA BIANCHET, Sherbrooke, Canada

Philippe GAUBERT, Paris, France

Colin P. GROVES, Canberra, Australia

John GURNELL, London, United Kingdom

Alessio MORTELLITI, Canberra, Australia

Jorge M. PALMEIRIM, Lisboa, Portugal

F. James ROHLF, New York, United States

Daniilo RUSSO, Naples, Italy

Massimo SCANDURA, Sassari, Italy

Lucas WAUTERS, Varese, Italy

**Assistant Editor**

Simona IMPERIO, Torino, Italy

**Bibliometrics Advisor**

Nicola DE BELLIS, Modena, Italy

**Technical Editor**

Damiano PREATONI, Varese, Italy

**Impact Factor (2012) 0.352**

*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 onlus by bank transfer on c/c n. 54471, Cassa Rurale ed Artigiana di Cantù, Italy, banking coordinates IBAN: IT1310843051080000000054471.

Associazione Teriologica Italiana secretariat can be contacted at [segreteria.atit@gmail.com](mailto: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](mailto:info@italian-journal-of-mammalogy.it)

**Associazione Teriologica Italiana Board of Councillors:** Luigi CAGNOLARO (formerly Museo Civico di Storia Naturale di Milano) *Honorary President*, Adriano MARTINOLI (Università degli Studi dell'Insubria, Varese) *President*, Sandro BERTOLINO (Università degli Studi di Torino) *Vicepresident*, Gaetano ALOISE (Università della Calabria), Carlo BIANCARDI (Università degli Studi di Milano), Francesca CAGNACCI (Fondazione Edmund Mach, Trento), Roberta CHIRICHELLA (Università degli Studi di Sassari), Enrico MERLI (Università degli Studi di Pavia), Stefania MAZZARACCA *Secretary/Treasurer*, Giovanni AMORI (CNR-ISE, Rome) *Director of Publications*, Damiano PREATONI (Università degli Studi dell'Insubria, Varese) *Websites and electronic publications*, James TAGLIAVINI (Università degli Studi di Parma) *Librarian*.



***HYSTRIX***  
*the Italian Journal of Mammalogy*

Volume 25 (Supplement) • 2014

## **IX Congresso Italiano di Teriologia**

**Civitella Alfedena (AQ), 7-10 Maggio 2014**

edited by

S. Imperio, S. Mazzaracca, D.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 3.0 Italy License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/3.0/it/> or send a letter to Creative Commons, 444 Castro Street, Suite 900, Mountain View, California, 94041, 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.

# IX Congresso Italiano di Teriologia

Civitella Alfedena (AQ), 7-10 Maggio 2014

## Riassunti: Comunicazioni e Poster

edited by  
S. Imperio, S. Mazzaracca, D.G. Preatoni

**Organizzato da**  
Associazione Teriologica Italiana onlus

In collaborazione con



Parco Nazionale  
d'Abruzzo Lazio e Molise



Società Italiana di  
Ecopatologia della Fauna



Progetto LIFE09/NAT/IT/000160 Arctos

## Walking on the snow, feeding at the box: drivers of winter habitat selection by roe deer (*Capreolus capreolus*): an empirical assessment in the Alps

F. OSSI<sup>1,2</sup>, M. HEBBLEWHITE<sup>3</sup>, M. ROCCA<sup>4</sup>, S. NICOLOSO<sup>5</sup>, J.-M. GAILLARD<sup>1</sup>, F. CAGNACCI<sup>2</sup>

<sup>1</sup> University Claude Bernard Lyon 1, France

<sup>2</sup> Fondazione Edmund Mach, Italy

<sup>3</sup> University of Montana, Missoula, USA

<sup>4</sup> Associazione Cacciatori Trentini

<sup>5</sup> Dimensione Ricerca Ecologia Ambiente



C148

In an alpine environment, accessibility to food during winter represents one of the most limiting factors for animals and can hamper individual survivorship. Typically, snow is the element that mostly affects food availability by covering food items. Moreover, snow also affects food accessibility by increasing the energetic costs of walking for those species that lack specific adaptation to locomotion in deep snow. To compensate for such food limitation and help ungulate population to survive over winter, supplemental feeding sites have been set up, with the consequences of strongly modifying resource distribution and thereby individual use of space.

We investigated the relative importance of snow cover, snow quality- i.e. snow sinking- and supplemental feeding in shaping winter habitat selection of the European roe deer (*Capreolus capreolus*), a small deer species, with a distribution range from Mediterranean to Scandinavia, across a variety of landscapes and climates. In alpine environments, winter represents the limiting season for this ungulate. In particular, roe deer morphological traits does not allow an efficient locomotion in deep snow and consequently resource accessibility and acquisition. Therefore roe deer adopt specific behavioural adaptations, e.g. migration or selection of overwinter areas, to escape unfavourable winter conditions.

However the importance of snow cover, and especially snow quality in terms of sinking on shaping roe deer winter habitat selection in the Alps, has never been evaluated. The context of our study offers a good case to evaluate locomotion vs acquisition of resources, given the presence of supplemental feeding sites, that favour resource acquisition and consequently contribute to determine roe deer movement tactics and use of space in winter time.

We performed a fine-scale empirical assessment of snow depth and hardness within a used - available design, and compared it with the information provided by remotely sensed Moderate Resolution Imaging Spectroradiometer data (Snow MODIS,

500 m resolution). We developed a resource selection function by means of multivariate logistic regression-mixed modelling framework (GLMM).

We found that within their winter range, roe deer strongly selected forest canopy and spots with harder snow (i.e. with less snow sinking), whereas only a weak positive effect of proximity to supplemental feeding sites was detected. Snow cover distribution from MODIS was not retained in the best model.

We conclude that roe deer in winter selected those habitats that provide a good thermal shelter and an efficient filter for snow-fall. The presence of forest canopy may provide both hiding and thermal protection, by reducing the amount of snow on the ground and limiting daily temperature variation. Moreover forest canopy reduces the depth of snow cover layer limiting the energetic costs associated with movement. These factors are likely to increase overwinter survival of roe deer. The adoption of a particular behavioural tactic, i.e. the usage of trails previously formed by other individuals to move from bedding sites to supplementary feeding sites, might explain the unexpectedly weak effect of closeness to supplemental feeding stations on roe deer winter habitat selection.

We suggest the importance of complementing large scale models of snow cover (MODIS data) with site-specific information on snow quality and distribution, especially in mountainous areas with high local heterogeneity.

Our results confirm the strong effect of snow cover and snow quality on roe deer winter habitat selection. We suggest that the modification of snow cover abundance and seasonal extent due to ongoing climatic changes affects roe deer population dynamics patterns because of the scarce adaptation of snow typical of this species. The investigation of trends between snow distribution and roe deer population performances might therefore provide important indications for the correct management of this ungulate in an alpine environment.