Stockholm University
August 17–21 2015

Organizers:
Anders Angerbjörn, Stockholm University
Love Dalén, Swedish Museum of Natural History
Bodil Elmhagen, Stockholm University
Lars Werdelin, Swedish Museum of Natural History

P.8 Andrea Corradini

Comparison of wolf (Canis lupus) and lynx (Lynx lynx) signs of presence in the Carpathian Mountains (Romania)

Andrea Corradini <corradini.andre@gmail.com>[a]
University of Florence, Italy

Abstract for poster The relationship between wolf (Canis lupus) and lynx (Lynx lynx) in the Romanian Carpathians is still unclear. To date, no studies have been made but, due to the high cost of radio tracking, preliminary studies based on signs of presence can provide useful information. This study, located in the Eastern Carpathian Mountains (Romania), was carried out by the WOLFLIFE project (LIFE13 NAT/RO/000205) covering an area of 1.200 km^2 (12 squares 10x10 km, EU grid). The study area was surveyed over 119 days of consecutive snow cover during a total of 179 days of wolf monitoring. It used transects (n 57) of different lengths (mean 9,2 km), covering 522,9 km. A total of 69 wolf tracks and 48 lynx tracks were found. Analysis was performed using GIS. The spatial overlap of the signs of presence for both species was compared, considering variables such as land cover and altitude. Contingency tables based on presence/absence in 1-km and 500-m transect segments were also used.

[a]Co-authors: Gabriella Rizzardini, Teodora Sin, Viorel Popescu, Ioan-Mihai Pop, Silviu Chiriac, Andrea Gazzola

P.9 Gonçalo Curveira-Santos

Drivers of badger occupancy in Northern Scotland

Gonçalo Curveira-Santos <goncalo-cs@hotmail.com>[a]
Centre for Ecology, Evolution and Environmental Changes, Faculty of Sciences, University of Lisbon, Campo Grande, 1749–016 Lisbon, Portugal, Portugal

Abstract for poster Scottish badger (Meles meles) populations face an environment characterized by high climatic heterogeneity. We aimed to understand what environmental and anthropic factors drive badger inter and intra-area occupancy variability in Northern Scotland. We applied occupancy models to a comprehensive camera-trapping data set of 11 study areas. Aiming to emphasize the effect of intra-area factors, we clustered study areas into two topo-climatic groups, as temperature and altitude were the main determinants of inter-area variability of occupancy probability. In lower temperature and higher altitude, occupancy likelihood was related to agriculture patches, while in warmer but lower altitude areas, human disturbance (distance to settlements and roads) was the key driver of occupancy. Under predictions of increasing temperature and human population density, our results indicate that human activities will be an increasingly important factor in determining badger occupancy in Scotland.

[a]Co-authors: André P. Silva, Kerry Kilshaw, Chris Newman, David W. Macdonald, Luciana Simões, Luís M. Rosalino

Comparison of wolf (*Canis lupus*) and lynx (*Lynx lynx*) signs of presence in the Carpathian Mountains (Romania)

Andrea Corradini [1], Gabriella Rizzardini [1], Teodora Sin [1,2], Viorel Popescu [2], Ioan-Mihai Pop [1], Silviu Chiriac [3], Andrea Gazzola [1]*

1- ACDB (Asociația pentru Conservarea Diversității Biologice); 2- University of Bucharest; 3- Agenţia pentru Protecţia Mediului Vrancea; * **corradini.andre@gmail.com**

INTRODUCTION

The relationship between wolf (*Canis lupus*) and lynx (*Lynx lynx*) in the Romanian Carpathians is still unclear. To date, no research has been made but, due to the high cost of radio tracking, preliminary studies based on signs of presence can provide useful information. This study uses data from fieldwork performed during winter 2014/15 (from Nov. to Apr.) as part of the WOLFLIFE project.

STUDY AREA

- Located in the Eastern Romanian Carpathians (45° 58‘ N - 26° 26‘ E), the study area covers 1.200 km^2 (12 10x10 km squares from EEA reference grid, see Fig.1).
- It is an alpine biogeographical region, with altitude ranging from 400 to 1.777 m a.s.l.
- 85% of the study area is covered by forest, of which 53% is mixed forest dominated by beech-fir or beech-fir-spruce (*Fagus sylvatica*, *Abies alba, Picea abies*).
- Large mammal community is composed of bear (*Ursus arctos*), wild boar (*Sus scrofa*), roe deer (*Capreolus capreolus*), red deer (*Cervus elaphus*) and chamois (*Rupicapra rupicapra*).

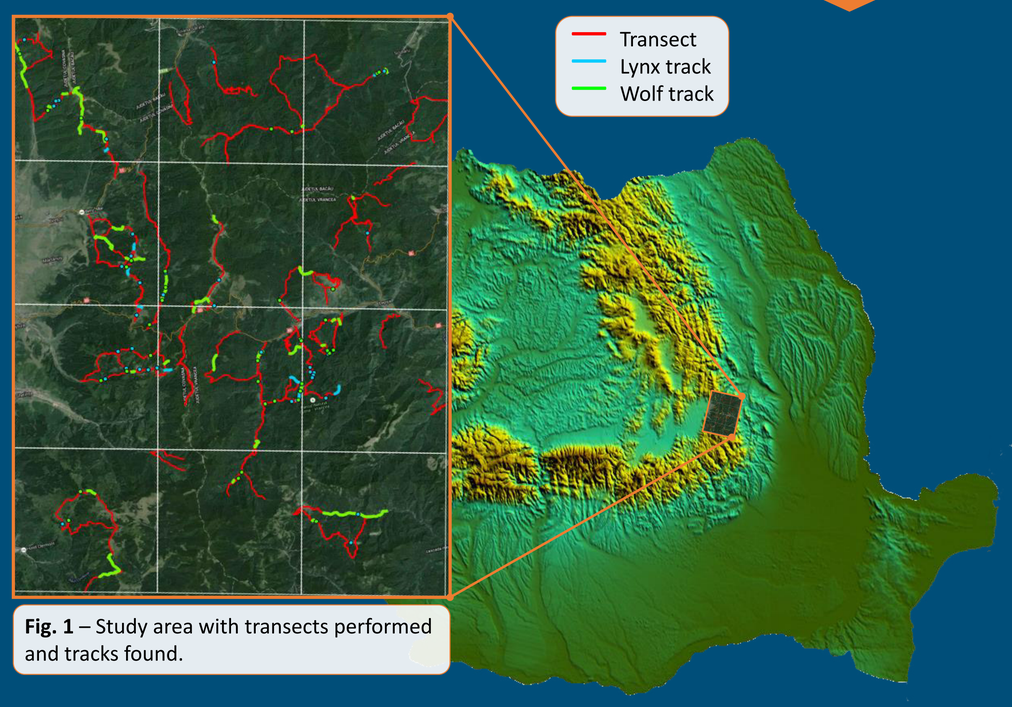


Fig. 1 – Study area with transects performed and tracks found.

MATERIALS AND METHOD

- The study area was surveyed over 119 days of consecutive snow cover using transects (n= 57) of different lengths ($\bar{x}$= 9.173 km). These were performed once (47%), twice (31%) or three times (7%), covering a total of 522,9 km (see Fig.1).
- Only wolf and lynx tracks were compared.
- To evaluate overlap of tracks, the transects were split into 250m, 500m and 1km trail segments. Contingency tables of presence/absence were built to assess:
  - temporal overlap → based on a single transect.
  - spatial overlap → based on repeated transects.
- A *G-test* (Hurd, 2001) was used to statistically test the overlap of tracks ($\boldsymbol{H_0}$= tracks overlap; $\boldsymbol{H_1}$= tracks do not overlap).
- Tracks were correlated with 7 habitat types (using CORINE Land Cover 2012, see Tab. 1) and 3 ranges of altitude.
- A *resource selection index* ($\mathbf{w_i}$) (Manly et al. 2002) was calculated for both land cover and altitude.
- Analysis was conducted using Excel 2013, QGIS 2.8.1 “Wien” and R 3.0.3 “Warm puppy”.

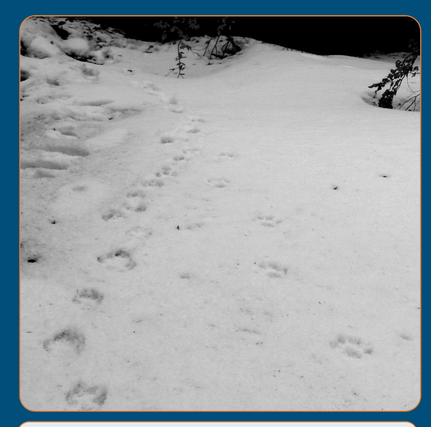


Fig. 2 – Wolf (left) and lynx (right) tracks in the snow.

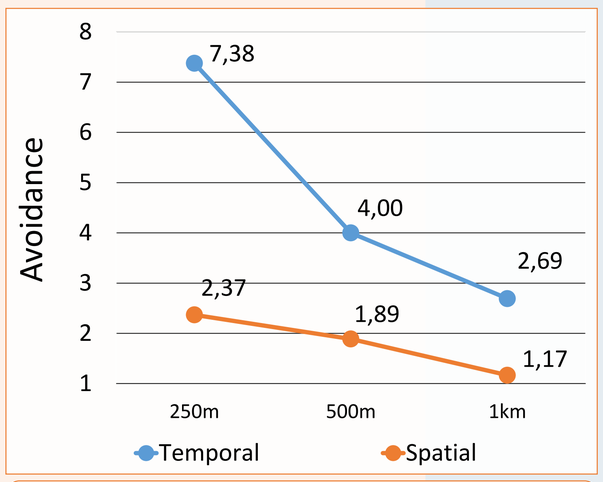
RESULTS

- A total of 36,78 km of wolf tracks (n= 69) and 6,02 km of lynx tracks (n= 48) were found.
- **Tracks overlap** → Temporally, there is a clear species avoidance in all segments: 250m (p-value < 0,0001), 500m (p-value < 0,0001) and 1 km (p-value < 0,001). Spatially, there is avoidance within both 250m (p-value < 0,001) and 500m segments (p-value = 0,026), but not within 1 km trail segments (p-value = 0,633) (see Graph 1).
- **Altitude** → Wolves randomly used lowland (w_i= 0,93) and mid mountain (w_i= 0,95) ranges, preferring to select ridges (w_i= 1,46). Conversely, lynx seemed to avoid low altitudes (w_i= 0,32), occasionally selected ridges (w_i= 1,27) and preferred the mid mountain (w_i= 1,66) (see Graph 2).
- **Land cover** → Both species completely avoided 2 habitats (see Tab.1). Wolves selected broad-leaved forest (w_i= 1,54), natural grasslands (w_i= 1,62) and transitional woodland-shrub (w_i= 1,49). Lynx, likewise, selected natural grasslands (w_i= 1,53) and transitional woodland-shrub (w_i= 1,30). Other habitats were used randomly (see Graph 3).

Class	CORINE land cover legend	Used
231	Pastures	X
243	Land occupied by agriculture	X
311	Broad-leaved forest	✓
312	Coniferous forest	✓
313	Mixed forest	✓
321	Natural grasslands	✓
324	Transitional woodland-shrub	✓

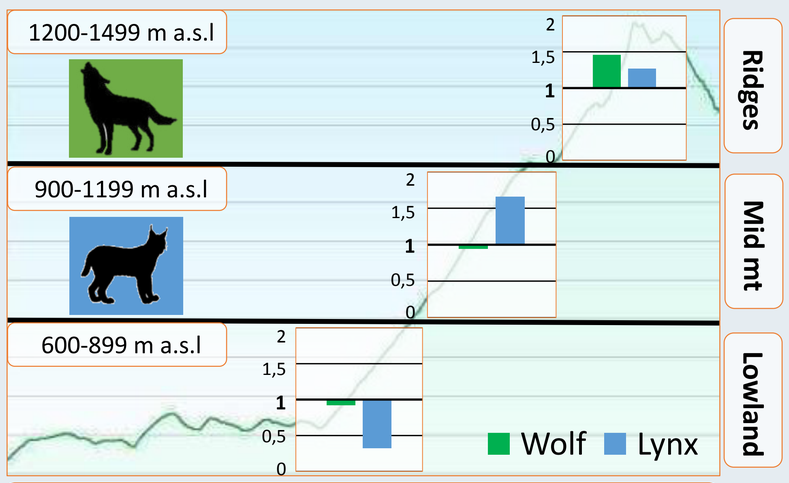
Tab. 1 – Corine Land Cover 2012 Legend.

Tracks overlap



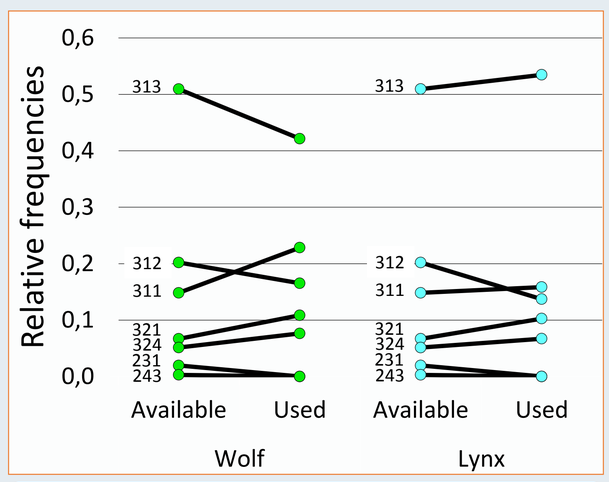
Graph 1 – Degree of avoidance (Lynx occupancy / Lynx ∧ Wolf occupancy) in temporal and spatial overlap.

Altitude



Graph 2 – Selection among altitudes (avoidance < 1; random use = 1; selection > 1).

Land Cover



Graph 3 – Comparison between the relative frequencies of available and used habitat. Template from Weissgerber (2015).

DISCUSSION

- ✓ **Track overlap** → The species spatially share territory, over a 500m radius, but not temporally, suggesting that both carnivores share the same trails but use them at different times.
- ✓ **Altitude** → Wolves usually use the ridges for fast movement inside their home range. Lynx, on the other hand, prefer the middle mountain (because it is typically forested) and avoid the lowland, perhaps due to human presence.
- ✓ **Land cover** → It would seem natural grasslands are selected by both large carnivore species because they allow fast movement and wild prey encounters, whereas transitional woodland-shrub is selected because it is an important habitat for hunting and resting. Pastures and land occupied by agriculture are found only in the lowland, so are probably avoided because of human settlement.
- ✓ Indexes often lead to a loss of information. However, they are useful as a starting point to understand complex phenomenon like species interactions.
- ✓ It is strongly suggested this short-term study is developed with radio-gps tracking to gather a medium-long term understanding of the wolf-lynx relationship.

BIBLIOGRAPHY

- Manly, B. F. L., McDonald, L., Thomas, D., McDonald, T. L., & Erickson, W. P. (2002). Resource selection by animals: statistical design and analysis for field studies. Springer Science & Business Media.
- Weissgerber T.L., Milic N.M., Winham S.J., Garovic V.D. (2015). Beyond Bar and Line Graphs: Time for a New Data Presentation Paradigm. PLoS Biol 13(4): e1002128. doi:10.1371/journal.pbio.1002128.
- Hurd, P. (2001). G-test script. Retrieved July 20, 2015, http://www.psych.ualberta.ca/~phurd/cruft/g.test.r.

ACKNOWLEDGEMENT: The data collection would have not been possible without the financial support of the LIFE+ programme and the Romanian Ministry of Environment and Forests via the WOLFLIFE Project. Participation at the 7th European Congress of Mammalogy was supported by the strategic grant POSDRU/159/1.5/5/133391. Special thanks to Kieran O’Mahony for English review and suggestions.