



Functional connectivity and ecological sustainability of European ecological networks

- A case study with the brown bear -

BEARCONNECT



Marta De Barba (Partner 1, Laboratoire d'Ecologie Alpine, CNRS, France)

Funded projects final conference, 12-13 November 2019, Brussels

BiodivERsA COFUND Call (2015-2016)

« Understanding and managing biodiversity dynamics to improve ecosystem functioning and delivery of ecosystem services in a global change context: the cases of soils and sediments, and land- river and sea-scapes »

CONSORTIUM DESCRIPTION



Composition of BearConnect consortium:

Partner 1 (coordinator, WP3 leader): **Wilfried Thuiller, Marta De Barba**, Laboratoire d'Ecologie Alpine, CNRS, **France**, *Funded by Agence Nationale de la Recherche (ANR)*

Partner 2 (WP4 leader): **Niko Balkenhol**, University of Goettingen, **Germany**, *Funded by Federal Ministry of Education and Research (BMBF)*

Partner 3 (WP5 leader): **Ancuta Fedorca**, National Institute for Research and Development "Marin Dracea", **Romania**, *Funded by Romanian National Authority for Scientific Research and Innovation (CCCDI – UEFISCDI)*

Partner 4 (WP2 leader): **Nuria Selva**, Institute of Nature Conservation, Polish Academy of Sciences, **Poland**, *Funded by National Science Center*

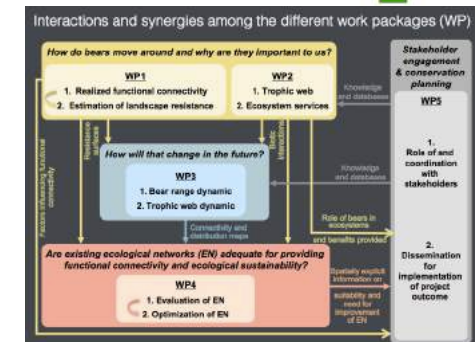
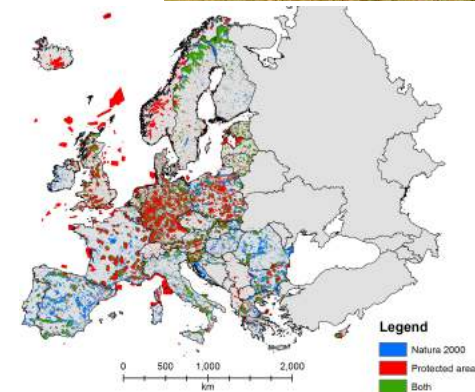
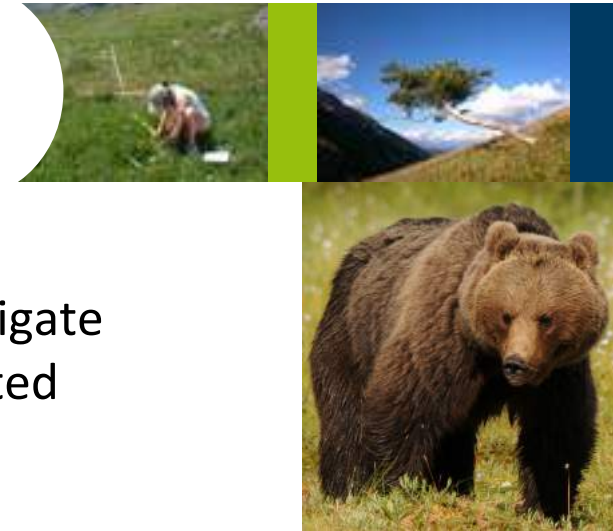
Partner 5 (WP1 leader): **Andreas Zedrosser**, University of South-Eastern Norway, **Norway**, *Funded by Norwegian Research Council*

Partener A: **Luigi Maiorano**, University « La Sapienza », **Italy**. *Self-funded*

PROJECT DESCRIPTION

We focused on the brown bear (*Ursus arctos*), to investigate whether **ecological networks** including national protected areas and the Natura 2000 network, ensure **landscape functional connectivity** and **ecological sustainability** in Europe, and to provide **practical recommendations** for their improvement.

- Local, regional and European scale
- Analyze movement, genetic, demographic and diet data



SCIENTIFIC OUTPUTS

a) evaluate **functional connectivity** and factors influencing brown bear **distribution, movements**, and **effective dispersal** in landscapes under current & future scenario



SCIENTIFIC OUTPUTS

European scale: direct and indirect effects of global changes on distribution

Ensemble modelling (64 models)



Bear presences

=

Land
use

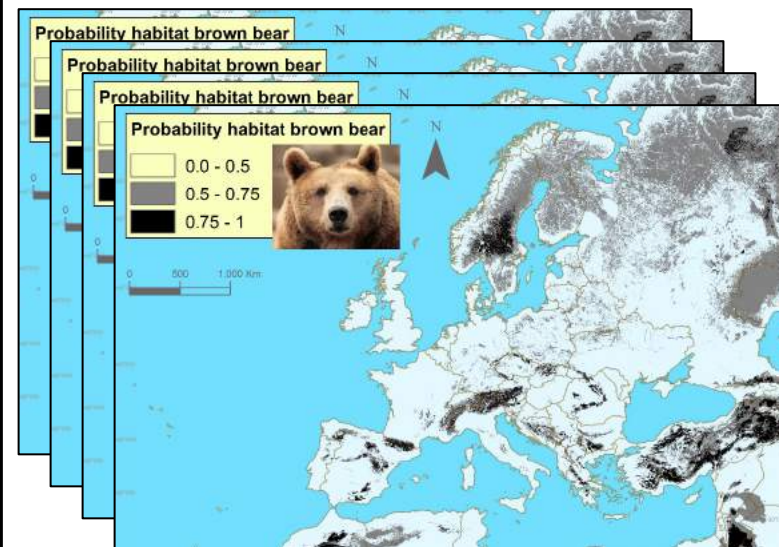
+

Climate

+

*Spatial
Potential
Food
Energy*

Prediction of habitat for
current/future scenarios



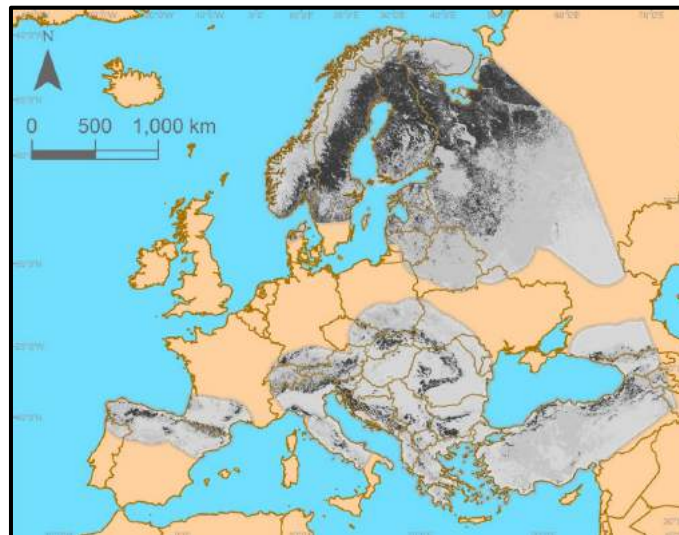
SCIENTIFIC OUTPUTS

European scale: direct and indirect effects of global changes on distribution

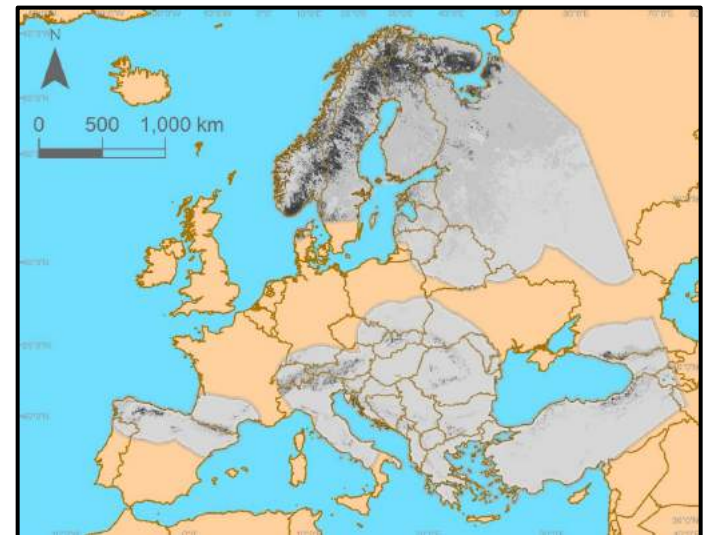
=> Reduced habitat suitability especially in southern Europe

=> Importance of considering indirect effects of global changes

Current habitat



Future habitat



Habitat
Suitability



High

Low

SCIENTIFIC OUTPUTS

European scale: movement and dispersal



Short Communication

Bears without borders: Long-distance movement in human-dominated landscapes

Kamil A. Barton ^{a,*}, Tomasz Zwijacz-Kozica ^b, Filip Zięba ^b,
Agnieszka Sergiel ^a, Nuria Selva ^{a,1}

Review of 29 long distance movement cases:

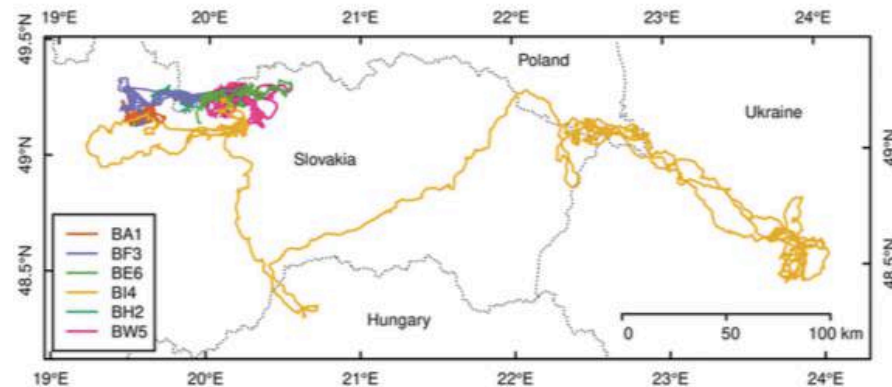
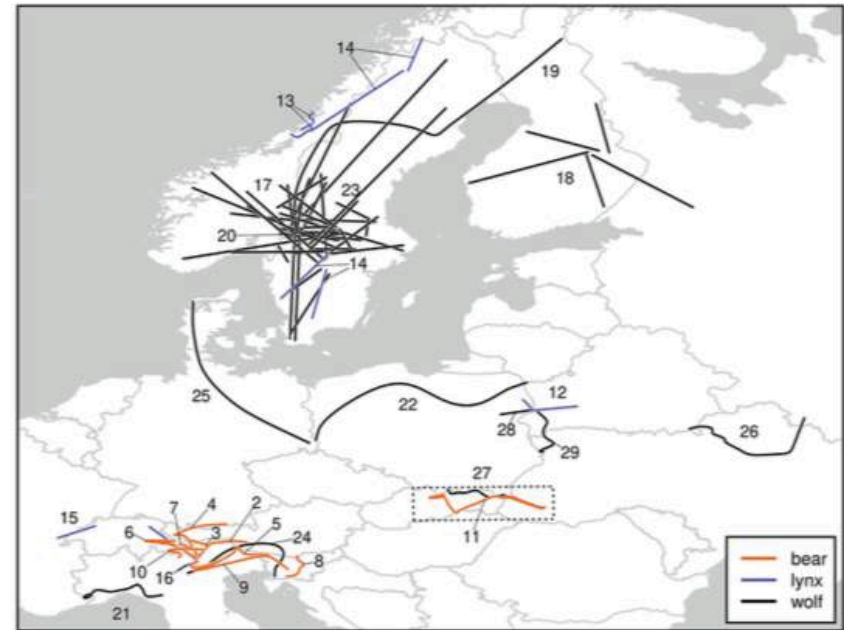
96% transboundary

9 over different populations

10 over recolonization areas

52% ended with death of the animal

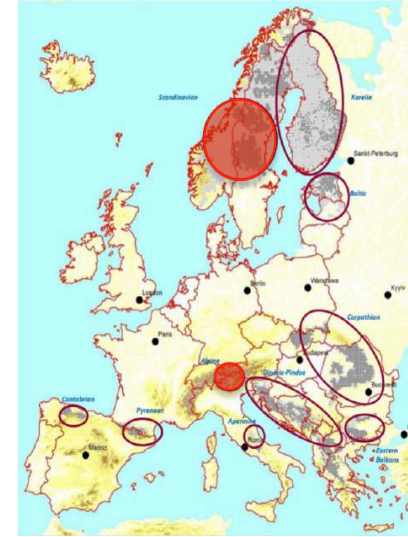
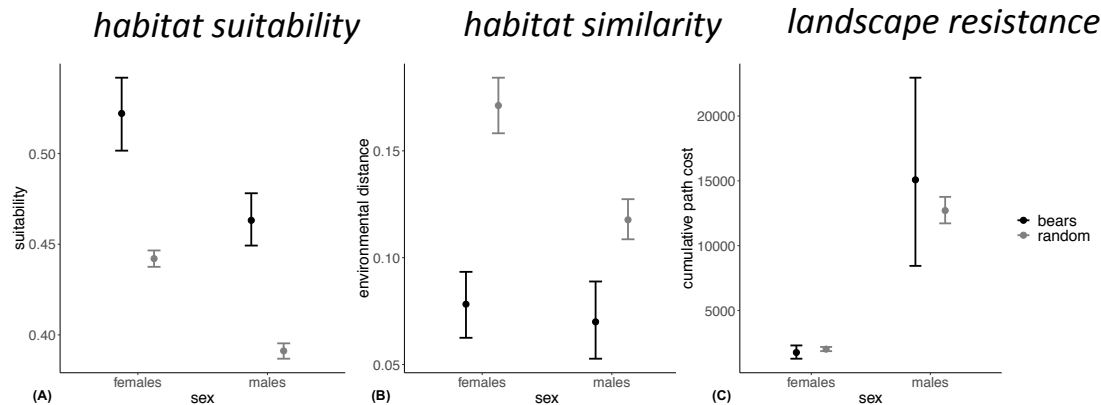
=> Need to consider wide-ranging, transboundary movements in conservation policies



SCIENTIFIC OUTPUTS

Local scale: movement and dispersal, settlement areas selection

Alps => bears settled in areas more suitable and similar to natal areas than alternative available areas
=> habitat suitability and similarity are important for population expansion and connectivity



Scandinavia => human influence is similar in dispersing and settled bears
=> Individual-level variation in movement behavior may help maintain population connectivity

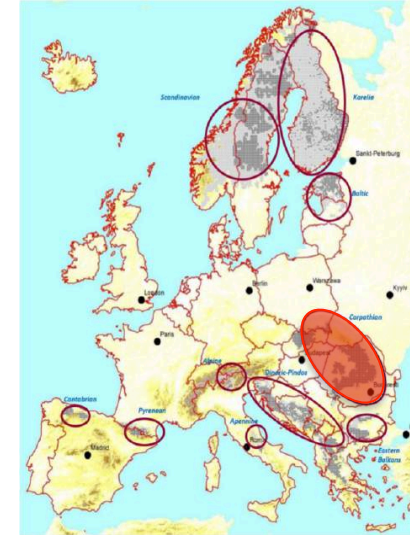
SCIENTIFIC OUTPUTS

Local scale: gene flow, road infrastructure development

Romanian Carpathians

=> proposed highway development threatens to fragment currently functionally connected regions

=> developed a decision support tool for infrastructure design and mitigation measures



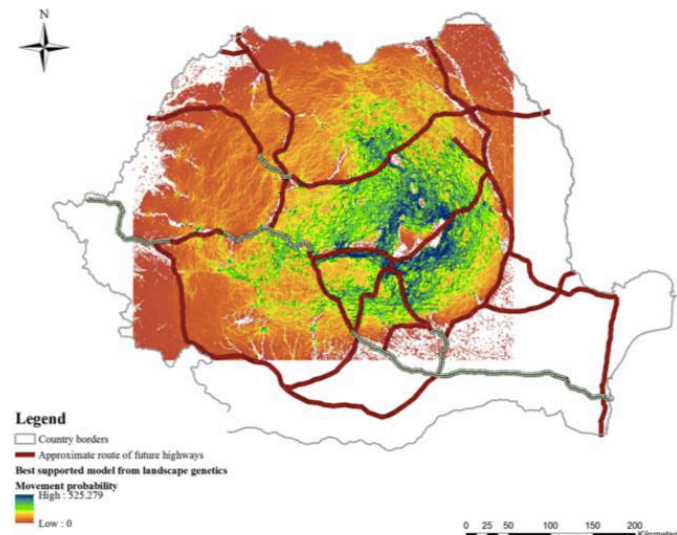
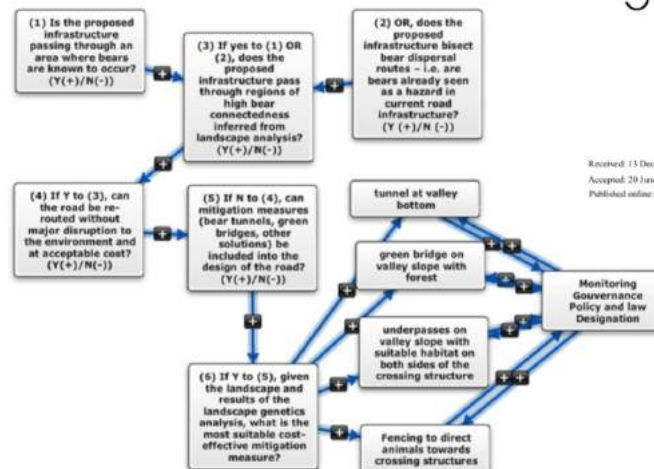
SCIENTIFIC REPORTS

OPEN

Inferring fine-scale spatial structure of the brown bear (*Ursus arctos*) population in the Carpathians prior to infrastructure development

Ancuta Fedorca^{1,2}, Iza-Rita M. Russo³, Ovidiu Ionescu^{1,2}, Georgeta Ionescu^{1,2}, Marius Popa^{1,2}, Mihai Fedorca^{2,3}, Alexandru Lucian Curtu², Neculae Sofletea², Gary M. Tabor⁴ & Michael W. Bruford³

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SCIENTIFIC OUTPUTS

b) understand the role of brown bears in ecosystems, with focus on trophic interactions and associated ecosystem services

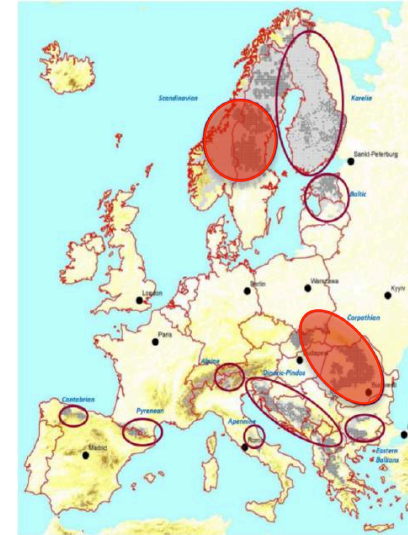


SCIENTIFIC OUTPUTS

Local scale: influence of environmental and anthropogenic factors on bilberry, *Vaccinium myrtillus*, seed dispersal

Scandinavia

=> humans influence bear decisions in terms of where bears forage, rest and defecate, altering the dispersal of berry species



Polish Carpathians

=> At least 20 different species are dispersing bilberry in the Tatra Mountains, Poland

=> Up to 800 seedlings per m² within next to daybeds used by brown bears



SCIENTIFIC OUTPUTS

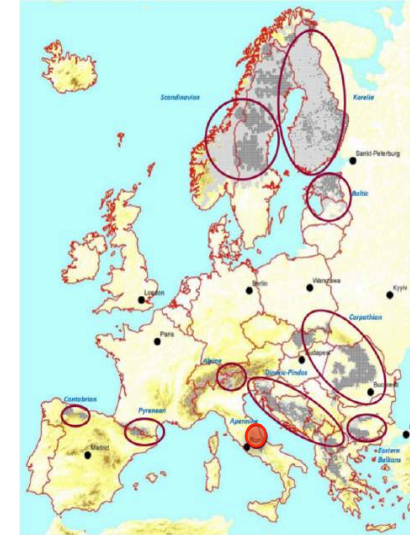
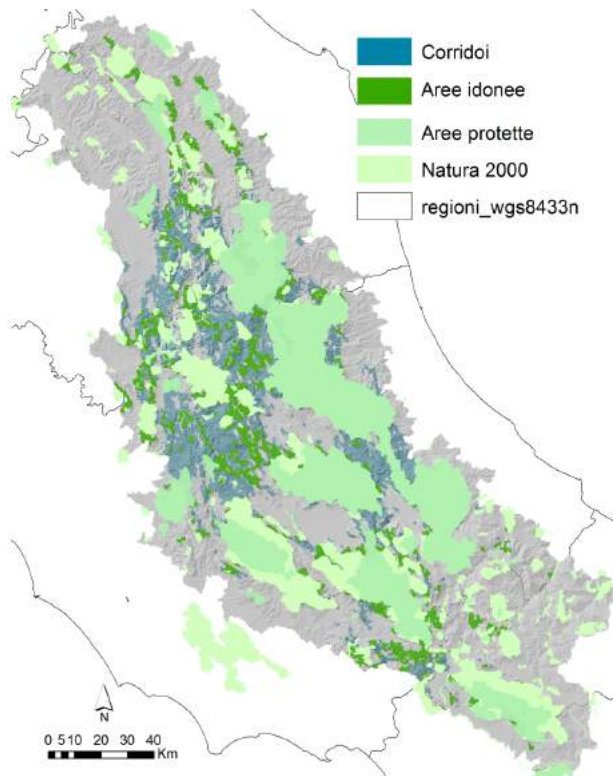
c) assess the effectiveness of the existing system of ecological networks for supporting connectivity



SCIENTIFIC OUTPUTS

Local scale: effectiveness of protected areas and Natura 2000

=> critical habitat and structural connectivity not fully protected



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journal homepage: www.elsevier.com/locate/biocon



Combining multi-state species distribution models, mortality estimates, and landscape connectivity to model potential species distribution for endangered species in human dominated landscapes

Luigi Maiorano*, Luca Chiaverini, Matteo Falco, Paolo Ciucci

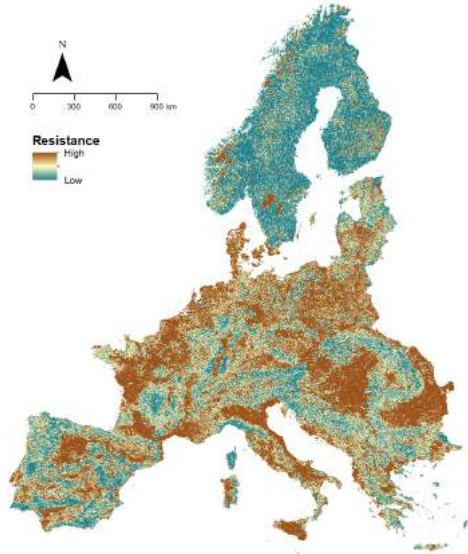


SCIENTIFIC OUTPUTS

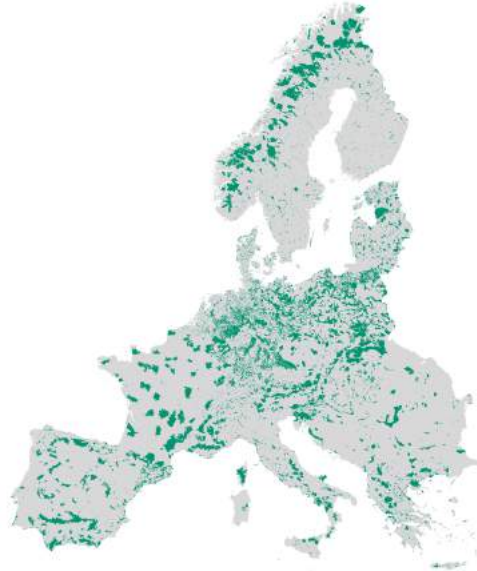
European scale:
Umbrella species for connectivity conservation
Potential connectivity between protected areas



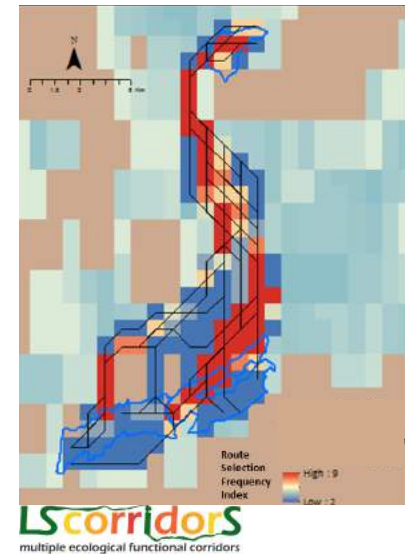
Generating the resistance surface



Selecting PAs



Simulating corridors for each species

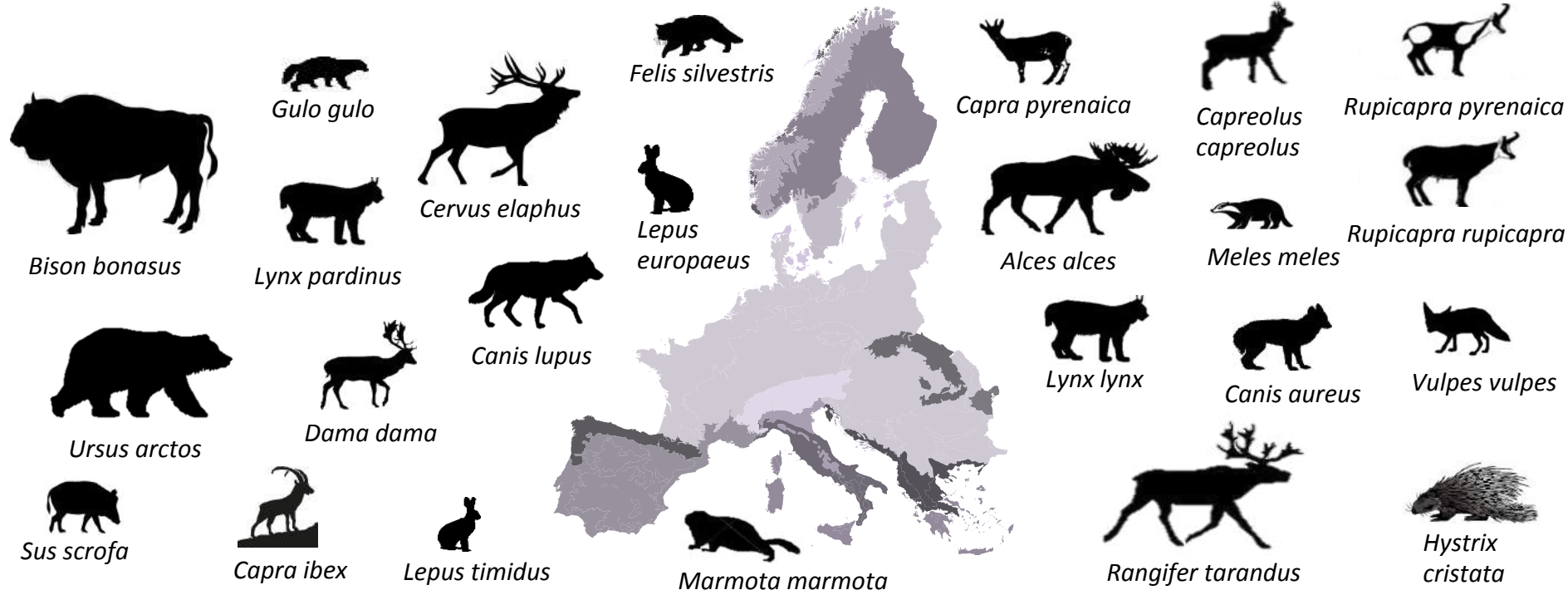


SCIENTIFIC OUTPUTS

European scale:

Umbrella species for connectivity conservation

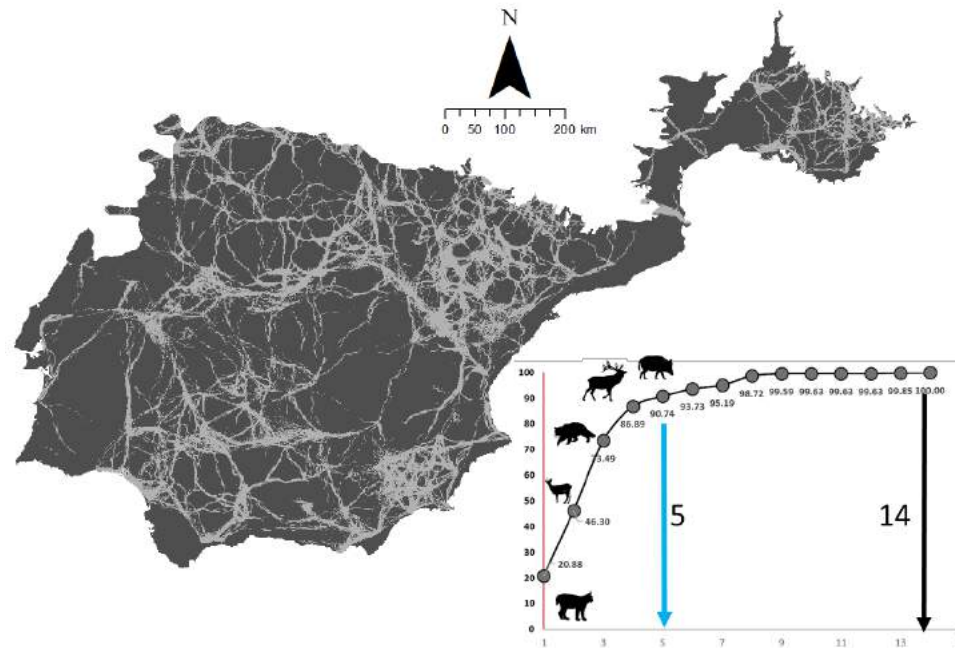
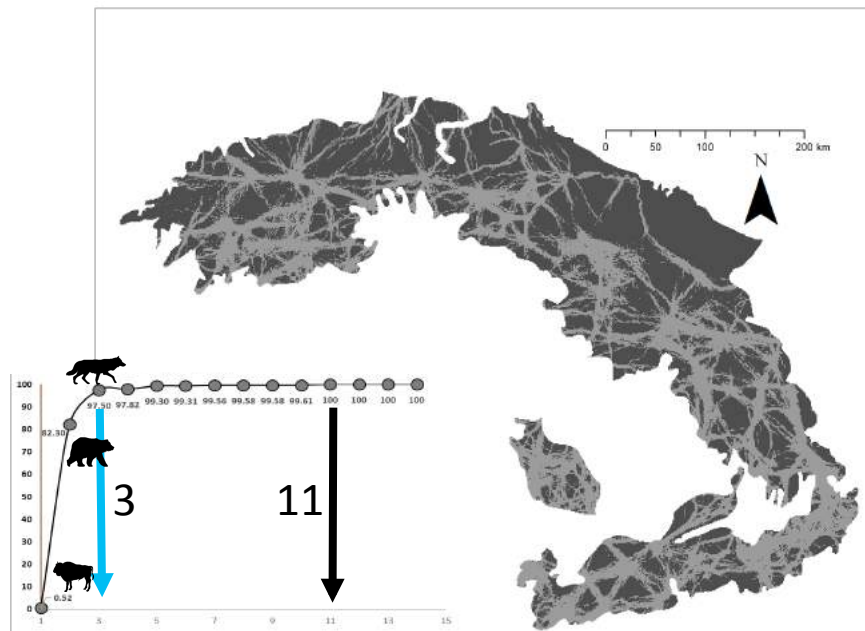
Potential connectivity between protected areas



SCIENTIFIC OUTPUTS

=> More than one species required to conserve connectivity

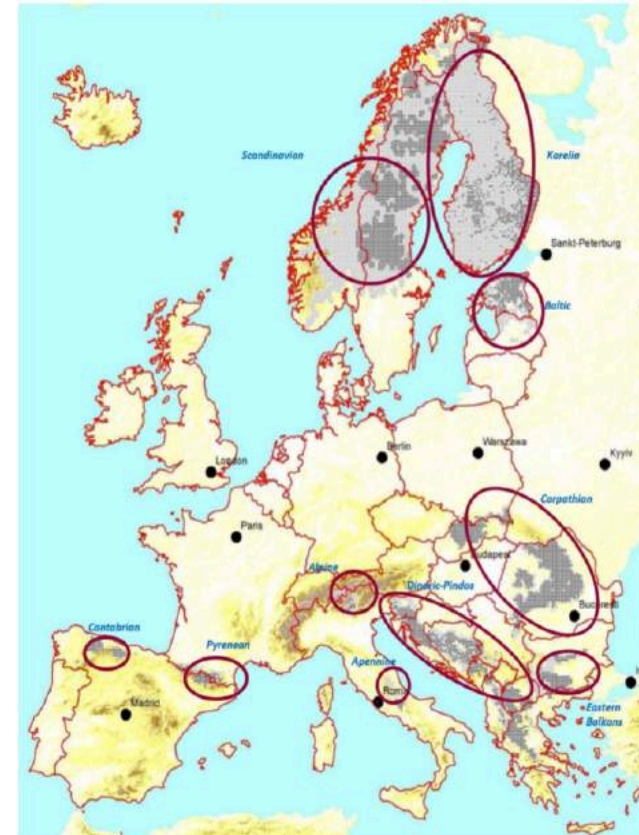
=> Number and suite of umbrella species differ by regions



STAKEHOLDERS / POLICY OUTPUTS

Engagement of “Brown Bear stakeholders”

1st stakeholders workshop - Bucharest Romania, 20-22 March 2017





STAKEHOLDERS / POLICY OUTPUTS

Engagement of “Brown Bear Stakeholders”

=> Co-authored oral presentation - 25th International Conference on Bear Research & Management November 12-17, 2017 Quito, Ecuador

45 organizations working in 24 countries: majority universities, public research institutions, NGOs, government management agencies, museums, private institutions, protected areas administrations, and associations

=> Alpine brown bear connectivity initiative



25th CONFERENCE ON BEAR RESEARCH AND MANAGEMENT
QUITO

BROWN BEAR RESEARCH IN EUROPE: A REVIEW OF THE DATA COLLECTED AND THEIR VALUE FOR CONSERVATION

Marta De Barba¹, Nuria Selva², Andreas Zedrosser³, Niko Balkenhol⁴, Ancuta Cotovelea⁵, Luigi Maiorano⁶, Wilfried Thuiller¹, Fernando Ballesteros⁷, Francesca Cagnacci⁸, Duško Ćirović⁹, Paolo Ciucci⁶, Francesca Davoli¹⁰, Umberto Fattori¹¹, Slavomir Findo¹², Miguel de Gabriel Hernando¹³, Alexandar Dutsov¹⁴, Claudio Groff¹⁵, Snorre Hagen¹⁶, Djuro Huber¹⁷, Otso Huitu¹⁸, Klemen Jerina¹⁹, Alexandros A. Karamanlidis¹³, Felix Knauer²⁰, Ilpo Kojola¹⁸, Alexander Kopatz¹⁶, George Mertzanis²¹, Paolo Molinari²², Javier Naves²³, Ladislav Paule²⁴, Luca Pedrotti¹⁵, Aleksandar Perovic²⁵, Maria Psaralexi²¹, Milan Punovic²⁶, Pierre-Yves Quenette²⁷, Georg Rauer²⁰, Eloy Revilla²³, M^aCruz Mateo Sánchez²⁸, Santiago Saura²⁸, Maryna Shkvyria²⁹, Tomaz Skrbinsek³⁰, Michaela Skuban¹², Aleksandar Stojanov³¹, Aleksandër Trajçe³², Yegor Yakovlev²⁹, Diana Zlatanova³³

STAKEHOLDERS / POLICY OUTPUTS

=> Coordination for data collection

Data Term of Use Agreement

Data curation and standardization

Collection of Metadata

Calibration of genotype data

=> Brown bear databases

All 10 European populations

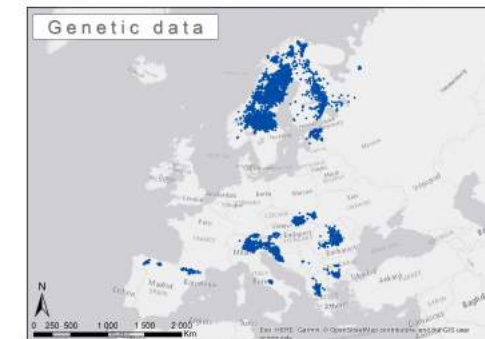
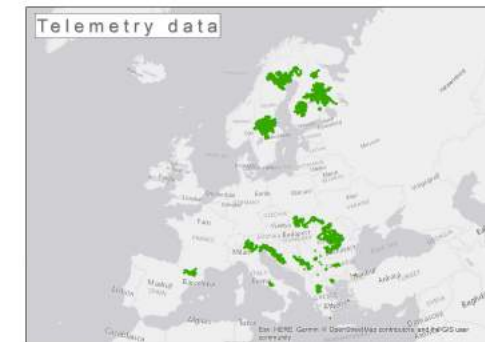
23 countries

37 groups working on bears across Europe, representing several contributing organizations

=> Final stakeholders workshop, February 2020

Presentation of project results

Perspectives



STAKEHOLDERS / POLICY OUTPUTS

d) provide spatially explicit guidelines for the improvement of ecological networks to be used in landscape connectivity planning



STAKEHOLDERS / POLICY OUTPUTS



Connectivity Conservation Workshop



Stakeholders: Scientists, Wildlife managers, NGOs,
Policy makers, Landscape managers

⇒ Addressed connectivity conservation at the
landscape scale in the context of ecological networks

⇒ A document is being drafted for policy makers and
landscape managers and the broader scientific
community



ACKNOWLEDGEMENTS



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National Science Center

Norwegian Research Council



Federal Ministry
of Education
and Research



Romanian National Authority for
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Innovation, CCCDI – UEFISCDI



The Research Council
of Norway