### PhD Progress



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### 1st phase: Using distribution data

### First paper



### First paper

- **Compile** different source of data to make distribution maps of ungulates species in Europe.
- The resulting distribution maps are used to **inform about human-wildlife coexistence**.

Surveying Consumerorium 244 (2020) 100500

Contents has available in SecureOuts







The challenges and opportunities of coexisting with wild ungulates in the human-dominated landscapes of Europe's Anthropocene John D.C. Linnell, Benjamin Cretois, Erlend B. Nilsen, Christer M. Rolandsen, Manual Manual Vallages, Vall John D.C. Linnell", Benjamin Cretoks", Erlend B. Nilsen", Christer M. Rolandsen",
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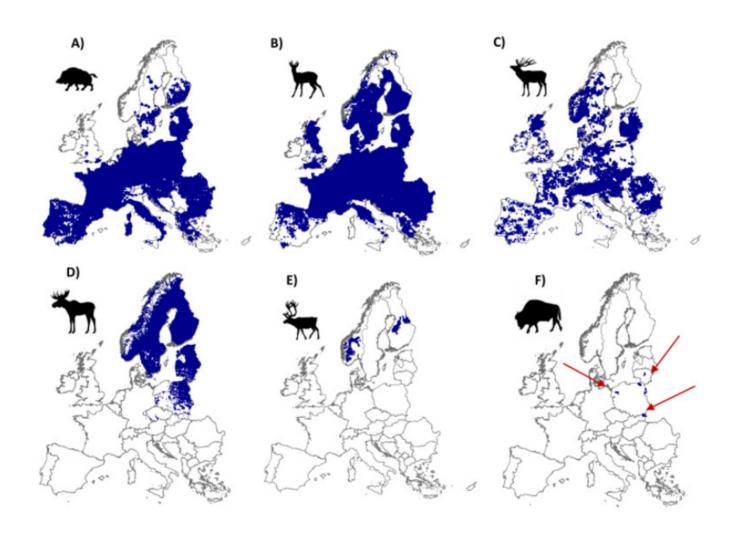
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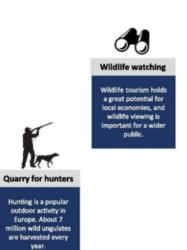
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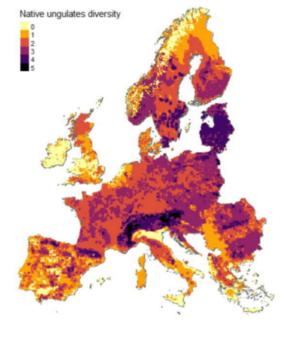
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### First paper

- We summarize knowledge on wild ungulates distribution in Europe.
- About 90% of Europe is home to at least one species of wild ungulates.
- 75% of wild ungulate distribution is located outside protected areas
- We explore the interactions between ungulates and humans in Europe's anthropogenic landscape.
- More than 7 million ungulates are harvested each year in Europe.













constitute the main part of the diet of the 17,000 wolves and 9,000 lynx present in Europe.



More than 500,000

each year in Europe.

collisions are recorded Wildlife disease

> Infectious zoonotic and wildlife-livestock diseases can threaten human health and cause large economic losses for the livestock industry.

Damage to crops Ungulates generate economic losses to agriculture and forestry. Damages caused by wild boar alone costs more than 80 million Euros each year.

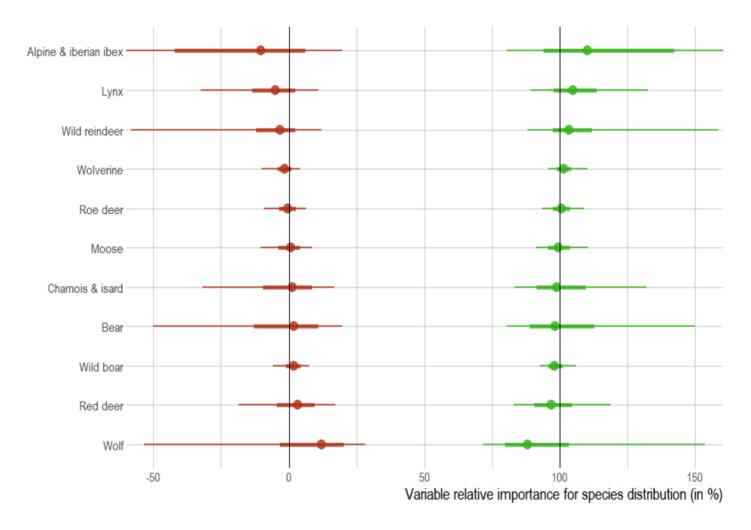
# **1st phase: Using distribution data**Second paper



1 Coexistence of large mammals and humans is possible in Europe's Authors: Benjamin Cretois; John D. C. Linnell?; Bram Van Moorter2; Petra Kaczensky2; Erlend B. Nilsen3; anthropogenic landscapes Department of Geography, Norwegian University of Science and Technology, 7491 Trondheim, Norway Jorge Parada<sup>1</sup>; Jan Ketil Rød<sup>1</sup> 3 <sup>2</sup> Norwegian Institute for Nature Research, PO Box 5685, Torgard, 7485 Trondheim, Norway Affiliations: 3 Department of Mathematical sciences, Norwegian University of Science and Technology, 5 7491 Trondheim, Norway 8 9 10 Corresponding author: 11 Benjamin Cretois e-mail: benjamin.cretois@ntnu.no 12 13 adaptation, sustainability, Europe, mammals, human disturbance 14 keywords: 15

### 2nd paper

- In this paper, we evaluate the relative effects of both the human footprint and protected areas on large mammal distribution at a continental scale.
- We found that the broad scale distribution of most large mammals in Europe includes areas of high to very high human disturbance.
- Their distribution is primarily driven by environmental variables rather than the human footprint or the presence of protected areas.



Environmental variables relative contribution to species' model

Anthropogenic variables relative contribution to species' model

# **1st phase: Using distribution data**3rd paper



### 3rd paper

- A huge amount of distributional data come from hunting bags. For instance deer maps in Norway from hunting bag data.
- We acknowledge hunters' contribution to biodiversity monitoring in the 3rd paper.





## Global Ecology and Conservation

Journal homepage: http://www.elsevier.com/locate/gecco



### Hunters as citizen scientists: Contributions to biodiversity Benjamin Cretois \*\*, John D.C. Linnell \*, Matthew Grainger \*, Erlend B. Nilsen \*, Original Research Article

### monitoring in Europe

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### ARTICLE INFO

Received 25 Starch 2020 Received in ordered form 25 April 2020 Article history Received 23 March 2020 Accepted 23 April 2020

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Monitoring biodiversity characteristics at large scales and with adequate resolution re-Monitoring, biodirecting characteristics at targe scales and with adequate resolution re-places considerable officer and resources. Overall, there is clearly a bugs scope for European. opieres considerables effort and resources. Overall, There is clearly a burge scope for European tenters, a special and other, operiodised group of citizen sciential, to contribute even more to bindiversion manufacture.

businers, a special and office overlooked group of organi scientist, to contribute even more to biodiversity translocing, especially because of their presence across the entire European landscence. Landscape.

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the scientific output steeming from busines-based transforing data.

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and collect data on biodinersity in its key dimensions. Callaborations between hunters.

Hunters collect data on biodisersity in its key dimensions. Collaborations between hunters and scientists are founded and should be considered a standard parametring for biodiversity. and scientists are truthal and should be considered a standard partner-ring for incirerymy conservation. To overcome the challenges in the use of hunters' data, more eigenstate and incorrection for incidence data should be incidented and incorrectioness made in data. conservation. To overcome the challenges in the use of bunders' data, more rigorous profescols for sampling data should be implemented and improvements made in data suppressions controls.

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Global biodiversity is undergoing severe declines (Diaz et al., 2019). This situation has led the international community to the action to alter this treed by setting policy frameworks and obsertives. For example, the Aichi Biodiversity Targets set by Global biodivecuty is undergoing severe declines (Diaz et al., 2019). This situation has led the international community to take action to alter this trend by setting policy frameworks and objectives. For example, the Aichi Biodiversity Targets set by 1. Introduction about the former frame frame frameworks and fine energies in

### 3rd paper

We found that hunters contribute to monitoring biodiversity in all its key characteristics:

- **Distribution** through carcasses ...
- **Phenology** through carcasses ...
- **Physiology** through carcasses ...
- Migration through carcasses too ...

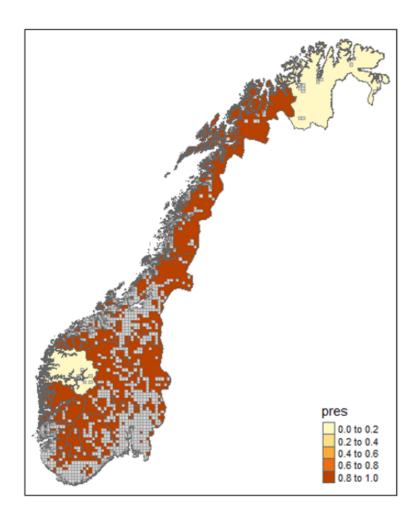
And much more!

# 2nd phase: Understanding distribution data

Characterizing CS data & account for its biases



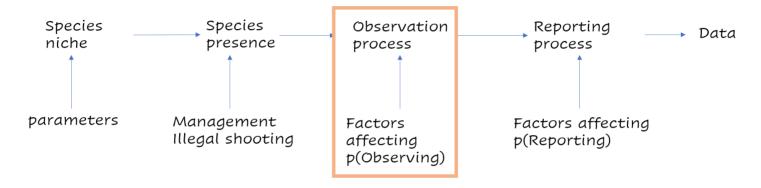
- While useful (as shown in phase 1), distribution maps heavily depends on the quality & the amount of data available. This is especially true at lower resolution!
- Because of this, certain areas may be non sampled even though the species of interest is present.
- We need to understand the drivers of citizen science observations.
- Using the understanding to properly integrate the dataset & obtain more accurate prediction maps.



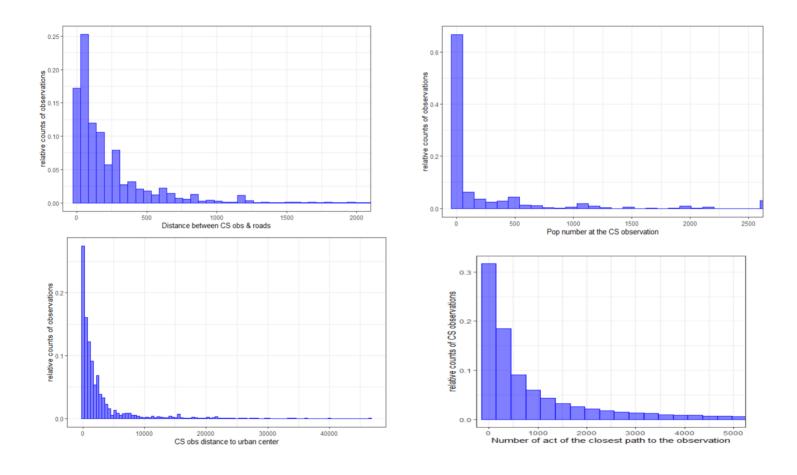
Some areas should host roe deer but are not sampled by CS.

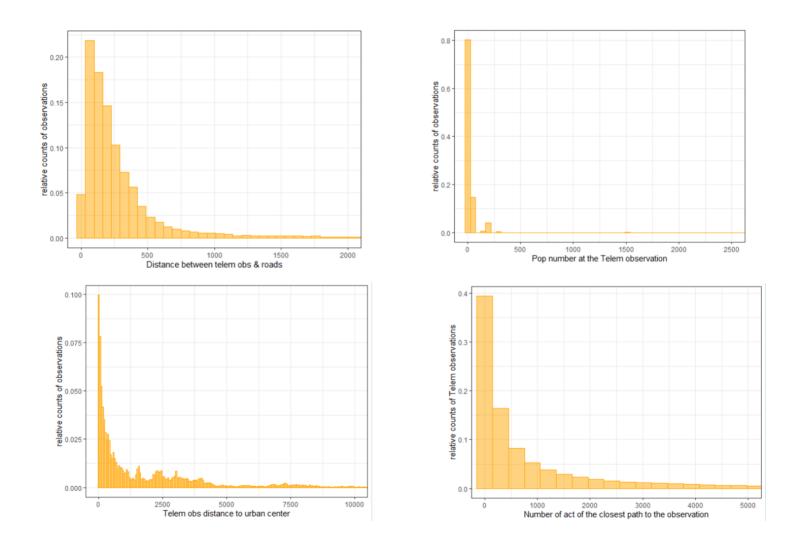
Some areas are non hunted but hosts citizen scientists observations.

### How are data generated?



- Case study on the distribution of roe deer (Capreolus capreolus).
- We have telemetry data and we are able to infer the "true" use of the habitat or where the species is in reality
- Is it so different from citizen science?





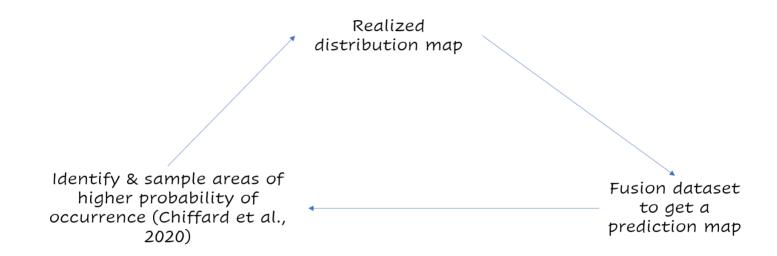
- Why such differences in the distribution of the observations?
- Which areas lack observations? We hypothesize areas far from urban centers
- Can we tone down these biases by adding other dataset? We test data fusion

### And next ...



### Next...

- Using the part 1 results to fusion properly the dataset & obtain more accurate prediction maps and compare them to the observed distribution.
- These prediction maps can be used to identify areas worth sampling.
- Citizen Scientists could be used to sample these areas.
- Their data could then be used to recompute the prediction maps



### PhD plan in a nutshell:

Phase 1: using distribution data

Compiling distributional data to create European-wide maps

Using the maps to derive HWC results

Paper 1 & 2

Hunters' contribution to distributional data + other

Paper 3

Phase 2: understanding distribution data

Characteristics of CS data: biases & how to account for them Make better
prediction maps
that will help fill the
gaps in
distributional data

Data fusion + other knowledge to predict species presence

CS adaptative sampling along with other dataset to obtain "realized" distribution

## Thank you for your attention

