

# A big threat for the smallest Rodent: Present and future distribution modelling of *Micromys minutus*.

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## Introduction

*Micromys minutus* (Pallas, 1771) is a micromammal with a wide Palearctic distribution. Its distribution contains a variety of habitats yet in Greece faces threats due to intensification of agriculture. The species is considered vulnerable in the Red Book of Greece. Greece is the southernmost limit of its European distribution.

## Aim

The aim of our study is to predict the present European (western) distribution of the species and the effect of climate change on distribution of the species by implementing species distribution modelling.

## Materials & methods

We derived the species presence data for Greece from the pellet collection of the Natural History Museum of Crete, and for Europe from the Global Biodiversity Information Facility (GBIF). To model the distribution we used the Maxent algorithm. We used 2 sets of environmental variables (table 1), one with topographic, land cover and climate data (full model) and one with only climate data (climatic-only). The climatic-only model was used to model the future distribution of the species.

## Results

Our full model for *Micromys minutus* scored 0.87 AUC and the climatic-only 0.86 AUC, which are considered as very good performances. Our models, full and climatic-only, predicted similar distributions.

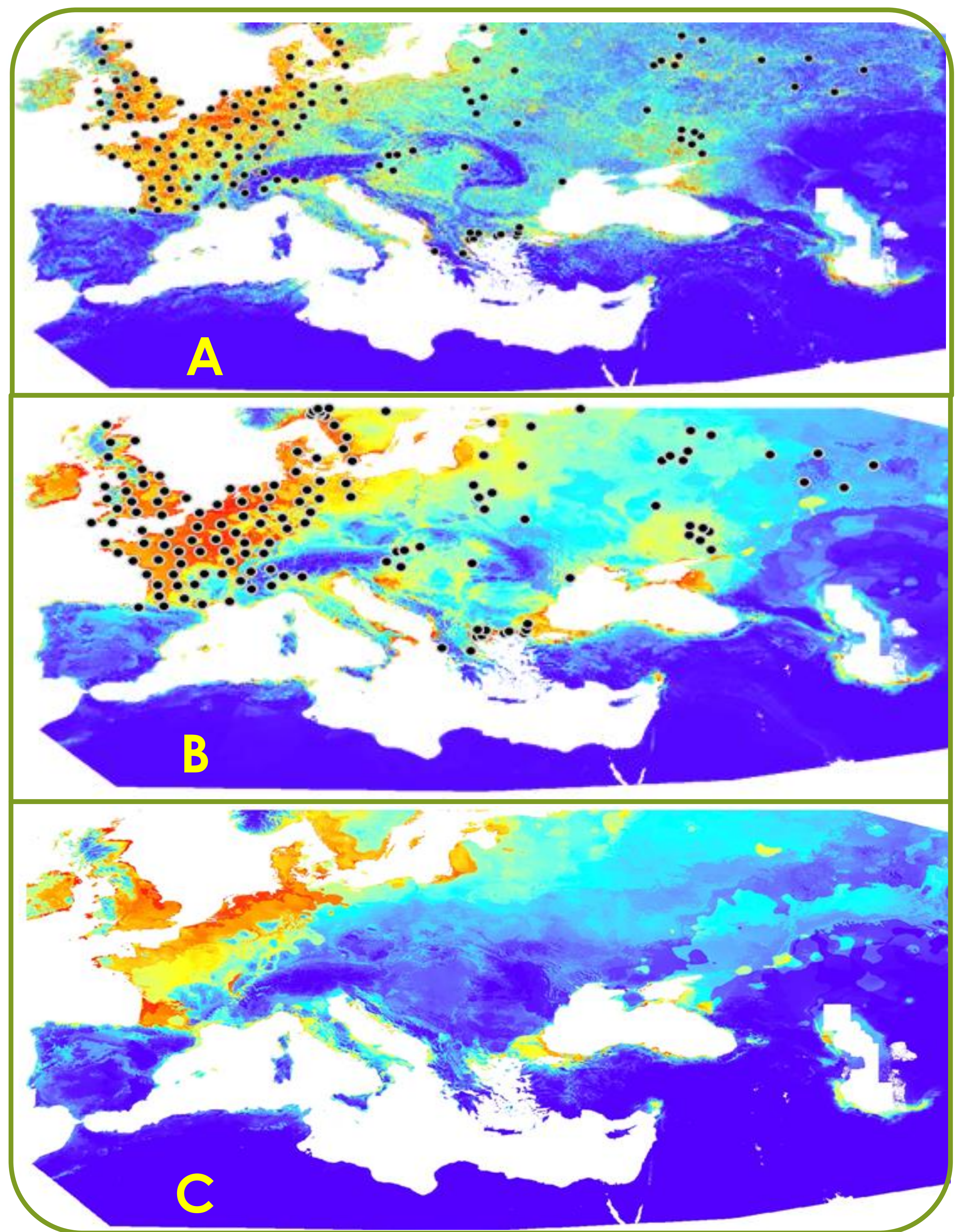


Figure 1: Predicted distributions maps, as a percentage of habitat suitability of *Micromys minutus*. Full model (A), Climatic-only model (B) and Future projection (C).

## Conclusions

Climate data alone was adequate to predict the distribution of the species, with the full model identifying potential habitats at higher resolution. Our projection into the future predicts major habitat losses in the Balkans and a probable extinction of *Micromys minutus* in Greece.

Table 1: Environmental variables used for Species Distribution Modelling

| Variable           | Pixel size and          | Source  |
|--------------------|-------------------------|---|
| Land cover         | 100m <sup>2</sup> WGS84 | <a href="https://lcviewer.vito.be/2015">https://lcviewer.vito.be/2015</a>                               |
| NDVI               | 1km WGS84               | <a href="https://lpdaac.usgs.gov/products/mod13a2v006">https://lpdaac.usgs.gov/products/mod13a2v006</a> |
| SRTM               | 90m <sup>2</sup> WGS84  | <a href="https://srtm.csi.cgiar.org/">https://srtm.csi.cgiar.org/</a>                                   |
| Human population   | 30 arc sec WGS84        | <a href="https://landscan.ornl.gov/">https://landscan.ornl.gov/</a>                                     |
| Climatic Variables | 30 arc sec WGS84        | <a href="https://chelsaclimate.org/">https://chelsaclimate.org/</a>                                     |

## Selected literature

Krystufek B., Zorenko T., Bontzorlos V., Mahmoudi A., Atansov N., Ivajnsic D. (2018). Incipient road to extinction of a keystone herbivore in south-eastern Europe: Harting's vole (*Microtus hartingi*) under climate change, *Climate change* 149: 443-456

Naimi, B., & Araújo, M. B. (2016). sdm: a reproducible and extensible R platform for species distribution modelling. *Ecography*, 39(4), 368-375.



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