Assessing the habitat suitability of mason bees in Europe to guide conservation efforts

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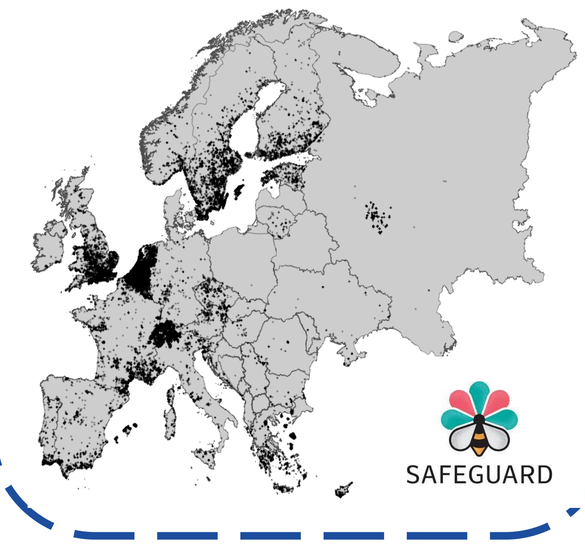
BACKGROUND

Bees are important pollinators in both natural and agricultural ecosystems. Yet, increasing anthropogenic pressures threatens their populations. Despite ongoing research efforts, some groups of bees remain understudied, and their conservation needs therefore remain overlooked. This is particularly true for mason bees (Megachilidae, tribe Osmiini), a diverse group of bees (> 1,100 spp. worldwide, > 240 spp. in Europe) with unique life-history traits. As part of broader conservation efforts, this study investigates the ecologically suitable areas for osmiine bees across Europe using an ecological niche modelling approach

METHODS

Occurrences records

Only species with a min. of 30 unique occurrences were retained (66 out of 246 species)



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Environmental variables
(for 2000-2019)

ISIMIP
Inter-Sectoral Impact Model Intercomparison Project

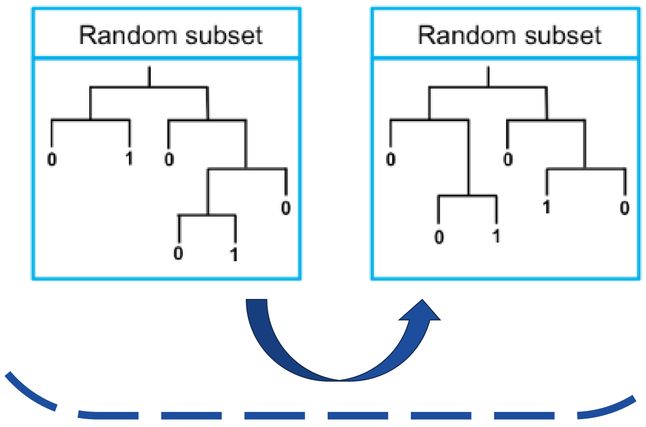
Temperature, precipitation, relative humidity

Human population

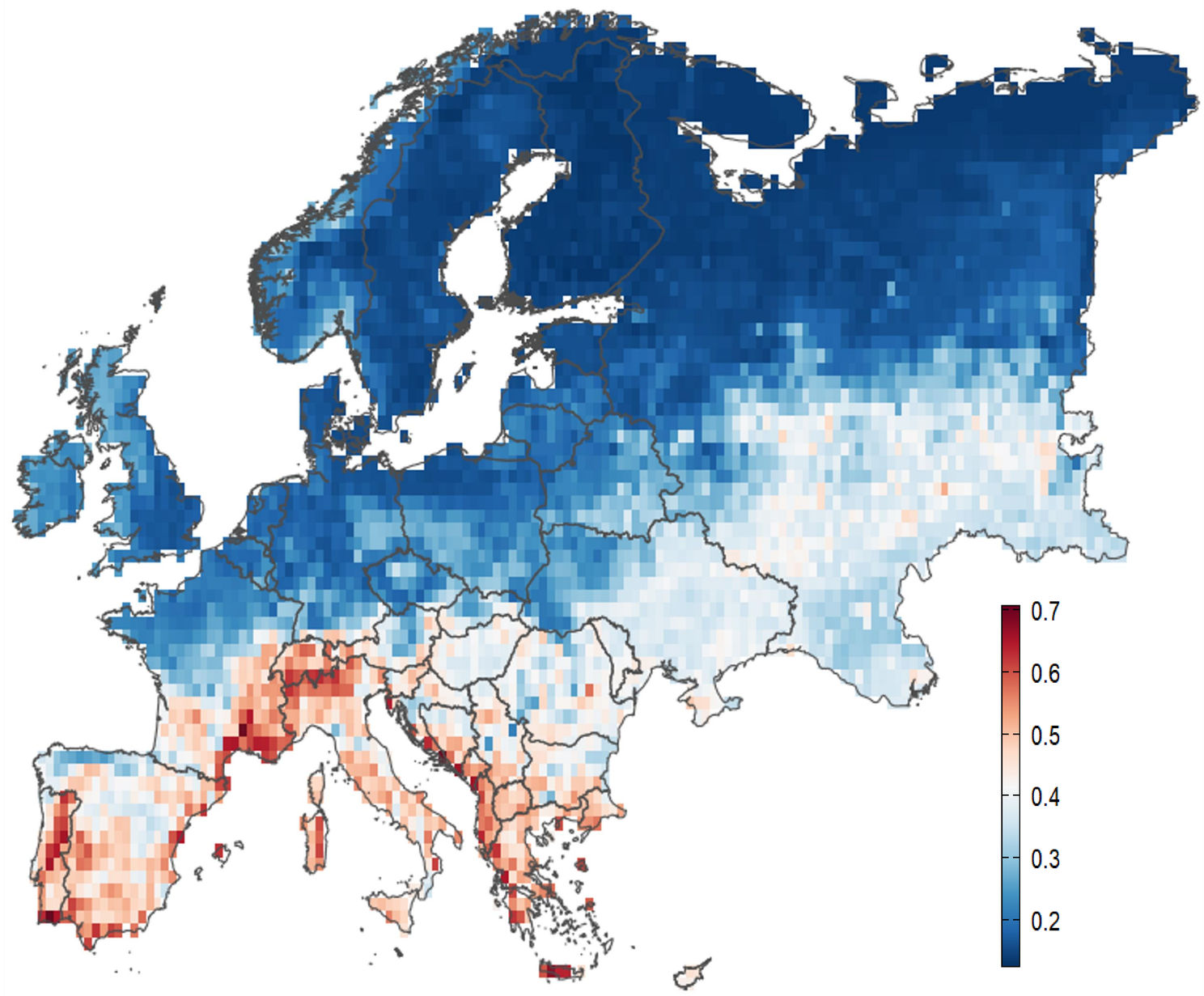
Pastures, croplands, forested-areas

Ecological niche modelling

- Machine learning approach (Boosted Regression Trees, BRT)
- Spatial-cross validation procedure to avoid model overfitting due to spatial auto-correlation



RESULTS



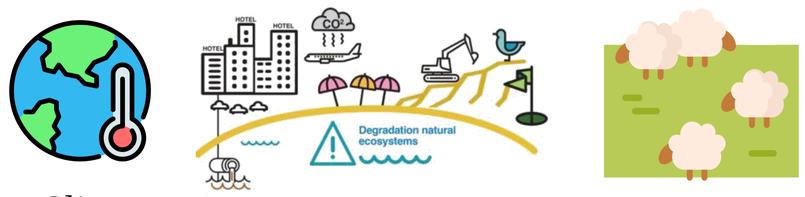
Ecological suitability of mason bee species in Europe. The values of the coloured bar gradient range from 0 to 1 and represent the ecological suitability of the area

KEY POINTS

South-to-north gradient with decreasing ecological suitability

Highest suitability in:
- Mediterranean basin
- Mountainous areas

Highest suitability areas are under growing anthropogenic pressures



Climate change

Tourism

Overgrazing

Main messages:

1. Conservation efforts should prioritize these ecosystems, both for their ecological importance and the increasing threats they face
2. Conservation plans would benefit not only osmiine bees but also support these global biodiversity hotspots

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