

INTEGRATED ANALYSIS OF FACTORS INFLUENCING PLANTS SPATIAL DISTRIBUTION

David Uroz Tomas | Tutor: Miquel Ninyerola
Grau en Biologia Ambiental. Facultat de Biociències. Universitat Autònoma de Barcelona

INTRODUCTION

Due to the high diversity of phanerogams on our planet, spatial patterns are also diverse. Plant species describe a distribution as a result of the interaction between the organism and the environment. Their spatial model can affect the progeny and the conservation of the species, so it is of outmost importance to acquire knowledge of the factors influencing the plants occurrences.

GENERAL PATTERNS IN BIOGEOGRAPHY

Biogeography is the study of the geographical patterns of species¹. This science uses different typologies to describe distribution models of species based on various aspects [Fig. 1].

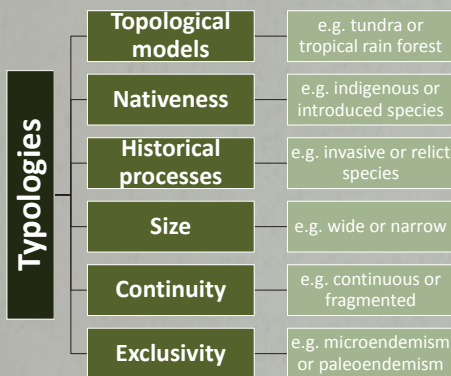


Fig. 1 Distribution models based on different typologies

RELEVANT CASES TO PROTECT BIODIVERSITY

The merely presence of humans manipulate the distribution of life on earth being a serious threat to biodiversity².

The study of the human presence added to the environmental natural dynamics is necessary to avoid a potential loss of biodiversity. Alien and relict species are only two examples of different patterns of distribution that can reduce species richness of native biota leading to extinctions³.

The research about the biology and the ecology of each species could be decisive in order to maintain the biodiversity of every place. To illustrate this fact, one species of each kind inside our territory is considered.

A CASE OF STUDY OF AN INVASIVE PLANT: *Rhaponticum repens*

- Detected in Girona on 2009⁴
- Native from Asia and Eastern Europe
- Presence increased as a result of contaminated alfalfa (*Medicago sativa* L.) seed shipments
- Catalogued as pest for producing negative effects on native grasses by:
 - × Reproduction from seed and adventitious buds
 - × Allelopathic components
 - × Accumulation of zinc
- Tolerant to herbicides. Biological control strategies with the fungus *Puccinia acroptili* are carrying out⁵



Photo credit: Max Licher <http://swbiodiversity.org>

A CASE OF STUDY OF A RELICT PLANT: *Ramonda myconi*

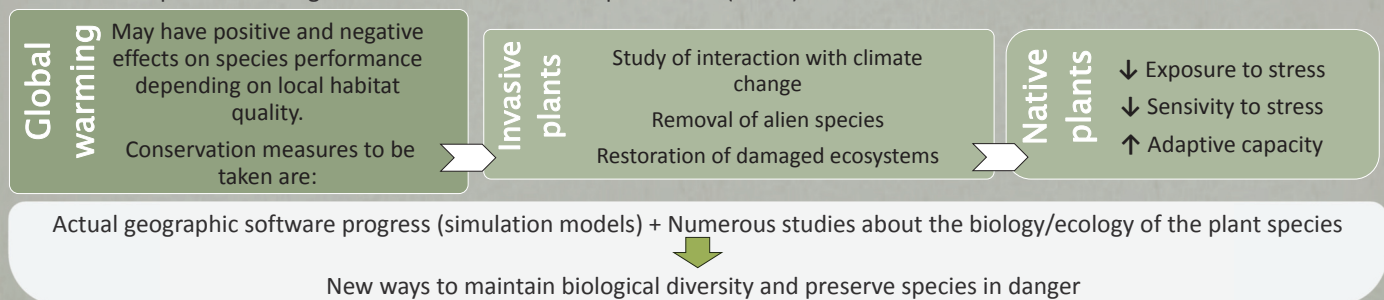
- Located at NE Iberian Peninsula and UK
- Restricted distribution forming patches of isolated populations⁶
- Range based in glacial refugium during Pleistocene glaciations
- Water availability is the main factor controlling populations' dynamics⁷
- Safe sites to establish are also needed
- Possible insect-mediated self-pollination
- Adult longevity and survival preferences before recruitment
- Regeneration and persistence survival strategy



Photo credit: David Uroz Tomas

USAGE OF CEMS TO INFER FUTURE DISTRIBUTIONS

Linking environmental variation over time and space to the plants will allow us to understand the response of the species. Predictions are possible through the use of 'climate envelope models' (CEMs)⁸.



REFERENCES CITED

- ¹ Brown J. H. and M. V. Lomolino, 1998. Biogeography. Sinauer Associates, INC. Publisher, Sunderland, Massachusetts.
- ² Vitousek PM, D'Antonio CM, Loope LL, and Westbrooks R. 1996. Biological invasions as global environmental change. *American Scientist* 84: 468-478.
- ³ Godoy O, Castro-Díez P, Valladares F, and Costa-Tenorio M. 2009. Different flowering phenology of alien invasive species in Spain: evidence for the use of an empty temporal niche? *Plant Biology* 11: 803-811.
- ⁴ López Alvarado J, Crespo Villalba MB, García-Jacas N, Alonso M, Vilár L, Fernanz C, Carlos J, Susanna A, Martínez Flores F, and Juan A. 2011. First record of the alien pest *Rhaponticum repens* (Compositae) in the Iberian Peninsula. *Collectanea Botánica*: 59-62.
- ⁵ Bruckart WL, Eskandari FM, Berner DK, and Aime MC. 2010. Life cycle of *Puccinia acroptili* on *Rhaponticum* (= *Acroptilon*) *repens*. *Mycologia* 102: 62-68.
- ⁶ Riba M, Picó F, and Mayol M. 2002. Effects of regional climate and small-scale habitat quality on performance in the relict species *Ramonda myconi*. *Journal of Vegetation Science* 13: 259-268.
- ⁷ Xavier Picó F, and Riba M. 2002. Regional-scale demography of *Ramonda myconi*: remnant population dynamics in a preglacial relict species. *Plant Ecology* 161: 1-13.
- ⁸ Hijmans RJ, and Graham CH. 2006. The ability of climate envelope models to predict the effect of climate change on species distributions. *Global Change Biology* 12: 2272-2281.