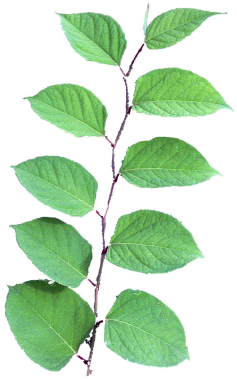

Alien invasive species and climate change: overview of research activities

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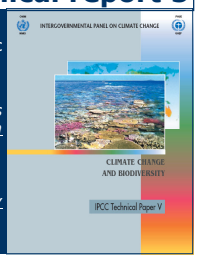
Biological invasions by alien species and climate change represent significant component of global environmental changes that affect biodiversity. As there is evidence that temperature may represent a major constraint on alien species expansion, increasing temperature may conceivably trigger important shifts in alien species distribution range.

The present poster present an overview of the research activities of the Laboratory of Ecology – FUSAGx, addressing the possible influence of climate change on the patterns of invasion by alien plant species. We mainly focus on the pattern of variation of fitness-related traits in relation to climate and the parameters of dispersion and establishment that could be influenced by increasing temperature.

IPCC 2002 Technical report 5

Projected impacts of changes in mean climate and extreme climatic events on terrestrial and marine ecosystems:

- « *The impact of climate change will depend on significant processes such as habitat loss and fragmentation and the introduction of non native species (especially invasive species)* »
- « *Changes in phenology are expected to occur in many species* »
- « *The general impact of climate change is that the habitats of many species will move poleward or upward from their current locations* »



Senecio inaequidens DC. is an herbaceous perrenial originating from South Africa. It was introduced as a wool alien in a few precise locations about one century ago and after a lag phase of several decades, started to spread rapidly throughout Europe and its contrasted climate. Our study uses common garden experiments to assess the differenciation of the species along both altitudinal and climatic gradients. Life history traits are measured and linked to climatic conditions of source populations. Results show that the species evolved along a climatic gradient from the mediterranean to the high Pyrrenean.

This along-invasion differentiation can be linked to mean temperature evolution along the gradient and shows how an introduced species can potentially develop adaptations to new encountered thermic conditions in a lengh of time of several decades. Understanding the adaptative response of a plant to new climatic conditions will help anticipating the potential response of the flora to climate change.

In *Fallopia* species (Polygonaceae), hybridization, polyploidy and a huge clonal growth capacity are probably responsible for the invasive success of several species outside their native range. This project aims to characterize evolutionary processes occurring in invasive polyploid complexes by focusing on hybridization and polyploidization, and their consequences on phenotypic characters in response to changing climate. Besides this, the invasive potential of parent and hybrid taxa is evaluated through the assessment of reproduction, dispersal, germination and establishment capacities, which are directly influenced by the different factors of changing climate.

The naturalisation process of some exotic species occuring in our region seems for the moment limited by the winter cold period.

Cultivation of ornamental species has been recognized to foster plant naturalization of exotics by counteracting environmental stochasticity and by continuously providing propagules. Ornamental exotics that currently depend on the artificial climate and intensive cares of gardens might become invasive if climates shifts in their favor. We assessed the degree of naturalization of a horticultural plant species, *Cotoneaster horizontalis*, in calcareous grasslands, habitats considered as biodiversity hotspots in Belgium.

Ambrosia artemisiifolia is an invasive plant in Europe originating in the East coast of the USA and causing severe problems in several parts of the world because of the allergies caused by its pollen. It is currently present in Belgium, but does not seem to be naturalized yet. Nevertheless, the risk of naturalization and expansion is real if: 1) the climatic conditions evolve to a reheating in the next years; 2) the species evolved or moved since its introduction localities in Europe, creating European ecotypes potentially better adapted to our region 3) the introductions are done from more varied and more numerous spots.

The Belspo ALIEN IMPACT projetc aims to provide a first integrated study of patterns and mechanisms of impact by alien invasive species in Belgium. It considers multiple, highly invasive plant species, and combines large-scale screening of invader impact at different spatial scales with mechanistic methodology at fixed sites to characterize impact pathways. In this context, our laboratory endeavours to identify the effect of invasive plant species on the diversity of native plant communities, characterizing communities that experience greatest impact and characterizing sensitive species or functional types that might serve as bio-indicators for impact. The course of this research program will bring us to evaluate the direction and amplitude of impacts under the assumption that increasing temperature may conceivably triggering shifts in species distribution range.

Take home message

- Invasive species are considered as a major cause of biodiversity loss worldwide. Many invasive species share traits that will allow them to take advantage of the different component of climate change. More and more evidence suggests that species range shifts will occur as a result of climate change, which will undoubtedly be the case for many invasive species.
- Research is needed to further assess the impact of climate change on the invasive success of alien species and the resulting effects on habitats, communities and ecosystems.
- Efforts must be increased to develop methods for preventing new potential invasions and managing nowadays occurring invasive species taking into account their ability to respond to climate change.