Assessing the effect of climate change in vascular plants with disjunct populations

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Introduction

Many species exhibit intraspecific ecological variation and to not consider this ecological differentiation can confound predictions made with species distribution models (SDMs). This problem may be particularly relevant for species where there are few populations with potential local adaptations.

Methods

We selected twelve plant species distributed between the Pyrenees and the South-west Alps, characterized by having groups geographically disjunct populations which are from 30 to 500 km away from the main group. we considered as "aggregate model" for the species the area predicted to be suitable by at least one of each group of populations.

Results

In general, highest range contractions were identified by the species model. The species model forecasted a similar trend as the aggregate model in the majority of species, but in three cases they predicted opposite trends (Table 1). Our results suggest that the inclusion of intraspecific variability does not significantly improve the overall accuracy of SDMs based on all species occurrences but may lead to substantially different conclusions about future range changes.

Conclusion

Our results suggest that intraspecific variability alone may provide a buffer against environmental change, even if the niche is conserved among different intraspecific groups. Consideration of intraspecific differences may ultimately allow us to highlight potential resilience units that can act as potential buffers against the adverse effects of climate change, and to develop targeted conservation strategies accordingly.

Species	Model	Moderate scenario percentage	Extreme scenario percentage
Adonis pyrenaica	core	-10.81	-47.96
	disjunct	-33.56	-90.44
	species	14.49	-31.79
	aggregate	-11.51	-48.8
Eryngium spinalba	core	-36.37	-41.8
	disjunct	320.68	220.99
	species	-7.18	-28.32
	aggregate	14.34	-4.83
Gentiana alpina	core	-14.35	6.45
	disjunct	27.86	69.06
	species	0.49	-23.79
	aggregate	-14.96	4.26

Table 1 - Percentage of range change projected under future moderate and extreme scenarios

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