Past range dynamics and their relationship with current richness: a study case from the SW Alps endemics

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Endemic species are not uniformly distributed across the world but some areas are richer than others. In general, it is widely recognized that past climate changes strongly affected endemic richness and distribution. In fact, endemic species shifted little their distributional range over time, accumulating in the so-called areas of persistence because unable to persist in surrounding areas during adverse periods and to expand their range during favourable ones due to dispersal limitations. According to this expectation, past climate stability was detected as the main driver to endemic richness at global and regional scales. We used palaeoclimatic data and species distribution models to analyse the relative importance of *in situ* persistence versus migration in explaining the current pattern of distribution and richness at local scale using 100 plants endemic to SW Alps. The mean values of predicted persistence over time were very low in all studied species. The currently known endemic richness was positively correlated with gained species per cell, while the correlation with past mean richness and stable species was very low. Moreover, currently known endemic richness was positively correlated to velocity of past climate changes and mean annual temperature, and negatively correlated with temperature seasonality. The low *in situ* values of persistence are consistent with phylogeographical evidences on both endemic and non-endemic plants occurring in the study area, suggesting that within SW Alps species shifted their geographical distribution in order to track favourable climatic conditions. The relationship between current known richness and gained species suggests that at local scale species composition has changed over time and that areas are not located in climatically stable areas, that albeit may have acted as refugia for single species, but in confluence areas, likely as a consequence of the co-occurrence of species colonizing these areas coming from separate refugia. The positive correlation between endemics richness and past climate change velocity is in line with the high temporal and spatial range dynamic detected by species distribution models and provides further support for the idea that short-distance migrations may have weakened both the importance of glaciations in affecting the genetic patterns of endemics and the importance of climate stability with respect to other factors in affecting endemic richness at local scale. Altogether these findings support the idea that dispersal and persistence ability of species may affect the relationship between local and regional species richness and that therefore the relation between endemic richness and explanatory variables is strongly scale-dependent. In order to clarify the past range dynamic of SW Alps endemics and their relationship with environmental variability we are now focusing our study on *Lilium pomponium*, a species potentially prone to extinction risk because of range loss induced by climate change and spanning across Mediterranean to Alpine climate.