

Short-term trends in vegetation cover of Danish semi-natural ecosystems - a landscape-ecological assessment of main drivers indicated by traits of winner and loser species

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The landscapes in which many plant communities persist today are increasingly modified by anthropogenic activities, especially in Denmark, where most communities are influenced by for example atmospheric deposition of Nitrogen, changes in soil moisture levels (e.g. ground water-table changes caused by drainage) and changes in management regimes (primarily reduced grazing-pressure). Such modifications of the environment are filtering the persistence of species into those that are adapted to these new conditions (winners) and those that are not (losers) (McKinney & Lockwood 1999).

Across the landscape, it is reasonable to expect species with similar traits to respond similarly to systematic shifts in habitat conditions and disturbance. Consequently, contrasting traits of winner and loser species could be a powerful tool in identifying mechanisms that might be driving community changes.

In this study, we use a large dataset of vegetation surveys from 207 semi-natural non-forested sites in Denmark, identifying temporal short-term changes in vegetation cover, notably identifying those species that are winners and losers. A further goal is to identify environmental drivers of contemporary vegetation change in Danish semi-natural habitats by quantifying which functional traits makes species decline or increase. We therefore assess whether winners and losers differ with regard to key functional traits and ecological indicator values, and whether these results match our expectations given the current anthropogenic disturbance regime. Notably, do winner and loser species display distinct sets of traits of the ones related to: exotic species invasion, eutrophication by nitrogen deposition, management changes (decreasing grazing and associated encroachment by woody plants), soil moisture changes (due to excessive water extraction and drainage)?

Preliminary results suggest that even during a relative short time span of just seven years, it is possible to identify winner and loser species, indicating that significant shifts in species composition are currently taking place in Danish semi-natural ecosystems. The number of identified loser species was greater than the number of identified winner species, suggesting that homogenization of species composition across the landscape may be a concern.

Today, management of semi-natural habitats is a common conservation measure. However, despite traditional management, habitats may still be vulnerable to compositional changes due to e.g. surrounding land-use and atmospheric nitrogen deposition. The preliminary results from this study, are dichotomous in that it seems some factors as for example soil moisture and woody species encroachment are being managed in a way that opposites expectations from human disturbances, whereas management can not combat the effects of nitrogen deposition. Further analyses are still being developed to differentiate the landscape pattern of winners and losers into the specific habitat-types to induce differences between them in their responses to environmental drivers.

McKinney, M. & Lockwood, J. (1999) Biotic homogenization: a few winners replacing many losers in the next mass extinction. *Trends in ecology & evolution (Personal edition)*, **14**, 450-453.