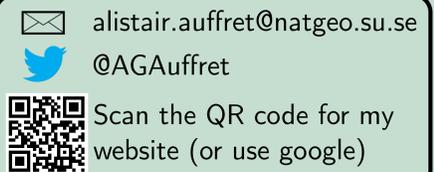


Plant community turnover after a century of change

Alistair Auffret, Elsa Aggemyr, Jan Plue and Sara Cousins

Stockholm University



The Stockholm archipelago was once a thriving farming landscape but agriculture was largely abandoned during the 20th century. Grazing and haymaking were once widespread but are now almost completely gone. We used plant occurrence data from before and after grassland abandonment to ask:

What drives the responses of plant species to environmental change?

Responses



Drivers

Biogeography

Area
Connectivity
Distance to mainland

Functional traits

Dispersal
Competition

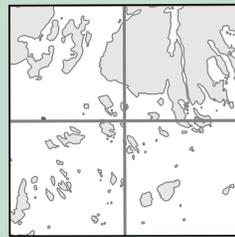
Occurrence data 1900 and 2000

Dataset 1: 27 islands



Specialists
All species

Dataset 2: 64 grid squares (6.25km²)



All species



Grassland plant *Campanula rotundifolia* has traits relating to both dispersal and competition

Results



Specialists

More immigration on **larger islands** and **closer to mainland**

All species

Dispersal and competition facilitate immigration, mediated by **island size** and **connectivity**

All species

Immigration only linked to perenniation, i.e. **good competitors**

Persistence
Good dispersers more likely to go extinct, especially on **smaller islands, far from mainland**

Competition traits plant height, perenniation and seed banking aid persistence

Good competitors - those which are long-lived and taller were more likely to persist



Hepatica nobilis responded well to grassland abandonment, while *Antennaria dioica* disappeared from the 27-island dataset.

Key messages

Both biogeographical variables and plant functional traits combine to determine responses to environmental change at the island scale.

Functional traits and biogeographical variables appear to drive community turnover differently according to spatial scale and habitat specialisation.

Turnover at larger spatial scales can become decoupled from both dispersal and landscape factors.

A bit more detail:

Data

27-island data are based on a revisitation in 2008 of 27 islands inventoried by J.W. Hamnér 1884-1908 (Aggemyr & Cousins 2012, *J Biogeog*). Grid-square data are from *Upplands Flora*, comparing inventories from 1910-1930 and 1991-2005. *Specialists* are those species significantly associated with islands with intensive grassland management in 1901.

Competition/persistence traits were: Plant height, life span, leaf size and seed bank persistence. Dispersal traits were seed mass, seed morphology and seed number. The connectivity measure used is described in Aggemyr & Cousins (2012).

Analysis

We used Generalized linear mixed models to carry out fourth-corner analysis. For each scale/specialisation, a separate model was created to relate species responses (immigration and persistence/extinction) to the plant functional traits, the biogeographical measures and the trait:biogeography interactions. Final models were created using backwards selection. More detail about implementing fourth-corner analysis in GLMMs can be found in Jamil et al. (2013, *J Veg Sci*).