

Functional diversity in a model plant community

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Background and methods

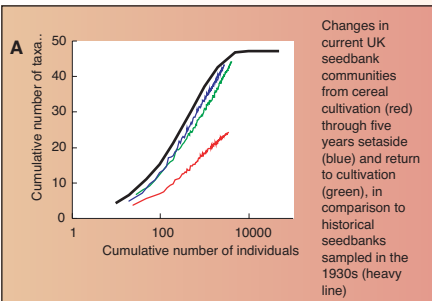
- Intensification of agriculture has reduced abundance and diversity of arable plants and food webs
- Arable diversity, system function and crop productivity are inextricably linked
- Crop variety and field management can in principle be deployed to achieve a sustainable balance, but ...
- ... the species as an accounting unit is too coarse and hide too much diversity
- We therefore seek to link system-level properties of the habitat to small differences in functional diversity of individuals

Our approach is to:

- 1, define the system's properties;
- 2, characterise individuals *ex-situ*;
- 3, reconstruct 'communities' of individuals with known traits and test for expected emergent properties

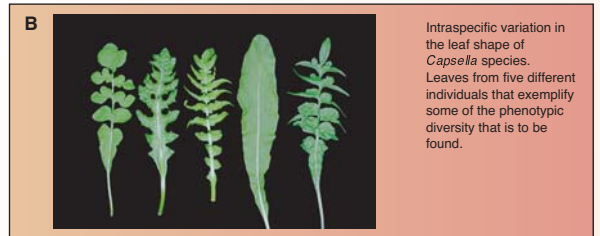
1 Measuring properties of the system

Properties (type-accumulation curves, relative abundance and spatial distribution) are sensitive to crop variety and management



2 Defining individual variation

Capsella (shepherd's purse) was selected as a model plant: it is phenotypically plastic and comprises several distinct ecotypes (B)

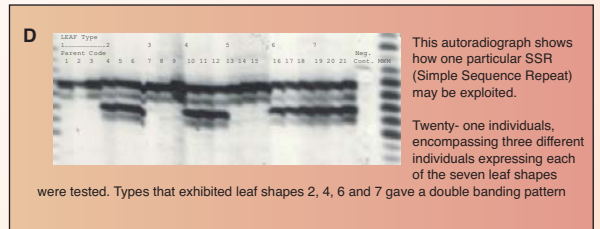


Phenotypic characterisation in controlled environments separates the ecotypes.

Capsella Leaf Types		Chlorophyll content / time to flowering	
1, 2, 3, 4, 5, 6, 7		3, 4	
Leaf number	Seed size		
1	2, 6, 7	5	
2	6	7	

50 *Capsella* individuals gathered from throughout the UK and characterised by their leaf shape (1 to 7). Leaf shape correlates with other ecologically important phenotypic characters.

Genotyping (SSRs) distinguishes the different ecotypes and might identify the link between phenotypic and genotypic variation (D)

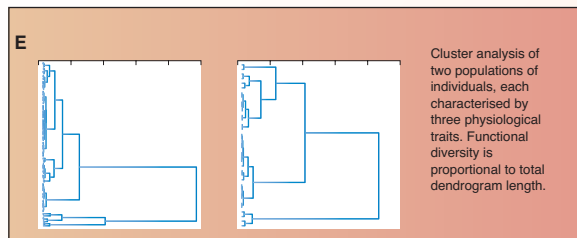


3 Reconstructing assemblages and testing for emergent properties (2003-2006)

Capsella ecotypes were assembled at a 'patch' scale in the field at different population density and background weed flora

Example of emerging system property - total branch length of a dendrogram for 116 plants in a 1m² plot based on three traits, plant height, leaf number and rosette diameter (E), gives a preliminary estimate of functional diversity

Functional diversity in turn relates to the abundance and biomass of different types of insect (herbivores, detritivores, pollinators, predators and parasitoids) living on the assemblage.



Next steps

- Generalise as to how a range of plant traits impacts on food web
- 'Design' crop/weed communities that balance yield and arable diversity
- Use modelling to up-scale over time and space
- Validate by reference to large data sets

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