

Trajectories in trait space reveal more diversity than a population average

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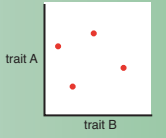
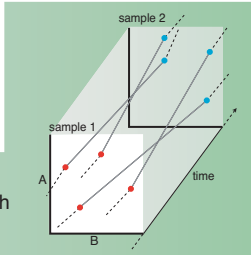
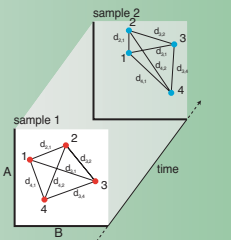
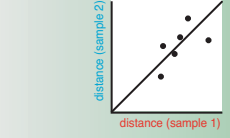
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Introduction

- Ecological science tends to work through population averages but differences between individuals may have important consequences for ecosystem function.
- Our objective is to develop a method for the identification of individual behaviour which we apply here to the life-history processes of *Rumex acetosa*.

Method

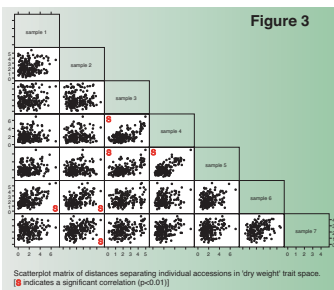
- An ecological process is defined with respect of a number of measurable traits. The trait values act as co-ordinates defining the position occupied by an individual in trait space.
 
- As the process unfolds, the individuals move through trait space resulting in trajectories that describe the behaviour of individuals with respect to the process.
 
- When individual variation exists in the process there are significant differences in the trajectories. In one instance of individual variation, the relative position of the individuals remains constant. Comparing the distances between the individuals in trait space over time is used to identify this.
 
- A significant correlation between distances provides evidence of individual behaviour.
 

Application

The growth and reproduction of *Rumex acetosa* are dictated by the uptake and use of nitrogen within periods defined by grazing events and the length of the growing season.

The mean values of 20 accessions (genotypes) measured *ex situ* and sampled on 7 dates over one year showed changes in biomass and nitrogen in different plant parts that were characteristic of perennial life-history processes (figure 1).

However, the means masked considerable variation between the accessions (figure 2).



Significant positive correlation occurred between distances during peak reproduction (Sample 3-5) and in a comparison of trait positions before and after reproduction. Further examination of the data suggests that these were due to individual differences in the timing of reproduction and the storage capacity of the roots (figure 3).

Figure 1

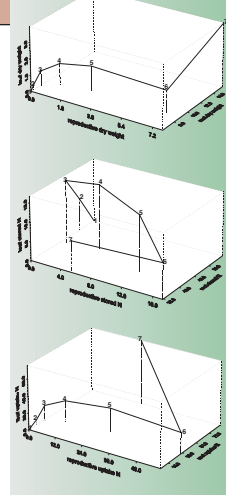
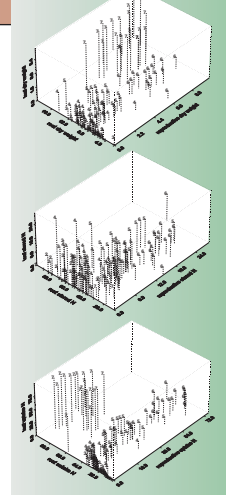


Figure 2



Conclusions

- The approach and methodology reveals information about diversity in populations that was not apparent using population averages. It is a potentially useful tool for interpretation of many ecological phenomena.

Acknowledgements

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