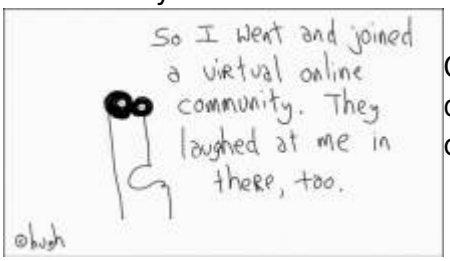
Community

Community Structure

In the three exercises in this section we will build a hypothetical community along an environmental gradient and then use the tools for classifying and sorting communities and seeing how they behave. The idea is to contrast two competing views of community ecology: (1) communities have defined boundaries and (2) there is a gradual transition in species replacement along environmental gradients.

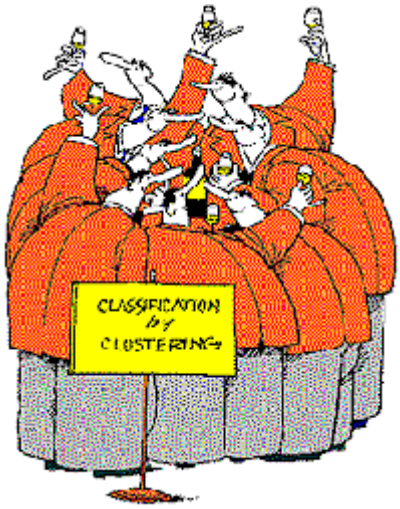
Virtual Community



Let's build virtual plant communities based on Frederic Clements' ideas of “superorganism” (communities with well-defined boundaries) and Henry Gleason's individualistic concept (communities without clearly defined boundaries).

- Virtual Community Tutorial

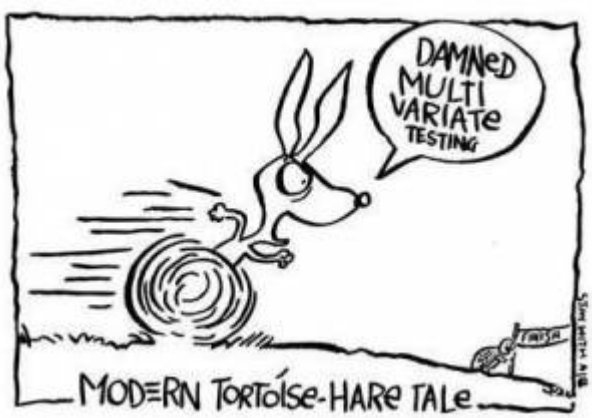
Classification



Classification methods group objects according to the similarity of their attributes. They serve to identify sets of more similar objects that, in our case, are plots of plants. However, the method can also be used for other noble purposes, such as classifying single malt scotch whiskey. This work was published in the journal Applied Statistics (1994) 43, No. 1, pp. 237-257, one of the most renowned journals in the field of Mathematics and Statistics, with one of the most renowned ecologists today, Pierre Legendre, from the University of Montreal in Canada. He and his son published one of the reference books for anyone interested in quantitative methods in ecology: “Numerical Ecology”. This exercise is dedicated to them.

- Classification by Clustering Tutorial

Ordenation



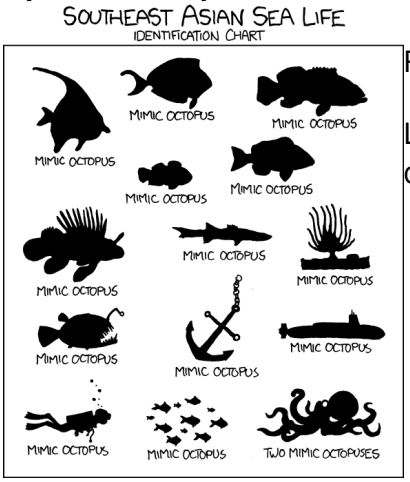
Ordination is a method of redescription of multivariate data in order to present them in few dimensions, usually 2 or 3, with minimal loss of information. Let's use one of the first ordination methods described - polar sorting. This method was developed by John Thomas Curtis and served as a way of revealing gradients in his studies of plant communities in Wisconsin, considered as evidence against Clements' theory of communities as a superorganism.

- Ordenation Tutorial

Succession and Disturbance

Natural disturbances were long considered an exogenous and rare factor in natural systems, but today they are fully incorporated as an important factor in the organization of communities. Furthermore, the study of disturbances acquired greater importance with the increase in their intensity and frequency by the action of man. After disturbances, plant communities tend to return to a state similar to the initial one, which we call ecological succession. Here we will address the relationships between disturbance and succession, focusing on coexistence and colonization/competition tradeoff in simple models of community dynamics.

Diversity and Stability



Are communities with more species more stable? In the 1970s Robert May showed that the opposite can happen.

Learn about the method used by May to assess the stability of dynamical systems and reproduce her results.

- Diversity and Stability Tutorial

Disturbance and Coexistence

- Disturbance and Coexistence Script

Disturbance and Tradeoff

The concept of tradeoff is very important for ecology and evolution. In the ecological context, it is related, for example, to energetic constraints that prevent an individual from investing in several optimal strategies simultaneously, such as growing and reproducing. In the evolutionary context it is related to the selection of ecological strategies to the detriment of others that are also efficient, for example the size of fruits and the amount produced per reproductive event. Here we present the concept associated with different disturbance regimes.

- Tradeoff Tutorial

Ecological Succession

- Ecological Succession Tutorial

Regeneration Niche

- Regeneration Niche

Dinâmicas Neutras

Modelos neutros em ecologia partem da premissa de que todas as espécie são competitivamente equivalentes, ao contrário dos modelos baseados em nicho. Vamos examinar duas das teorias neutras mais importantes em ecologia, ambas publicados na influente série de monografias MPB, da Universidade de Princenton.

Biogeografia de ilhas

Além da teoria neutra de evolução molecular de Motoo Kimura de 1968, Hubbell baseou-se fortemente na teoria de biogeografia de ilhas de MacArthur e Wilson. A teoria de biogeografia de ilhas foi criada para explicar um padrão muito recorrente na natureza: a relação entre o número de espécies de um local e sua área. A teoria mais aceita até então, baseada na idéia de que cada espécie possui um nicho, propunha que ilhas maiores tinham maior riqueza de espécies porque continham maior diversidade de habitats. Já a teoria de MacArthur e Wilson propõe que o número de espécies de uma ilha é determinado apenas pela taxa de extinção das espécies já presentes na ilha e pela taxa de imigração de espécies vindas do continente.

- Roteiro Biogeoografia de Ilhas

Teoria Neutra da Biodiversidade

Stephen Hubbell partiu da Teoria de Biogeografia de Ilhas e de sua vasta experiência com dinâmica de florestas tropicais para propor um processo simples de nascimentos e mortes que explicaria a grande diversidade nos trópicos. Conheça mais sobre a polêmica "Teoria Neutra Unificada da Biodiversidade e Biogeografia", para a qual qualquer espécie pode estar em qualquer lugar.

- Roteiro Teoria Neutra da Biodiversidade