GOLD NUGGET

Distribution Patterns - Biogeography

Historical and Scientific Context

Biogeography is the study of the large-scale distribution of biodiversity through space and time. This science aims to reveal biodiversity regulation and its link with ecosystem biological functioning, goods and services, such as maintenance of productivity, of soil and atmospheric quality and of soil health. Ecologists studying plants and animals have long recognised that an examination of the modifications in diversity throughout a landscape is pivotal to understanding the environmental factors that drive the magnitude and variability of that diversity.

Soil biodiversity is extremely complex, ranging from microorganisms to macrofauna. Some of the questions that arise when considering large scales:

- are soil communities a 'black box' with no spatial structure or do they exhibit a particular distribution with predictable, aggregated patterns on local to regional scales?
- are spatial variations brought about by contemporary environmental factors or historical land use and contingencies?
- which environmental factors contribute most to the structure and diversity of the soil community on large geographic scales?

Drivers of soil biodiversity distribution

The factors that regulate the diversity and distribution of below ground communities are less understood than those acting on aboveground organisms. The activity and diversity of soil organisms are regulated by both abiotic and biotic factors.

The main abiotic factors

The main abiotic factors are climate (temperature and moisture), soil texture and structure, salinity and pH. Overall, activity and growth of soil organisms increase at higher temperatures and soil moisture levels.

Soil texture and structure also strongly influence the activity of soil biota. For example, clay soils favour microbial and earthworm activities; whereas sandy soils, with lower water retention potential, are less favourable.

Soil salinity can also cause severe stress to soil organisms, leading to rapid desiccation. However, increased salinity may sometimes have positive effects, by making more organic matter available. Similarly, changes in soil pH can affect the activity of species and nutrient availability.

The main biotic factors

The main biotic factors are vegetation composition and diversity, and aboveground trophic interactions. In addition, within soil food webs, each group can be controlled by bottom-up or top-down interactions. Top-down effects are mainly driven by predation, grazing and symbiotic relationships. Bottom-up effects depend largely on competition for access to resources.

Recent biogeographical studies on soil communities have mainly focused their attention on microbial communities; in particular, on the distribution of soil bacteria.

Farming Secrets says:* *Remember: Plants Drive The System

***Ref:* A Global Atlas of Soil Biodiversity p 68**