

Soil and Biodiversity

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Soil biodiversity reflects the mix of living organisms in the soil. Soil provides the habitat to a wide range of organisms, in fact a single gramme of soil may contain millions of individuals and hundred thousand species of bacteria. In addition to the microorganisms (which are not visible by the human eye), the soil also hosts a wide variety of microfauna (less than 0.1 mm): nematodes, tardigrades, rotifers; mesofauna (0.1 – 2 mm): mites, springtails, enchytraeids, pseudoscorpions and diplura; macrofauna (2-20 mm): earthworms, ants, termites, centipedes, millipedes and woodlice; megafauna (more than 20 mm): burrowing mammals like moles, naked mole-rats and gophers. Soil also supports a wide diversity of plants, fungi and lichens. So how does the soil provide a habitat for such a range of organisms?

The soil is made up of a variety of materials, from the physical structures (peds) which are made up of sand, silt and clay particles, which are bound together and supported by organic matter. Soil peds come in a variety of sizes and shapes, which allows for air and water pockets to be created between the ped units, these are known as pores. The pore network provides habitat niches of different sizes and resources of food and shelter within the soil. The pore network and soil structure strongly determine the habitat available within a soil and therefore it is essential to ensure that soil is managed in a way that supports this network of pores and peds. Soil fauna are also capable of engineering the soil habitat, particularly the macrofauna. Earthworms provide a good example, where they create either vertical or horizontal burrow networks within the soil to access food and these burrows provide new habitats for microorganisms and or microfauna, which often colonise the surfaces of these newly created burrows. The earthworms are also able to support the development of soil structure, by eating the soil and through digestion, they break the particles down and create new structural units in the cast material they excrete.

Soil biodiversity also plays a strong role in supporting many of the processes or functions which take place in the soil. A few examples are:

Primary productivity - Mycorrhizal fungi create symbiotic relationships with plant roots and aid the host plants in acquiring nutrients to support plant growth and development, in response the plant provides the fungi with simple sugars as a food source.

Nutrient cycling - The food web within the soil (who eats who) often contributes to the mineralisation nutrients, for example bacterial-feeding nematodes increases the rate of decomposition and release of nitrogen compounds for plant uptake.

Decomposition of carbon compounds – while soil microbes are responsible for the vast majority of respiration and decomposition in soils, they also need the bulkier organic material to be broken down. Oribatid mites are well known for this process, breaking down the physical leaf into more decomposable material, through fragmentation.

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