GOLD NUGGET

Soil Biodiversity And Ecoregions – Antarctica
Part 2

Geothermally active soils represent very distinct microhabitats. Several active volcanoes create geothermally heated soils in an otherwise cold environment and support distinct communities both aboveground (i.e. mosses) and below ground, with several endemic species of bacteria known only from such sites. Importantly, geothermally active soils may have acted as refugia during the last glacial maxima. The diversity of soil invertebrates is relatively low compared with soils in other biomes. Only two higher insects and some 225 species of mites, 85 species of collembolans, 49 species of nematodes, 30 species of rotifers and 41 species of tardigrades have been officially recorded.

The species richness of microbial communities is still not well described although recent studies suggest that there is a considerable diversity of bacteria with a high proportion of novel species. Most of the taxa are indigenous and several genera are unique to Antarctica. Recent advances in molecular tools have provided evidence of an unexpectedly high diversity of microbes in the polar desert. More than 14 different phyla of bacteria have now been recorded, with the most dominant phyla representing the Acidobacteria, Actinobacteria and Bacteroidetes. By contrast, the Proteobacteria tend to dominate the soils in maritime Antarctica. There is substantial variation in the composition of microbial communities between different regions and landscape types. Therefore, Antarctic soils harbour a high number of novel microbial and animal taxa that contribute significantly to global soil biodiversity.

Adaptations to local conditions

Not only are Antarctic organisms exposed to low water availability and temperatures, they also experience other extreme conditions, such as high salinity and pH values, and even hot soils in the case of geothermally active areas. Many native Antarctic organisms show significant adaptation of growth and survival strategies to survive the severe environmental conditions. Several taxa of Antarctic soil fauna, including nematodes, tardigrades and rotifers, are able to enter a dormant state that allows them to survive for many years. Tardigrades, for example, have been 'revived' from dried plant material after 120 years, and survived being exposed to temperatures near absolute zero as well as several minutes at 151 °C, high pressure and in a vacuum.

Both nematodes and rotifers show similar enhanced capacity to cope with environmental stresses including freeze tolerance. Water inside animals generally does not freeze at 0 °C, and by producing anti-freeze molecules, the freezing point can be lowered even further. Some Antarctic organisms display significant supercooling capabilities. The collembolan Gomphiocephalus hodgsoni, for example, has been shown to be able to avoid freezing down to −37 °C . To achieve significantly lower freezing points, native Antarctic collembolans generally produce sorbitol and mannitol, whereas mites produce glycerol.

Antarctic terrestrial ecosystems represent one of the most extreme soil environments on Earth, and are inhabited by a unique collection of species, many of which are found nowhere else on Earth. As many of the native organisms have evolved and adapted to the local environmental conditions they are genetically and functionally distinct from many of the organisms found in what we consider more 'normal' environments. They represent an invaluable pool of novel genes as well as unique functions. Importantly, these endemic species may be highly vulnerable to global change.

Soil Lovers say: ***The Amazing Evolution And Adaptation Of Species Happens Over Long Periods Of Time***

Ref: **A Global Atlas of Soil Biodiversity p86**