Protist diversity along a pH gradient

Karin Steffen

In my master thesis, I try to elucidate a putative effect between the acidity of a soil and which microorganisms inhabit it.
'Protists' is the name for a collection of different groups of microorganisms that don't fit into any of the three more known groups of organisms with a nucleus. That is they are neither plants, nor multicellular animals nor fungi. But, what are they actually, how come I don't use a more common name for them?
Protists are often unicellular and cannot be seen without a microscope. Thus they are commonly overlooked and have no known vernacular names. We notice their existence mostly when they impact us, for instance *Phytphthora infestans*, the protist causing potato blight resulting in famines in Europe in the 1840s due to failed potato harvests.
Other soil microorganisms such as bacteria and fungi have shown a correlation between pH and community composition, which means both their number and the species found vary within a sample in correlation to pH. Such a correlation between pH and protist community composition has long been hypothesized and was investigated previously, but the earlier study did not find support of said correlation. We decided to take up this question again as we had access to a unique sampling location. All our soil samples were taken in a very close range of less than 100 m. This means that other factors from the environment with potential influence on the protist communities such as temperature, water content of the soil and even vegetation were very similar. This way, we could separate pH effects on protists from other environmental effects on them.
To investigate the hypothesis, we took five soil samples that covered the pH range from 3.9, which is very acidic, to 7.9, which is slightly basic. We extracted all DNA from it, and by amplification, subsequent parallel sequencing and computer analyses, we generated a list of organisms that were found in each sample. We statistically analyzed these results and found support for a correlation on two levels. Within individual samples, the diversity (number of different species) decreased at low pH. Compared between different samples, the species composition was more different with decreasing pH.
A possible interpretation of the data is that with lower pH, fewer species survive and those that survive are specialized to low pH, thus they differ from the protist species in circumneutral pH soil. These findings are valuable knowledge as they help us understanding different processes in soil for instance in the food web. Moreover, they supplement the picture of soil ecology previously dominated by bacterial and fungi.

Degree project in biology, Master of science (2 years), 2014
Examensarbete i biologi 45 hp till masterexamen, 2014
Biology Education Centre and Program in Systematic Biology, Uppsala University
Supervisors: Allison L. Perrigo and John H.-O. Pettersson