Fluctuating conditions – the ability of freshwater bacteria to cope with a changing environment

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In this time and age, climate change is a hot topic. Scientists predict that the weather will change in most parts of the world. In particular, the weather will probably become more extreme. This means, for example, that there will be more storms, more droughts and more floods than in the past. Some plants, animals and bacteria can deal with this better than others. This is likely to affect what our natural environment will look like in the future, because some species that are very important or common now might not be able to survive when the climate changes, while other species might do much better than before. As a result, this will change how much we can benefit from nature (such as food, timber, fresh air and clean water). That is why it is very important for us to be able to predict what will happen to our natural environment when climate change intensifies.

Now one might wonder where bacteria fit into this story. They seem invisible when one looks around in a natural environment. The fact that they are too small for us to see with the naked eye, does not mean that they are unimportant. In fact, they are essentially the base of many ecosystems. Many bacteria play an important role in breaking down organic matter (such as remains of dead plants and animals), to make the nutrients available again for plants to grow on. Some bacteria can also take nitrogen from our atmosphere and make ammonia out of it. Plants, in turn, can use this for making proteins, which we all need to survive. These are just a few examples of the many things that different types of bacteria can do, without which our world would not be the same, and humans certainly would have a hard time surviving. But just like plants and animals, bacteria are also sensitive to the conditions in their environment: climate change may affect which ones survive, and as a result, which tasks the surviving bacteria can perform.

The goal of my project was to find out if bacterial communities could become accustomed to fluctuations in temperature and if the ability to cope with this kind of changing environment would also help them cope with changes in acidity. I tested this by temporarily increasing the temperature of bottles of lake water several times over a period of four weeks, and then changing the acidity. Throughout the experiment I measured growth rates, enzyme activities and the composition of the bacterial communities. The composition of the communities changed after a few heating cycles, but did not change any more after acid was added. There was some indication that the communities gradually became better at recovering from the changes in temperature, although this was not visible in all the measurements. After being acidified, the communities which had been exposed to temperature fluctuations did better for some measurements and worse for others than communities which had not been exposed to temperature fluctuations.

This shows us that the ways in which bacterial communities respond to environmental fluctuations is very complex. The response probably depends on the type of environmental change one looks at and which bacterial characteristic one measures as well as which types of bacteria were in the system in the first place. Continued study of these types of responses will help us improve the predictions of how ecosystems will be affected by climate change, including nature´s ability to provide us with food, fuel, clean water and air.

Degree project in Biology, Master of Science (2 years), 2015
Examensarbete i biologi 45 hp, Uppsala universitet, 2015
Biology Education Center and department of Ecology and Genetics/Limnology
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