

# Leaf eater at work: Who plays what role? How much biodiversity does it take for an ecosystem to function? WSL researchers are investigating this by reconstructing nature in the laboratory.



Woodlice are scurrying through dead leaves in plastic tubes. In other tubes, earthworms are digging small tunnels in the ground, and some tubes have snails crawling up their walls. These creatures are part of an experiment that postdoc Simone Fontana and intern Yumi Bieri are performing at WSL under the direction of Marco Moretti. They have set up miniature habitats there, so-called mesocosms, in air-conditioned chambers. “We want to use these to investigate how changes in biodiversity affect ecosystems,” says Simone.

Specifically, the researchers want to know how the loss of species and changes in species composition affect the decomposition of leaves on the forest floor, the so-called litter. Invertebrates, such as woodlice, earthworms and snails, play an important role in this process. They eat leaves that have fallen to the ground and shred them. Smaller creatures, bacteria and fungi can then degrade the leaf bits further. In this way, nutrients from the dead leaves are returned to the soil, where plants take them up through their roots and use them for growth.

Litter decomposition thus plays an important role in the forest ecosystem, with different species performing different functions. However, climate change and other human influences are reducing species diversity worldwide. “As a result, important functions have been lost in many ecosystems,” says Simone. He wants to find out whether this is also the case with the decomposition of



Postdoc Simone Fontana watering the miniature habitats in which he is studying how earthworms, snails and woodlice decompose leaves.

leaves in forests. Does decomposition still work if one or more species are missing? And what role do the individual species play in the system?

Simone hopes to answer these questions with the help of mesocosms in the laboratory. The complexity of nature cannot be simulated in such mesocosms, but this is not the goal. “The advantage of lab experiments is that the individual factors in the system can be easily disentangled.”

This is exactly what the postdoc is doing. He first reduces the complexity. In each of the 189 mesocosms – sections of drainpipes 30 cm high – he places only one animal species, i.e. one of each of the three snail, earthworm and woodlice species. “This enables us to find out how much foliage each species decomposes on its own,” says Simone. The pipes are filled with a layer of soil 20 cm deep, with exactly 5 grams of leaves on top. The leaves are birch, maple or equal proportions of both tree species.

### Who eats how much?

If, several weeks later, about half of the leaves have been decomposed, Simone and Yumi finish the experiment and weigh how many grams each species has eaten. This information then serves as a basis for the researchers to gradually increase the complexity in further experiments and combine two or more species or animal groups. One question is whether their total foliage consumption is more when the different species are together than could be expected from their individual consumptions combined. This phenomenon, known as complementarity, often occurs in ecosystems where species complement each other in performing a given function. If a species disappears, it may lead to a function no longer being performed.

In the experiment, the species of a group of organisms are chosen to differ in size as much as possible and/or have different habitat and feeding preferences. “This makes it more likely that they will be complementary, i.e. complement each other,” says Simone. He was able to observe this in earlier experiments with large and small individuals of the same woodlice species. It will also become apparent whether litter decomposition is slower with just one or a few species. “If this is the case, the disappearance of species could cause problems for the forest ecosystem.” If there is a delay in nutrients returning to the soil, it may take longer for plants to germinate and grow. This is something the researchers also want to investigate, which is why, at the end of the experiment, they will take soil from the mesocosms to sow seeds in and then measure plant growth. The experimental animals themselves will be released back into the wild after the experiment.

For more information about the miniature habitats, see: [www.wsl.ch/leaf-eater](http://www.wsl.ch/leaf-eater)

