Study shows isopods may dampen impact of global warming on forest soil

May 19 2015, by Bob Yirka

Credit: Wikipedia.

(Phys.org)—An international team of researchers working in a forest in Massachusetts has found that the impact of global warming on forest soil might be less than predicted due to isopod activity in the same soil. In their paper published in *Proceedings of the National Academy of Sciences*, the researchers describe their study and what they learned about the interaction between forest fungi and isopods.

As the planet heats up, scientists around the world have been trying to predict what will happen to its various parts, one of which is soil. When ordinary soil grows warmer, microbes in it multiply and get busy munching dead plant material in it, which means they cause more carbon to be released from the soil into the air. This is a really big deal because soil actually releases almost ten times as much carbon into the atmosphere as human activities. But there is more to the story, the researchers with this new effort discovered—bugs play a role as well.

If microbes in the soil multiply, the team wondered, what happens with the bugs that live in the soil that feed on them? To find out, they ventured into the Harvard Forest Long-Term Ecological Research site and set up various temperature controlled chambers seeded with various amounts of nitrogen, a type of fungi known as cords, and some isopods (pill bugs). Three months later they came back to see what had happened. They found that as expected the fungi thrived in the warmer chambers in the absence of pill bugs (especially if there was more nitrogen) but in the warmed chambers that had both, the level of fungus was approximately the same as a control group, which suggested that the pill bugs had prevented a fungus population increase, which in turn suggested the pill bugs had prevented an increase of carbon release from the soil.

The researchers contend that their study results indicate that dire predictions of run-away global warming due to increased carbon release from soil around the planet, may not be sound—instead, they believe it might be tempered by microbe eating bugs—something that is not currently being accounted for in models created to predict carbon levels in the future.

More information: Biotic interactions mediate soil microbial feedbacks to climate change, Thomas W. Crowther, DOI: 10.1073/pnas.1502956112

Abstract

Decomposition of organic material by soil microbes generates an annual global release of 50–75 Pg carbon to the atmosphere, ~7.5–9 times that of anthropogenic emissions worldwide. This process is sensitive to global change factors, which can drive carbon cycle–climate feedbacks with the potential to enhance atmospheric warming. Although the effects of interacting global change factors on soil microbial activity have been a widespread ecological focus, the regulatory effects of interspecific interactions are rarely considered in climate feedback studies. We explore the potential of soil animals to mediate microbial responses to warming and nitrogen enrichment within a long-term, field-based global change study. The combination of global change factors alleviated the bottom-up limitations on fungal growth, stimulating enzyme production and decomposition rates in the absence of soil animals. However, increased fungal biomass also stimulated consumption rates by soil invertebrates, restoring microbial process rates to levels observed under ambient conditions. Our results support the contemporary theory that top-down control in soil food webs is apparent only in the absence of bottom-up limitation. As such, when global change factors alleviate the bottom-up limitations on microbial activity, top-down control becomes an increasingly important regulatory force with the capacity to dampen the strength of positive carbon cycle–climate feedbacks.