Ant mounds are more important for biodiversity than previously thought

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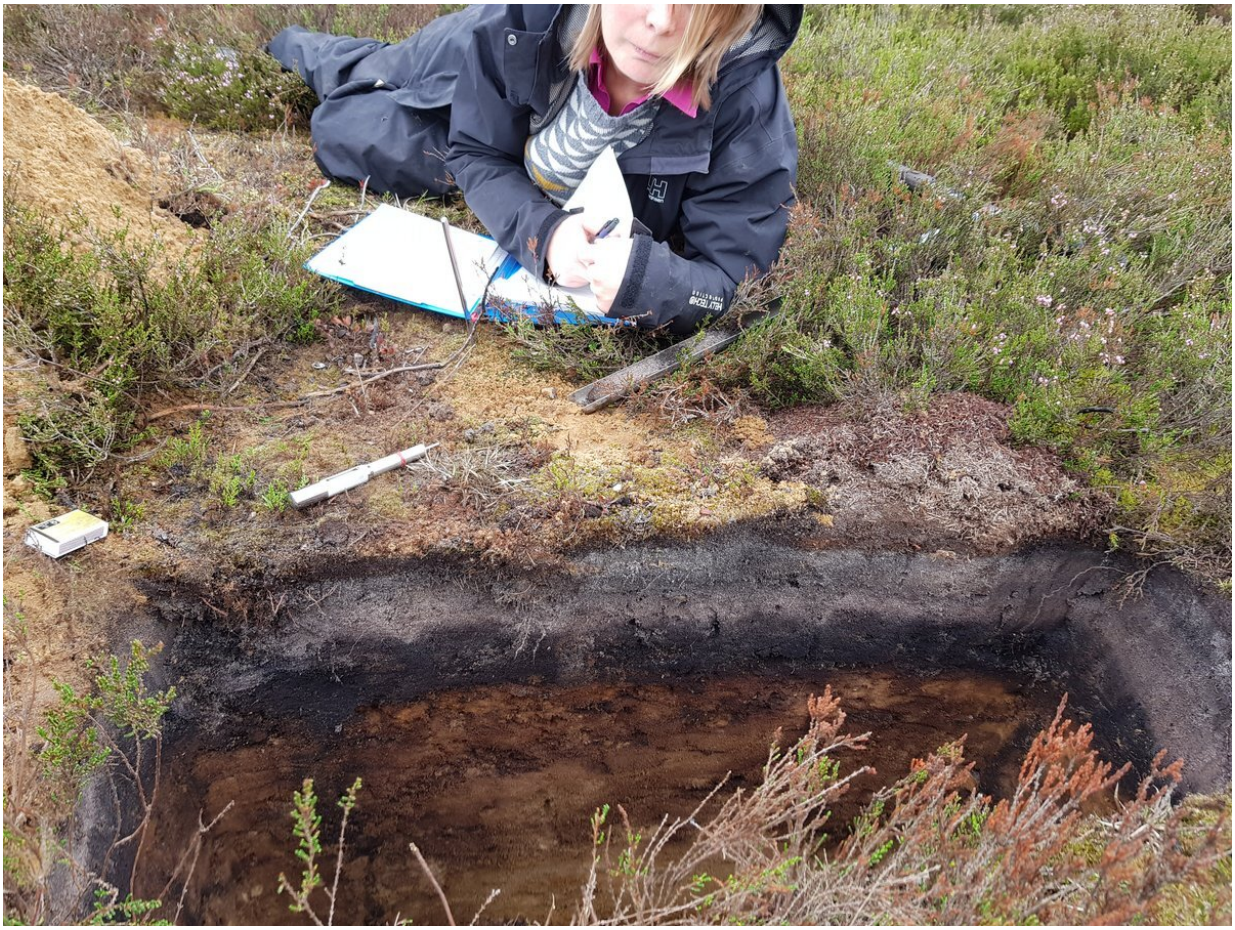

By digging holes next to the ant mounds Rikke Reisner Hansen was able to both see and measure how the mounds affects the soil around them. The thermometer showed that the temperature is slightly warmer next to the ant mound because the ants emit heat. Credit: Aarhus University

Most of us are annoyed by ants in our gardens. There are so many of them. And if you leave food out on your garden table, even for just a couple of minutes, the table will be swarming with ants when you return.

Most garden owners will therefore do everything they can to get rid of ant colonies in their garden. But perhaps we should leave the ants be? Because they are hugely beneficial for biodiversity, a new study published in *Arthropod-Plant Interactions* shows.

With colleagues from the Department of Ecoscience at Aarhus University, Rikke Reisner Hansen has studied ant mounds on Danish heathlands to discover their importance for other insects and for plants.

"The ants drag dead animals back to the ant mound, and this adds carbon and other important nutrients to the surrounding soil. The ant mound moreover warms up the surrounding ground, and in springtime, adders, lizards and beetles like to rest near ant mounds for warmth. The heat and the nutrients create unique conditions that allow certain plant species that don't otherwise thrive on heathland to thrive on the ant mound," she says.

Digging on the heath

Equipped with a spade, Hansen went to the heath to study the role of ant mounds in heathland wildlife. She looked for two types of ant mound:

Those belonging to the narrow-headed ant, which look almost identical to the ant mounds you see in Danish forests. However, instead of pine needles, narrow-headed ants use leaves from heather and grass. And mounds belonging to the yellow meadow ant. This is a small ant that builds its nest from mineral soil on heathlands.

Whenever she came across an ant mound, she took out her spade and dug a deep hole right next to the ant mound. In this way, she could study

how the ant mound affected the soil, roots and wildlife both above and below the mound. She also measured the temperature on top of the ant mound, and she examined the soil around and underneath it to determine the soil nutrients.

"It appears that the top part of the ant mound acts like a kind of miniature Costa del Sol for insects and reptiles. The animals exploit the excess heat from the ants for warmth in early spring and on chilly mornings," she explains, and continues:

"The same applies to plants. If a plant grows on an ant mound, it will blossom or come into leaf faster than the same species growing in the surrounding heathland soil. This is a huge benefit for insects that feed on pollen and nectar, because the ant mounds introduce an extra flowering season."

The butterfly that fooled an entire colony

The Alcon blue is a butterfly that lives only on the heathland where ants live. The caterpillar of the Alcon blue has developed a method by which it tricks the ants into thinking it is their queen.

"The Alcon blue lays its eggs on the rare marsh gentian plant. The caterpillar feeds on marsh gentian seeds during the first three stages of its life. When it has grown big enough, it falls to the ground and begins to emit a smell and a sound identical to those of a queen ant larva," says Hansen, and continues:

"When the worker ants discover what they mistakenly believe is a queen larva, they drag it into the ant nest. They feed the caterpillar, and sometimes they even forget their own offspring, and the colony dies."

The caterpillar winters in the ant mound and, come spring, it spreads its

beautiful blue wings and leaves the ant mound. Denmark is home to 12 species of gossamer-winged butterfly—the family of butterflies to which the Alcon blue belongs. Eleven of these species thrive best in places where ants also live. And a handful of these depend on ants to complete their life cycle.

But the ant mounds are also important for other species. Protecting ant mounds can therefore be an important step in mitigating the biodiversity crisis.

Important for biodiversity

The world, including Denmark, is in the middle of a biodiversity crisis. We are losing species at an ever-faster rate as we destroy important habitats when we fell forests, cultivate heathlands or drain bogs.

A total of 1,844 species of animal, plant and fungi are under threat of extinction in Denmark alone. Among these is the Alcon blue. In just 40 years, the Alcon blue has lost more than 15 percent of its habitat in Denmark. This could be because of the way we manage our heathlands, Hansen explains.

"We tend to manage our heathlands as a homogenous landscape. We often apply the same management method throughout a heathland to preserve it as an open landscape. For example, we allow too many animals to graze the land. Or we use large machines to cut the vegetation. Unfortunately, this destroys the ant mounds.

To ensure many different plants and animals on the heath, we need to rewild the landscape, or at least return it to the way it was before machinery took over from traditional management systems," she explains.

A changing landscape

Before humans began to shape and cultivate the land, most of Denmark was covered in forest. When a lightning bolt hit a tree, it might set off a massive forest fire. Such fires could clear large areas of land, and from the blackened tree stumps and ashes an open heathland landscape emerged and developed.

Slowly, over the course of decades, trees grew up again and eventually the forest returned. In this way, heathlands emerged and disappeared again over time throughout Denmark.

Because the heathlands were changing landscapes, they offered all kinds of habitat and were teeming with life and an abundance of species.

According to Hansen, this is the type of heathland landscape that must be restored in Denmark today if we want to do biodiversity good.

"We have to preserve the ant mounds and not use the same management method throughout the heath. Grazing and burning are important management techniques. But we have to apply methods varyingly and adjust them. If we allow goats, sheep or horses to graze on the same, restricted area throughout the summer, they will eat everything and leave a very homogeneous landscape, she says and explains further:

"It's all about creating a varied landscape. If you apply a varied management system, the result will be a varied landscape."

Leave the ant mounds be

In many places in Denmark, the local government is responsible for maintaining and managing the heathland landscapes. Therefore, since

local governments often decide the vegetation management plans, maybe they should consider what Hansen has found out?

"Local governments have many skilled biologists in their workforce. They know it's important to apply varied heathland management techniques. Unfortunately, it is often a matter of finances, and biodiversity is on the losing end," she says.

But local governments are not the only ones who should listen to what Hansen has to say. Garden owners also need to change their game. At home, in her own garden, Hansen has been experimenting. She has left the ant mounds be. And this has led to much more life, she explains.

"After I left the ant mounds be and sowed wild, indigenous pea flowers, I now have many more common blue butterflies in my garden. It's teeming with beautiful, blue butterflies," she says.

She explains that it is not enough to plant a few meadow flowers here and there to create more biodiversity. It is important to think about the living conditions needed for the butterfly to complete its entire life cycle. Many insects need a variety of landscape types.

"For example, bees need areas with bare, solid soil. Small, warm spots where they can make nests. Other insects need small mounds of earth, water or deadwood. It's also important to have plants that provide different types of nectar. Some bees can only use the nectar from a single or a few species of flower, and some butterflies only live on certain plants. It's important that we ensure these small habitat variations in our gardens, both in terms of space and across the year, if we want to give diversity back to nature," she concludes.

More information: Rikke Reisner Hansen et al, Ant mounds extend the duration of plant phenology events and enhance flowering success,

Arthropod-Plant Interactions (2023). DOI: 10.1007/s11829-023-09946-z