Climate change is pushing the pine beauty moth northward 50 years ahead of earlier predictions

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Pine beauty moth (Panolis flammea). Credit: Olli-Pekka Tikkanen

In Finland, climate change is causing the pine pest Panolis flammea, or pine beauty moth, to shift its range northward 50 years ahead of

predictions. Changes in both the distribution and size of the pine beauty moth population are linked to higher temperatures, a new study from the University of Eastern Finland shows. The findings were reported in the *Scandinavian Journal of Forest Research*.

"This is not unexpected, since many scientists have previously predicted that some insect pests will shift their distribution range northward as a result of rising temperatures caused by climate change. However, what is astonishing is that this is happening 50 years ahead of earlier predictions," Doctoral Researcher Alexander Pulgarin Diaz from the University of Eastern Finland says.

The larvae of the pine beauty moth feed on the needles of different pine species across Central Europe, developing periodical outbreaks often controlled with chemical insecticides. These outbreaks co-occur with other pine insect pests and diseases and could reach thousands of hectares. Outbreaks have not been reported in Finland, but conditions for their development could become favorable as a result of increasing temperatures and forest health decline—both of which are consequences of climate change.

Earlier studies have shown that temperature is closely related to the development and distribution of insects. To study the distribution and size of the pine beauty moth population in Finland, the researchers coupled the number of captured individuals with the previous year's thermal sums for the same location. For this, they used traps throughout Finland and found that this insect pest had spread into northern Finland, up to 68°51'N. Also, they found that its abundance was higher in warmer places, as in southern Finland.

As climate change advances and temperatures rise in Finland, the range and population density of the pine beauty moth may also increase, allowing it to become a common, abundant pine-feeder throughout the

country. The results of this study on the pine beauty moth are parallel with previous findings on another major pine defoliator, the Nun moth (Lymantria monacha), which also has increased significantly in Finland since 2000.

More information: John Alexander Pulgarin Díaz et al, Thermal sum drives abundance and distribution range shift of Panolis flammea in Finland, *Scandinavian Journal of Forest Research* (2022). DOI: 10.1080/02827581.2022.2060303

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