

Moths prefer to reproduce in the dark

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Night-time is no longer dark by definition in our country. 'Light pollution' is increasing by around 6% each year, while the ecological consequences are still largely unknown. 'Cloaked in darkness,' as Koert van Geffen puts it. Van Geffen earned his PhD from Wageningen University for his research into the effects of artificial light on moths. His research showed that the effects go much further than, for example, an attraction to lampposts.

We have known for some time that moths can be disturbed by artificial light because they are attracted to light sources, especially ones with a high level of radiation in short wavelengths. Koert van Geffen has shown that there are many more aspects of moth life that are disturbed. They no longer know what time of the year it is, for example, which means they no longer know what to do. Males and females can no longer find each other, resulting in less mating. 'Considering the rapid decline in the moth populations in Western Europe, it is extremely important that we obtain more insight into the ecological causes of this problem,' he says.

Adjusted caterpillar calendar

As part of the 'Light on Nature' project, Van Geffen studied the effects of night-time artificial light on the development of cabbage moth caterpillars (*Mamestra brassicae*), which hide during the daytime and come out at night to eat. It turned out that the caterpillars did not grow more slowly but during pupation, it became clear that the caterpillars' calendar was disrupted. Caterpillars that live in the summer when the days are long pupate and become a moth immediately. During the fall, when the days are short, the caterpillars need to wait in their cocoon until spring. This puts them into a rest phase or diapause. The caterpillars who spent long nights without light in the experiment easily entered the rest period, but those whose long night was disrupted somewhat did not enter into diapause and quickly emerged as a moth – too quickly it turned out, resulting in a higher death rate in the winter.

Changing pheromones

Female moths attract males using pheromones, species-specific combinations of odours. The females only do this at night. The research showed that, when exposed to night-time artificial light, the females produced far fewer pheromones and the composition and smell were

different. The most important attractive substance decreases and substances that repel the males increase. 'My field research showed that this in fact results in females in the light mate less often than females in the dark,' says Koert van Geffen. Of the females in the dark, more than half mated, while this was no more than a fourth in the light, depending on the type of light.

Darker nights are needed

In general, Koert van Geffen has concluded that the effects of artificial light on moths go much further than an attraction to, for example, lampposts. But this does not hold true for all types of light. 'Nearly all results showed that the effects are relatively small or even absent with red light. This means that adapting the spectral composition of light sources, especially reducing radiation with short wave lengths, can be an effective means to reduce the negative effects of artificial light on moths. However, this is not the solution to what is really needed: darker nights.'

Provided by Wageningen University

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