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Branching Out
from the Canadian Forest Service - Laurentian Forestry Centre

Spruce Budworm: Pursued by Red Mites

Spruce budworm (SBW) is the most serious insect pest attacking Canada's balsam fir stands. It is capable of making migratory flights over distances of up to 500 km. After laying a portion of their eggs, the fertilized females become as light as the males and fly with them in the upper atmosphere. The winds carry them towards stands that they hope will be more favourable to the development of the eggs that they still have to lay. As a result, budworm moths disperse and create new outbreaks. Canadian Forest Service (CFS) researchers recently discovered that red mites (*Leptus triati*) offer a way to track the routes followed by the moths during their migrations[1].
What is this discovery all about?

A mite with two functions in life

Commonly called red mites because of their scarlet colour, the mites of interest to the CFS researchers exercise two functions during their lifetime: predator and ectoparasite. During the pupal or adult stage, these mites are predators with a fondness for insects and their eggs. In the larval stage, they are ectoparasites, meaning that they live on the adults of several types of insects, including the spruce budworm, without killing them. Because these larvae live on the surface of the insect, they have developed mouthpieces capable of piercing the tissue of moths and drawing out their body fluids. Moreover, while feeding on their victims, these mites use them as a vehicle for their dispersal. The high degree of mobility of the moths explains this parasite's attraction to the budworm.

Red mite, predator of SBW eggs.

SBW female in flight.


Leptus triati on an SBW moth: Migration markers.
Photo: NRCan

1. In the past, SBW migration was studied using radar and visual observations made on scaffolding overlooking the forest canopy. In this case, red mites are used as visual markers. Other research work using genetic markers is being carried out to distinguish between "migrating" SBW and "local" SBW.

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Surprises!

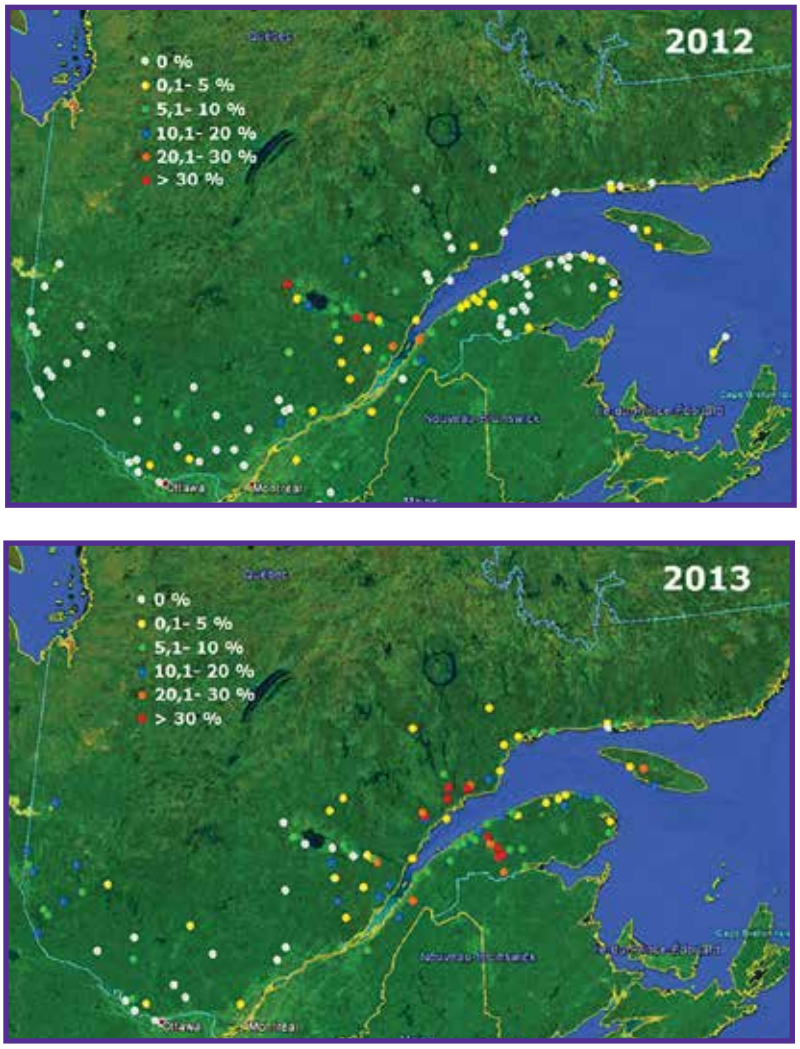
In 2011, during field studies of the dynamics of SBW populations in the Lower St. Lawrence region of Quebec, CFS researchers observed red mites among the moths captured in various types of traps. The parasitism rate in these populations was about 10%, whereas it was almost zero in two other populations near Quebec City that the researchers were also monitoring.

In 2012, the parasitism rate in the Lower St. Lawrence region populations fell to below 2%, then rose to the 2011 level in 2013. The researchers concluded that the mites have a 2-year life cycle (see maps).

The researchers had another surprise during the hot night of July 15-16, 2013, when swarms of moths during their peak period of emergence invaded the city of Rimouski and the surrounding area. At almost the same time, there was a sudden increase in the number of moths caught in the Armagh area, about 300 km west of Rimouski, although the activity of local moths had practically ended. It was found in the analysis of the moths caught in Armagh that there were as many parasitized moths as there were among the moths caught in the Lower St. Lawrence region. The researchers therefore assumed that the moths caught in Armagh had come from the same place as those caught in the Lower St. Lawrence region.

Is the use of red mites as markers something new?

This association between red mites and SBW moths was observed for the first time in Maine during the most recent outbreak (1970 to 1990). There is no mention of these mites in Canada in the scientific literature.



Parasitism rates in SBW populations infested by red mites in Quebec. Credit: NRCan

Since the start of the new outbreak in Quebec, CFS researchers have stepped up their work on SBW populations in the North Shore and Lower St. Lawrence regions. They have found that red mites are present and wish to study their potential as SBW migration markers. Using moths harvested by the various provincial departments operating within their permanent network of traps, CFS researchers are mapping potential moth-emitting and moth-receiving areas. The presence or absence of red mites will help them obtain a better understanding of the spatial and temporal evolution of SBW outbreaks in Canada.

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