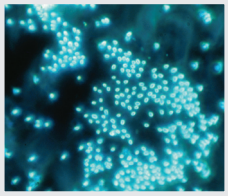
Natural Resources Canada | Ressources naturelles Canada

In Brief

from the Canadian Forest Service – Laurentian Forestry Centre

Number 22 – 2010






First Canadian report of white rot decay in pine

In Ontario, a team of Canadian Forest Service pathologists have identified the presence of white rot decay in pines. This disease is caused by a fungus injected into trees by the Sirex woodwasp. The fungus and a phytotoxic mucus produced by the insect weaken the host tree and provide conditions favourable to larval development. The insect and the fungus thus have a symbiotic relationship: the fungus uses the insect as a means of transportation and, in turn, it is indispensable to the insect's larval development in the wood.

Although the insect vector is native to Eurasia and North Africa, it has spread in recent decades, particularly in the Southern Hemisphere (New Zealand, Australia, South America and South Africa). The first report of its presence in North America dates back to the summer of 2005, when it was found in the state of New York. The following autumn, the insect was discovered in southern Ontario.

In their natural habitat, the fungus and the insect live in equilibrium with their parasites and host trees. However, their introduction into the Southern Hemisphere and later into North America has led to major outbreaks in forest tree plantations. More advanced genetic tests would make it possible to better determine the geographic origin of the insect-fungus complex. This knowledge is essential for developing biological control agents.

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A new method for assessing the incidence of parasitism of hemlock looper eggs

The hemlock looper (*Lambdina fiscellaria* (Guenée)) is an insect pest of coniferous forests in North America. Several outbreaks of this insect have recently caused severe damage in the Gaspé and North Shore regions of Quebec. In order to monitor population dynamics and forecast damage, it has recently become necessary to assess the incidence of parasitism of hemlock looper eggs by parasitoids of the genus Telenomus in the spring.

Canadian Forest Service researchers have developed a new polyurethane-based oviposition trap for use in estimating hemlock looper population levels and the rate of parasitism of looper eggs. This new, easy-to-use and rapid technique could replace the current population forecasting method which involves collecting branches. The conventional method is time consuming, requires specialized personnel and entails careful extraction operations in the laboratory. A recent study has shown that the polyurethane-based oviposition trap provides results that are just as accurate. Furthermore, the new method can be implemented more quickly, making it possible to establish a more extensive population monitoring network.


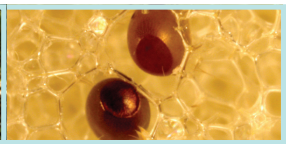

Photo: C. Germain *Photo: C. Hébert*

The new oviposition trap can also be used as a sentinel trap to determine the incidence of parasitism of hemlock looper eggs when population levels are low. Since egg parasitism is a key factor in the population dynamics of this pest, the new oviposition trap represents an effective tool that can be used to track population changes, which will help experts better understand and more effectively forecast outbreaks.

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Influence of the Pacific Ocean on fire frequency in the fire triangle area

Studies done by researchers at the Canadian Forest Service, the Université du Québec en Abitibi-Témiscamingue and the Université du Québec à Montréal show that anticyclonic (high atmospheric pressure) conditions associated with sea surface temperature changes in the Pacific Ocean favour the development of large forest fires in the fire triangle area (area encompassing the Waswanipi, James Bay and Lac Mistassini regions). As its name indicates, this is an area with a high frequency of forest fires compared with the Lac-Saint-Jean and Abitibi regions. Although most of the area is included in the territory protected by the Société de protection des forêts contre le feu (SOPFEU), a steady increase in fire activity has been recorded over the past 30 years.

In addition to using historical fire and climate data, the researchers studied tree growth rings in order to estimate the total area of forests burned prior to 1972, which is when data compilation on area burned began. Years with the largest total area burned correspond to periods of drought linked to high pressure systems, which occur more frequently when sea surface temperatures in the Pacific Ocean are higher than average.

A better knowledge of atmospheric circulation could help experts to forecast its impact on forest fires several months in advance. With climatic change, forest fires are likely to represent a major constraint to sustainable forest management in the fire triangle area.

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This publication is part of a series that presents popularized summaries of scientific articles written in whole or in part by Laurentian Forestry Centre researchers.

Canada

In Brief
from the Canadian Forest Service – Laurentian Forestry Centre

Rove beetles: indicators of the effect of forest management in mixedwood forests

Photo: K. Savard

From the standpoint of protecting litter-dwelling insects, clearcutting and scarification are among the forestry practices that should be avoided in mixedwood forests. Small-gap harvesting is the best silvicultural approach.

A study conducted by researchers at the Canadian Forest Service and the Université du Québec à Montréal in yellow birch and fir mixed forests of the Portneuf region examined the effect of silvicultural practices on rove beetles (family Staphylinidae), which belong to the order Coleoptera. Nearly 9,500 specimens, representing 116 species, were captured. Six species accounted for 82% of all the individuals collected. Given their sensitivity to disturbances, these insects are good candidates for investigating the effect of natural disturbances and forest management practices on biodiversity.

The findings show that small-gap (28 m diameter) harvesting without ground scarification produces the best results in terms of maintaining the natural balance of litter insect populations. These small gaps more closely approximate the type of natural disturbances that occur in the ecosystems concerned. Indeed, deciduous forest renewal occurs when old, large-diameter trees are uprooted and fall, creating openings in the canopy. The study also showed that even a light scarification treatment is deleterious to litter-dwelling insects.

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Are ground beetles good indicators of forest management practices in Canada?

Ground beetles, which numerous species make up the large family Carabidae, are often used as indicators of biodiversity. Their population dynamics are widely used in Europe and western North America to assess the quality of forest management from the standpoint of biodiversity maintenance.

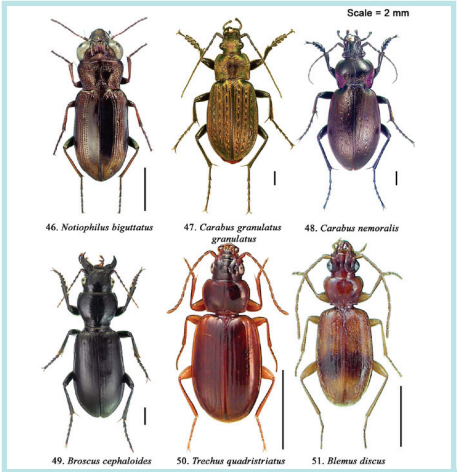

Photo: A. Goulet

In a recent study conducted by researchers at the Canadian Forest Service, the Université du Québec à Montréal, the University of Alberta and the University of Jyväskalä, the use of ground beetles as indicators of forest disturbances was evaluated on a local and regional basis through 10 large-scale forestry studies carried out across Canada. The researchers studied the impacts of various forestry practices on insect populations, ranging from clearcutting to gap harvesting, ground scarification, and even forest fire.

In this research, 152 species of ground beetles were identified, including 16 dominant species and 12 species that are distributed throughout Canada. The researchers noted that populations vary considerably with the type of forest cover (coniferous or deciduous) in which they are found. These results suggest that ground beetles are more effective indicators of forest management practices within the context of individual studies than at the regional or national level.

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A native fungal species may be able to hold the white pine weevil in check

The initial results of laboratory research undertaken by Canadian Forest Service and Institut Armand-Frappier researchers on a pathogenic fungus (*Beauveria bassiana*) of the white pine weevil could lead to the development of a new biological insecticide.

Although the pathogenic role of the fungus has long been known, its effectiveness against the white pine weevil had never been studied. Tests were conducted on five strains of the fungus, including two from Quebec (L'Île-Perrot and Cookshire), which proved to be the most virulent.

Two control strategies were tested in the laboratory, producing excellent results. The first consisted in applying the pathogen to soil, thus simulating infection of adult weevils overwintering in the litter. By tracking adult mortality during winter and during the three weeks following adult recovery in the spring, it was found that among the two isolates tested, between 60% and 88% of the adults had died. The second strategy targeted the weevils during their feeding and egg laying activities on the terminal leaders of pines. The results showed that the tested fungal strains have a high level of efficacy since they destroyed more than two thirds of the weevil population and also reduced egg laying by 50% to 85%.

Further studies will soon be done in the field to confirm the insecticidal potential of the pathogenic fungus under the conditions typically present in a plantation. Studies will also be carried out on the formulation and on the method that should be used to optimize the efficacy of what could become a new biological control tool for this important insect pest.

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