

Where do you come from, little gypsy moth?

With the increase in international trade and climate change, invasive exotic species represent a growing threat to Canadian forests. These species can cause irreversible damage to the environment and economic losses totalling several hundreds of millions of dollars. The Asian gypsy moth is an excellent example of such invasive exotic species which, should it become established in Canada, could cause major damage to Canadian forests. Researchers with the Canadian Forest Service (CFS) are developing tools to determine the geographic origin of the gypsy moths intercepted in Canadian ports.

A little moth with big plans

This pest, which is native to Asia, is able to colonize vast areas rapidly, and its caterpillars can feed on more than 500 tree species, including a wide variety of deciduous species (oak, poplar, willow, linden, birch, apple, elm, etc.) as well as some conifer species (larch, pine, spruce, etc.). The Canadian Food Inspection Agency (CFIA) considers the Asian gypsy moth to be an invasive exotic species at high risk of being introduced into the country, especially by ship. Indeed, this insect has been detected several times in Canadian ports on ships transporting goods from Asia.



Photo: C. Béliveau, NRCan



Photo: T. Arcand, NRCan

The challenge for CFIA inspectors is to distinguish the Asian gypsy moth from the European gypsy moth, a pest which is already established in eastern North America that no longer is regulated. Visually differentiating between the two species in their adult stage is quite difficult, and it is virtually impossible to do so at the egg or larval stage, which are the two stages most often discovered on ships. A misidentification can entail serious consequences, whether it is the introduction of the Asian gypsy moth into Canadian territory or the implementation of unnecessary regulatory measures that could jeopardize future trade.

Branching Out

from the Canadian Forest Service - Laurentian Forestry Centre



Photo: C. Schafellner, BOKU

Science to the rescue

At the request of the CFIA, researchers from Université Laval, the University of British Columbia, and the CFS developed a molecular diagnostic test based on the identification of differences between genomes (molecular markers), which makes it possible to distinguish the Asian gypsy moth from the European gypsy moth. The test can be conducted within 24 hours using just a few eggs.

Pleased with the efficacy of this first test, the CFIA expressed interest in a molecular diagnostic test which, in this case, would enable them to identify the geographic origin of gypsy moths caught on ships or in pheromone traps placed in port areas. Establishing the geographic origin of the moths would allow the CFIA to identify the foreign ports from which the gypsy moths originate in order to improve pest control measures in conjunction with commercial partners. For example, the inspection of ships setting sail for Canada would be systematic in ports identified as major sources of the Asian gypsy moth.

On the lookout for moths

In order to test the viability of such a test, a CFS research team performed an initial study on a small number of Asian and European gypsy moth populations, covering the current distribution area of these two pests: Asia for the first, and Europe and eastern North America for the second. Performed at the genome level, the analyses enabled researchers to successfully identify molecular markers that can be used to accurately identify the geographic origin of the moths examined. Encouraged by this first success, the team decided to repeat the study, this time with a larger number of populations sampled worldwide and in geographic areas neighbouring important foreign commercial ports. Sampling was carried out in the summer of 2017, when 109 pheromone traps were laid out in 23 countries. In Quebec, part of the sampling was carried out in collaboration with nine SÉPAQ parks and the La

Mauricie National Park of Canada, as well as with officials from the Ministère des Forêts, de la Faune et des Parcs du Québec. The 2017 campaign led to the collection of 15,551 gypsy moths, which will be used to generate genomic data. The data will be analyzed during the second quarter of 2018. The aim is to develop and validate a molecular diagnostic test by 2019.

One piece of the puzzle

These studies conducted to identify the geographic origin of gypsy moths are part of a large-scale Genome Canada project names BioSurveillance of Alien Forest Enemies – BioSAFE (project lead: R. Hamelin, UBC/U. Laval). The project aims to develop molecular tools enabling users to quickly detect and trace the geographic sources of four invasive exotic species: the Asian longhorned beetle, the fungus responsible for Dutch elm disease, the pathogen that causes sudden oak death, and, naturally, the Asian gypsy moth.



Photo: H. Philibert, Sépaq

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