Natural Resources Canada | Ressources naturelles Canada

Bulletin 69

FRONTLINE EXPRESS

Canadian Forest Service – Great Lakes Forestry Centre

The Insect Production and Quarantine Laboratories

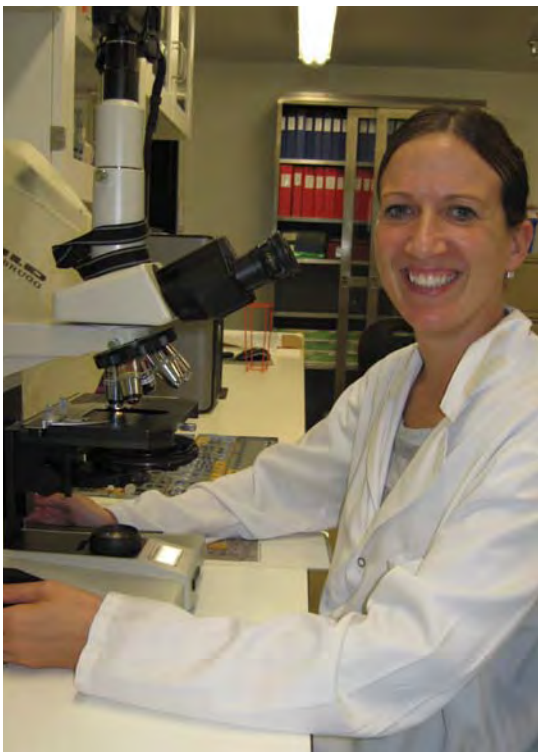
INTRODUCTION

Insect production services at the Great Lakes Forestry Centre (GLFC) are an essential component of much of the native and exotic forest entomology research carried out by Natural Resources Canada, Canadian Forest Service (NRCan, CFS).

In 2009, the area in Canada defoliated by insects or killed by beetles amounted to 15.2 million ha resulting in significant economic losses to the forest industry. By comparison, 611 874 ha were harvested in the same year.

As part of NRCan, CFS mandate to ensure the health of Canada's forests, researchers are working to develop environmentally friendly pest control strategies for insects that cause significant forest defoliation, such as the spruce budworm. The study of alien species has become an important part of the pest management research program because an increase in international trade has resulted in some of these insects entering Canada and endangering Canadian forests. Current alien insects of concern include the emerald ash borer, Sirex woodwasp, brown spruce longhorn beetle and Asian longhorned beetle.

The recently constructed Insect Production and Quarantine Laboratories at GLFC in Sault Ste. Marie, Ontario expands the capacity for the production of insects used primarily for research, and allows scientists to conduct research on alien species, due to the highly specialized quarantine capabilities in the building.



GREAT LAKES FORESTRY CENTRE ROLE

Overview of Insect Production

The Insect Production Services team has provided live insects to facilitate research since 1963. The insect rearing facility is the only laboratory in North America that rears multiple forest insect species and the only one in the world that mass-produces spruce budworm. The facility supports the primary research of about two dozen NRCan, CFS scientists and responds to the changing needs of the pest management research community by varying the inventory of species reared. Researchers can carry out tests on insects under laboratory conditions using these reared insects, and use only the most promising products and procedures for field testing. This lab work allows for ongoing observations of insect behaviour, simulation of environmental variables and testing of potential control methods.

The most common species reared is the spruce budworm, with an average of 3.5 million spruce budworm larvae produced annually. Researchers at GLFC have been successful in creating a strain of spruce budworm that does not require diapause, the over-wintering dormant phase. A great benefit of this development is the speed with which the the non-diapause spruce budworm cycles through its generations. A shorter time span means that researchers do not have to wait more than a few months to determine long-term effects of different experimental treatments.

Other species successfully reared to date include western spruce budworm, fir coneworm, forest tent caterpillar, rusty tussock moth, whitemarked tussock moth, cottonwood borer and cabbage looper. The latter species, while not a forest pest is useful as a test insect. The team has also started programs to rear laboratory colonies of Asian longhorned beetle, mountain pine beetle and brown spruce longhorn beetle to support NRCan, CFS research initiatives. The laboratory ships domestic insects, along with the artificial diets developed for those insects, to scientists at all five NRCan, CFS research centres, to researchers and pest managers at provincial and state agencies, private industry, 20 universities throughout North America, and to research facilities overseas.

Procedures for raising insects

The insect production team must develop artificial diets that are unique to the insect being reared. This is important since living plant material is not readily available throughout the year and it may contain pathogens that can harm the colonies. Typical insect diet contains an agar base as well as vitamins and other essential ingredients such as sugar, salt, vitamins, and casein, which is a form of protein. The diet is put in tiny cups and the small insect larvae are placed on top of it. As they become larger they are transferred to larger cups to allow more room to grow and kept in customized environments. The insects are kept in climate controlled rearing rooms that are programmed to meet the specific needs of each species and stage of development, whether feeding, mating or in diapause. Strict quality control procedures are followed to ensure that each of the insect colonies remains healthy and conforms to acceptable standards.

The Insect Production and Quarantine Laboratories (IPQL) Facility

The laboratories completed in 2011 have more space and enhanced features than the previous quarters of the Insect Production Services, the most notable of which is a quarantine facility that meets strict Canadian Food Inspection Agency (CFIA) standards. The new space houses an insect diet preparation kitchen, a quality control laboratory and two methods development laboratories. In addition, there are nine rearing modules that can house one species each, six of which can be brought under containment and used for rearing invasive insects, four containment modules to accommodate research on invasive species, plus supporting facilities. All scientific areas in the lab are built to the same standards, called clean room technology, similar to that used in hospital isolation and surgical rooms to reduce microbial contaminants. One of the unique design features of the new facility is the use of positive air pressure in rooms with domestic insects to prevent contaminated air from entering, and varying levels of negative air pressure where alien insects can be contained.

The Invasive Species Centre

The IPQL also houses the Invasive Species Centre (ISC), a not-for-profit corporation comprised of staff from Ontario Ministry of Natural Resources (OMNR), NRCan, CFS, CFIA, and Department of Fisheries and Oceans. The ISC aims to promote cooperation among government agencies, universities, the private sector and the public. Led by an independent board of directors, the ISC will provide a national forum for sharing information and coordinating research necessary for implementing the Invasive Alien Species Strategy for Canada and the Ontario Invasive Species Strategic Plan.

CONCLUSION

The insect production services at GLFC assist scientists in improving their understanding of insect pest behaviour and in the development of effective control methods. These methods can be safely tested in the laboratory and only the most promising are field tested. In particular, the new IPQL will allow research to be safely carried out on alien invasive pests in addition to native species, which will help the CFS to remain on the leading edge of research in this area. With the Invasive Species Centre housed in the same building, collaboration between multiple agencies will be enhanced and lead to the development of the most effective strategies for dealing with invasive pests.

CONTACT INFORMATION

Peter Ebling
Great Lakes Forestry Centre
1219 Queen Street East
Sault Ste. Marie, Ontario, Canada
P6A 2E5
Phone: 705-541-5517
Fax: 705-541-5700
E-mail: GLFCWeb@nrcan.gc.ca
Web Site: cfs.nrcan.gc.ca/centres/glfc
Visit the Insect Production Services website:
cfs.nrcan.gc.ca/pages/320

ISSN 1496-7847