



The Insect Production and Quarantine Laboratories

INTRODUCTION

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

Insects have significant ecological and economic impacts on forest health and wood supply in Canada. These impacts far exceed any other natural disturbance and forest harvesting combined. As part of the 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. In addition, the study of alien and potential invasive 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 emerald ash borer (EAB), hemlock woolly adelgid, brown spruce longhorn beetle and Asian longhorned beetle.

Insect Production and Quarantine Laboratories (IPQL) at GLFC in Sault Ste. Marie, Ontario provides the capacity to produce insects used primarily for research, and allows scientists to conduct research on alien species, in a highly specialized quarantine facility 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 grows multiple forest insect species and the only one in the world that mass-produces spruce budworm. The facility supports the primary research of NRCan-CFS scientists and responds to the changing needs of the pest management research community by varying the inventory of species reared. Our insects and synthetically prepared insect foods are also available for purchase to researchers

at other government agencies, educational institutions, and private companies through our website. Researchers can carry out tests on insects under laboratory conditions using these quality 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 1 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 a “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 native species successfully raised and currently available to researchers include western spruce budworm, forest tent caterpillar, white-marked tussock moth, and cabbage looper. The latter species, while not a forest pest, is a useful “standard” insect test species around the world.

IPQL also grows invasive species such as EAB, the Asian longhorned beetle, and the brown spruce longhorn beetle to support worldwide research initiatives. In 2016, IPQL started to grow and mass produce parasitic wasps from China and Russia as classic biological control agents for release in Canada against EAB. The wasps currently raised and available to scientists for distribution include EAB larval parasitoids (*Tetrastichus planipennisi* and *Spathius galinae*), and the EAB egg parasitoid *Oobius agrili*. Both EAB and the biological control wasps for use against it are available to researchers and pest managers worldwide.

Procedures for Raising Quality Insects

The insect production team develops artificial synthetic diets that are specific to the insects 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 insects. Typical insect diets contain 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 into plastic disposable cups and the insect eggs, or small larvae, are placed on top of it. As the insects feed and grow they are transferred to larger cups to allow more room to grow and mature in customized environments. The insects are kept in climate-controlled rearing rooms or growth chambers that are programmed to meet the specific needs of each species and stage of development, whether feeding, mating or overwintering. Strict quality control procedures are followed to ensure that each insect colonies remains healthy and meets acceptable standards for quality and vigour.

The Insect Production and Quarantine Laboratories Facility

One of the most notable, enhanced features of the IPQL is the PPC-2a quarantine facility. Certified Canadian Food Inspection Agency (CFIA) quarantine lab allows for the rearing of invasive species and conducting experiments under strictly controlled conditions. IPQL houses an insect diet preparation kitchen, a quality control laboratory and two methods development laboratories. In addition, there are 16 programmable rearing modules that can be switched between domestic and invasive species, plus supporting facilities. All scientific areas in the lab are built “clean room technology” standards, similar to that used in hospital isolation and surgical rooms, to reduce microbial contaminants. One of the unique design features of this facility is the use of positive air pressure in rooms with domestic insects to prevent contaminated air from entering, and the use of negative air pressure to prevent alien insects from leaving. Access to the facility is limited to IPQL staff and maintenance staff only. However, special group tours can be arranged upon request.

The Invasive Species Centre

The IPQL wing also houses the Invasive Species Centre (ISC), a not-for-profit corporation. The ISC works with multiple partners, including various government agencies such as the Ontario Ministry of Natural Resources and Forestry (OMNRF), NRCan-CFS, CFIA, and the Department of Fisheries and Oceans. The ISC promotes cooperation among government agencies, universities, NGOs, the private sector and the public. Led by an independent board of directors, the ISC provides 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.

CONTACT INFORMATION

Insect Production and Quarantine Laboratories
Great Lakes Forestry Centre
1219 Queen Street East
Sault Ste. Marie, ON P6A 2E5 Canada
Tel: 705-541-5700

E-mail: insect_production@nrcan-rncan.gc.ca
Web site: natural-resources.canada.ca/science-and-data/research-centres-and-labs/forestry-research-centres/great-lakes-forestry-centre/insect-production-and-quarantine-laboratories/13467