

Suitability of Six Northern Hardwood Species for Larval Development and Host Selection of the Asian Longhorned Beetle (*Anoplophora glabripennis*) (Motschulsky) and Associated Behaviors

L.L. Lazarus and D.G. McCullough, *Michigan State University, East Lansing, Michigan*

Anoplophora glabripennis is an exotic cerambycid from Asia with a known affinity for maple tree species. Further information regarding the host range of this beetle is needed to develop potential management strategies. Our goal is to evaluate possible susceptible hardwood species and adult female behaviors that influence host selection.

The suitability for female oviposition and larval development on certain hardwood tree species was assessed for eight mating pairs of beetles. A mating pair of beetles was placed in a glass container along with sugar maple twigs and a wood section of the test species for oviposition. No eggs or larvae were found in logs of eastern cottonwood and tulip tree, but were found in oaks, honeylocust and sycamore. A greater number of larvae and eggs were clearly found in sugar maple logs.

Adult behavior was monitored in a four-armed olfactory chamber to determine types and duration of behaviors exhibited by the beetle. Three mating pairs were independently observed and videotaped in the dark for 24 hours, and given sugar maple as a host species. Preliminary results suggest that females mate, twig feed, chew an egg niche, and oviposit in a distinct successive order.

Virgin female host-selection behavior was monitored in a four-armed olfactometer when given various hardwood tree species as a host. A female beetle was videotaped for 50 minutes in the dark and all behaviors plus duration were recorded. A choice was made when certain behaviors were witnessed. Preliminary results suggest that maples are preferred to other tested hardwoods.

Differential Gene Expression in the Spruce Terminal Weevil Feeding on Resistant Versus Susceptible Host Trees

I. Leal, E.E. White, T.S. Sahota and J. Manville, *Canadian Forest Service, Victoria, British Columbia*

Reproductive maturation and oviposition of the spruce terminal weevil (*Pissodes strobi* Peck) are inhibited by resistant Sitka spruce (*Picea sitchensis* (Bong.) Carr.).

Vitellogenin is an egg yolk protein precursor which is necessary for the maturation of eggs. We describe the molecular cloning and characterization of a fragment of the vitellogenin gene from the spruce terminal weevil. The DNA sequence of this fragment has high identity to vitellogenin sequences from other insects. It hybridizes on Northern blots to a single 6.0 kb mRNA that is expressed only in females, and only after they have started reproductive development. Vitellogenin gene expression is induced by treatment with juvenile hormone, and is differentially regulated in insects feeding on resistant or susceptible trees.

We have observed that ovarian maturation and the expression of the vitellogenin gene is greater in weevils feeding on susceptible trees than in weevils feeding on resistant trees. We have also observed that the levels of ovarian growth and transcription of the vitellogenin gene are reduced in weevils feeding on the severed leaders from resistant trees relative to those feeding on severed leaders from susceptible trees. A force-feeding method was developed to deliver extracts from the bark of leaders into the alimentary canal of the weevils. Weevils given one dose of the aqueous extract from resistant leaders, followed by feeding on sections of laterals from susceptible trees, have exhibited 60% inhibition of oocyte growth and 48% inhibition of transcription of the vitellogenin gene relative to insects given the extract from susceptible leaders. These results indicate that these effects of resistance do not require an intact

tree, and experiments using extracts show that the observed effects result from a post-ingestive effect of the bark extract. The use of the vitellogenin gene

as a probe may provide a sensitive bioassay for identifying resistance factors.

Outbreak of an Exotic Defoliator: Pine False Webworm [*Acantholyda erythrocephala* (L.)] Research in New York

A.E. Mayfield, *State University of New York (SUNY), Syracuse, New York*

B.J. MacCulloch, *SUNY, Belgrade, Maine*

D.C. Allen, *SUNY, Syracuse, New York*

An outbreak of the pine false webworm (PFW), *Acantholyda erythrocephala* (L.), began expanding from an epicenter in 1981 and by 1995 resulted in defoliation of more than 5 400 ha of eastern white pine (*Pinus strobus* L.) in two northern New York counties. Our objectives were to monitor PFW population densities, identify vulnerable stand conditions, quantify impacts of defoliation on white pine growth, and characterize natural enemy responses to PFW. Population sampling revealed that PFW densities collapsed to non-damaging levels in all but 3 of 25 stands between 1998 and 2000. Pine false websorm densities greater than 150 webworms/m² crown cross-sectional surface area resulted in greater

than 60% defoliation. Repeated defoliation reduces mean basal area increment by more than 90%. Pine false webworm population densities in 1998 were positively correlated with stand area. In an investigation of bird predation on PFW, avian species richness and diversity were positively correlated with PFW density. Avian flocking behavior occurred only in stands with high PFW densities and corresponded with the time of PFW larval feeding. Pine false webworm larval density was greater on trees exclosed from birds than exposed trees. Total larval parasitoid (*Homaspis interruptus* (Provancher) and *Olesicampe* sp.) trap catch was positively correlated with PFW density.

An Improved Trap for Large Wood-Boring Insects (Cerambycidae, Buprestidae, Siricidae)

W.D. Morewood, K.E. Hein, P.J. Katinic and J.H. Borden

Simon Fraser University, Burnaby, British Columbia

Commercially available multiple funnel traps have three potential weaknesses for trapping large wood-boring insects: 1) escape by captured insects from the dry collecting cup, 2) low catches of insects that fall outside the trap, and 3) poor visual orientation to the narrow funnel column. To test the importance of these weaknesses, we compared conventional multiple funnel traps to multiple funnel traps with water-filled collecting cups or large bottom funnels, and crossvane traps with a prominent silhouette. The experiment was conducted in a mill yard in the southern interior of British Columbia between July 5–October 2, 2000. Differences in catch among different trap types indicated that two of the three potential

weaknesses were important limitations for the capture of most target species. Crossvane traps captured significantly greater numbers of most Cerambycidae and Siricidae, and similar numbers of most Buprestidae, compared to the other traps. Of the two most abundant species, *Xylotrechus longitarsus* Casey was captured in consistently greater numbers in crossvane than in other traps, but *Monochamus scutellatus* (Say) showed little discrimination early in the flight season and much higher captures in crossvane traps late in the season. The change in behavior of *M. scutellatus* may be related to a transition from maturation feeding to searching for oviposition sites.