Progress Report - Spring 2006

Research on *Leptoglossus occidentalis*

1. Characterization and attractiveness of male-produced sonic and vibrational signals

We tested the hypothesis that the western conifer seed bugs (WCSBs), *Leptoglossus occidentalis* Heidemann (Hemiptera: Coreidae), use sonic and vibrational signals in addition to pheromonal signals for communication. Male WCSB produced audible and vibrational sounds 20 decibels (dB sound pressure level) above the lower threshold of human hearing (0 dB = 20 μP), two dominate frequencies of 115 +/-10 and 175 +/-15, and a distinct temporal pattern. Repeated distinct pulse trains were not observed.

In arena bioassay experiments, male and female WCSB preferred played-back sonic signals from males over silent control stimuli, whereas nymphs showed no preference for either stimulus unless adults were present.

In binary choice wooden-dowel vibration bioassays, female WCSB preferred played-back vibrational signals from males over non-vibrational control stimuli. Neither males nor nymphs showed preference for either stimulus.

Analogous studies on potted trees are ongoing.

2. Characterization of frequency transmission of substrates used by WCSB

We are testing the hypothesis that transmission properties of substrate affect both production and perception of vibrational signals produced by WCSB.

Vibrational signals of 100-500 Hz transmit moderately to well through herbaceous plants such as beans and grasses. However, vibrational signals below 150 Hz do not transmit well, if at all, through living conifer stems like hemlock. Signals from 150-1,000 Hz often transmit significantly better through larger woody than smaller herbaceous material. Non-living wood, like oak doweling, transmits all tested frequencies above 70 Hz significantly better than either coniferous or herbaceous plants. Detailed studies of vibration transmission by host and non-host material are ongoing.

3. Infrared detection in WCSB

We are testing the hypothesis that WCSB use infrared (IR) detection to locate and colonise suitable habitat.

In binary choice experiments, individual nymphs discriminated a 5ºC (29 versus 24 ºC) difference between small heating elements under room conditions. Thermographic imaging under various conditions, ranging from noon to late dusk and cloudy to sunny weather, showed that infrared radiation from preferred spring microhabitat like apical growth and early white pine cones is readily distinguishable from the general background. During the day, apparent temperature of needles was consistently 13 ºC and 15 ºC less than that of apical growth and cones, respectively, even at 50-m distances. The contrasting apparent temperatures were also present after sundown, but became more muted with time. The temperature of apical growth rapidly showed little contrast with that of surrounding vegetation, whereas cones continued to radiate. Tree trunks and large branches eventually radiated more IR than cones.

Bioassays to confirm IR detection in WCSB are currently under way.

4. Distribution of WCSBs on host trees

Limited early-afternoon surveys in early spring 2006 indicate that male WCSB are present on apical growth and new cones at a ratio of 4 : 12.

.