Potential Impacts and Control of the non-native Box Tree Moth in Canada

Mariaelena A. Guarrasi
Cydalima perspectalis (Box Tree Moth)

Identified in Canada in August 2018 through iNaturalist

Karen Yukich, 2018
European Invasion

- Status not recorded
- Native
- Invasive

CABI, 2019
Host Plants

- Feeds on all common varieties of *Buxus* (Boxwood)
- *Buxus* is a native forest understory plant in Asia and Europe
- Used as an ornamental worldwide
- In Japan, *C. perspectalis* has been observed to feed on *Euonymus alatus*, *E. japonicus*, and *Ilex purpurea*, but this was not observed in Europe (Santi et al., 2015)
Effects of BTM
Predicted European Distribution

- Overwintering larvae survived temperatures of -25°C in Switzerland (Nacambo et al., 2014)

- Northern Chinese and Eastern Russian populations experience overwintering temperatures of -30°C (Nacambo et al., 2014)
Objectives

1. To determine the biology, phenology, and distribution of the species in Canada

2. To review possible control measures and their effectiveness

3. To examine what role citizen science will play in monitoring and control
1) BIOLOGY, PHENOLOGY, and DISTRIBUTION
Phenology: Life Cycle
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# Biology and Phenology: Regional Differences

<table>
<thead>
<tr>
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<th>Europe</th>
<th>Asia</th>
<th>Canada</th>
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<tbody>
<tr>
<td>Generations</td>
<td>$2_a, 3_{b, c}$</td>
<td>$3_d$</td>
<td>?</td>
</tr>
<tr>
<td>Number of Larval Instars</td>
<td>$3-7_{b,e}$</td>
<td>$5-7_f$</td>
<td>?</td>
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<tr>
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<td>$10.1{}^\circ C_d$</td>
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</tr>
<tr>
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<td>$2^{nd}-4^{th}<em>{e}, 4^{th} \text{ or } 5^{th}</em>{f}$</td>
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</tbody>
</table>

a) Leuthardt et al., 2010  
b) Leuthardt & Baur, 2013  
c) Santi et al., 2015  
d) Maruyama & Shinkaji, 1987  
e) Nacambo et al, 2014  
f) Maruyama & Shinkaji, 1991
Methodology

- Pheromone traps for capturing adult males - multiple trap designs were tested
- Boxwood in parks and gardens were monitored to record phenology and behavioural data
- Presence/absence data collected
- Measuring larval length as well as head width to determine instar
Distribution: Results

- 1241 properties scouted for the presence of BTM
- 359 positive finds
- 384 possible positive finds (only damage)
## Biology and Phenology: Results

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2) CONTROL MEASURES
Control Measures: Background

- Pheromone traps for adult males are commercially available (Kim & Park, 2013)

- Biopesticides based on *Bacillus thuringiensis* (Bt) are preferred over chemical insecticides (Kenis et al., 2013; CABI, 2019)

- Physical removal of larvae is possible but time consuming (CABI, 2019)

- Biological control is currently not effective (CABI, 2019)
Control Measures: Methodology

- Bt-based biopesticides were applied
- Pesticide has to be ingested by caterpillars for effectiveness
- Boxwood was monitored post-application
Control Measures: Results

- Pheromone traps and physical removal were not effective for management
- Over 300 homes sprayed
- Biopesticides were effective at killing caterpillars
- Pesticide application should be repeated after each adult generation
3) CITIZEN SCIENCE
Citizen Science: Background

- Originally detected through a citizen science database

- Citizen science initiatives have shown promising outcomes (Gallo & Waitt, 2011)
  - *Invaders of Texas Program*
  - *Invasive Plant Atlas of New England*

- Errors in species identification can be diminished with the use of voucher specimens and validation of photographed sightings (Crall et al., 2011; Gallo & Waitt, 2011)
Citizen Science: Methodology

- Traps distributed to interested citizen scientists
- Weekly monitoring, monthly pheromone changes
- Positive finds validated with photographs
- Raised awareness through contact with over 1,000 homeowners
Citizen Science: Results

- 70 traps distributed
- Identification skills were poor, photograph validation was essential
Citizen Science: Results

iNaturalist research-grade observations used
Generations in Europe vs Canada

Santi et al., 2015

Mariaelena Guarrasi, 2019
Takeaways from my internship

- BTM has established in Canada due to its cold tolerance and wide-spread host plant
- Effective control measures exist, but eradication is unlikely
- Citizen science can be a useful tool
- Collaboration between government, industry, public, and NGO’s is key
Future Directions

- Collect more data on the phenology of BTM in Canada - larval head width
- Examine possible biological control measures
- Track the spread of BTM (more traps, more citizen science?)

Florine Leuthardt, 2013
Thank You for Listening!

Acknowledgements

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Thank You for Listening!
Literature Cited


