Volatile attractants as a tool to collect cerambycids: ready for prime time

Ann M. Ray

Department of Biology, Xavier University, Cincinnati OH
Acknowledgments

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Communication in insects

http://www.firefly.org/

http://cicadainvasion.blogspot.com

http://www.life.illinois.edu/robertson
Pheromone: a chemical substance produced by an individual that causes a physiological or behavioral change in other individuals of the same species
**Pheromone:** a chemical substance produced by an individual that causes a physiological or behavioral change in other individuals of the same species

- Contact pheromones (gustation)
- Volatile pheromones (olfaction)
**Pheromone**: a chemical substance produced by an individual that causes a physiological or behavioral change in other individuals of the same species

Primary modality of communication in most insects
*these moths are not from the cloud forest
Subfamily Prioninae
Subfamily Cerambycinae

Subfamily Spondylidinae
Subfamily Lamiinae

Subfamily Lamiinae

Subfamily Prioninae

Pheromone traps are a valuable tool for collecting cerambycids.
How does it work?

1. Traps
2. Lures
How does it work?

1. Traps
2. Lures

Pheromone lure
How does it work?

1. Traps
2. Lures

Pheromone lure
How does it work?

Basin filled with preservative
What can you do with pheromone traps?

• Biology of individual species
• Phenology and population dynamics of cerambycid communities
• Species inventories
What can you do with pheromone traps?

• Biology of individual species
• Phenology and population dynamics of cerambycid communities
• Species inventories
Pheromones as predictors of natural history/behavior
“Rediscovery” of rare species

Generic pheromone: Prionic acid

Prionus linsleyi
Previously known from only two specimens

Barbour et al. 2010
Monitoring of endangered species

- U.S. Federally Threatened valley elderberry longhorned beetle *Desmocerus californicus dimorphus* (VELB)

- Endemic to the central valley of California

- Traps baited with synthetic pheromone captured 34 males in 2013, and 63 males in 2014

Ray et al., PLOS One, *in press*
Monitoring of exotic species

- *Trichoferus campestris* commonly intercepted in quarantine; population detected in Utah

- Attractant-based lures show promise for monitoring/control

Christopher Pierce, USDA APHIS PPQ, Bugwood.org
What can you do with pheromone traps?

- Biology of individual species
- Phenology and population dynamics of cerambycid communities
- Species inventories
Characterizing daily phenology

- Trap baited with generic pheromone
- Collecting basin attached to battery powered turntable
- Reveals daily activity of species

Generic pheromone: \((3R^*)\)-hydroxyhexanone
Characterizing seasonal phenology

Pennsylvania bioassays: 15,400 cerambycids over 3 yr.

Characterizing seasonal phenology

Pennsylvania bioassays: 15,400 cerambycids over 3 yr.

Generic pheromones:
- \((3R^*)\)-hydroxyhexanone
- \((2R^*,3R^*)\)-hexanediol
- \((2R^*,3S^*)\)-hexanediol
- Fuscumol + fuscumol acetate
- Monochamol

Host attractants:
- Ethanol + alpha pinene

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<tr>
<th>Taxonomy</th>
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Subfamily Cerambycinae
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Subfamily Lamiinae
What can you do with pheromone traps?

- Biology of individual species
- Phenology and population dynamics of cerambycid communities
- Species inventories
Long term assessment of cerambycid biodiversity

Taxonomy

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Euderces pini
Neoclytus horridus
Megacyllene caryae
Tessaropa tenuiipes
Tilioctlytus geminatus
Molochrus b. bimaculatus
Cyrtochorus verrucosus
Phymatodes amoenus
Phymatodes varius
Phymatodes aereus
Phymatodes testaceus
Anelaphus parallelus
Anelaphus pumilus
Clytus ruricola
Xylotrechus convergens
Xylotrechus integer
Euderces picipes
Neoclytus a. acuminatus
Sarosethes fulminans
Anelaphus villosus
Micranoplus unicolor
Xylotrechus colonus
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Obrium maculatum
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Hyperplatys maculata
Microgoes oculatus
Monochamus carolinensis
Astylidius parvus
Astylapsis macula
Astyleptus biustus
Short term assessment of biodiversity

- Collecting species seldom captured otherwise
What can you do with pheromone traps?

• Biology of individual species
• Phenology and population dynamics of cerambycid communities
• Species inventories

What else?
Untapped lines of research: natural enemies

*Wroughtonia ferruginae*  
*Chariessa sp.*
Untapped lines of research: eavesdroppers or overlapping pheromones?

Nicrophorus defodiens
Not quite ready for prime time: trap design
Not quite ready for prime time: weather
Cerambycid pheromones (and attractants) are an easy (innovative) addition to the collector’s toolkit
Logistics

Generic pheromones:
- (3R*)-hydroxyhexanone
- (2R*,3R*)-hexanediol
- (2R*,3S*)-hexanediol
- Fuscumol + fuscumol acetate
- Monochamol
- Prionic acid

Host attractants:
- Ethanol + alpha pinene

Sources:
- Synergy Semiochemical Corp. (Burnaby, British Columbia)
- Alpha Scents, Inc. (West Linn, OR)
- Bedoukian Research, Inc. (Danbury, CT)
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• Xavier University Robert Borcer Endowment