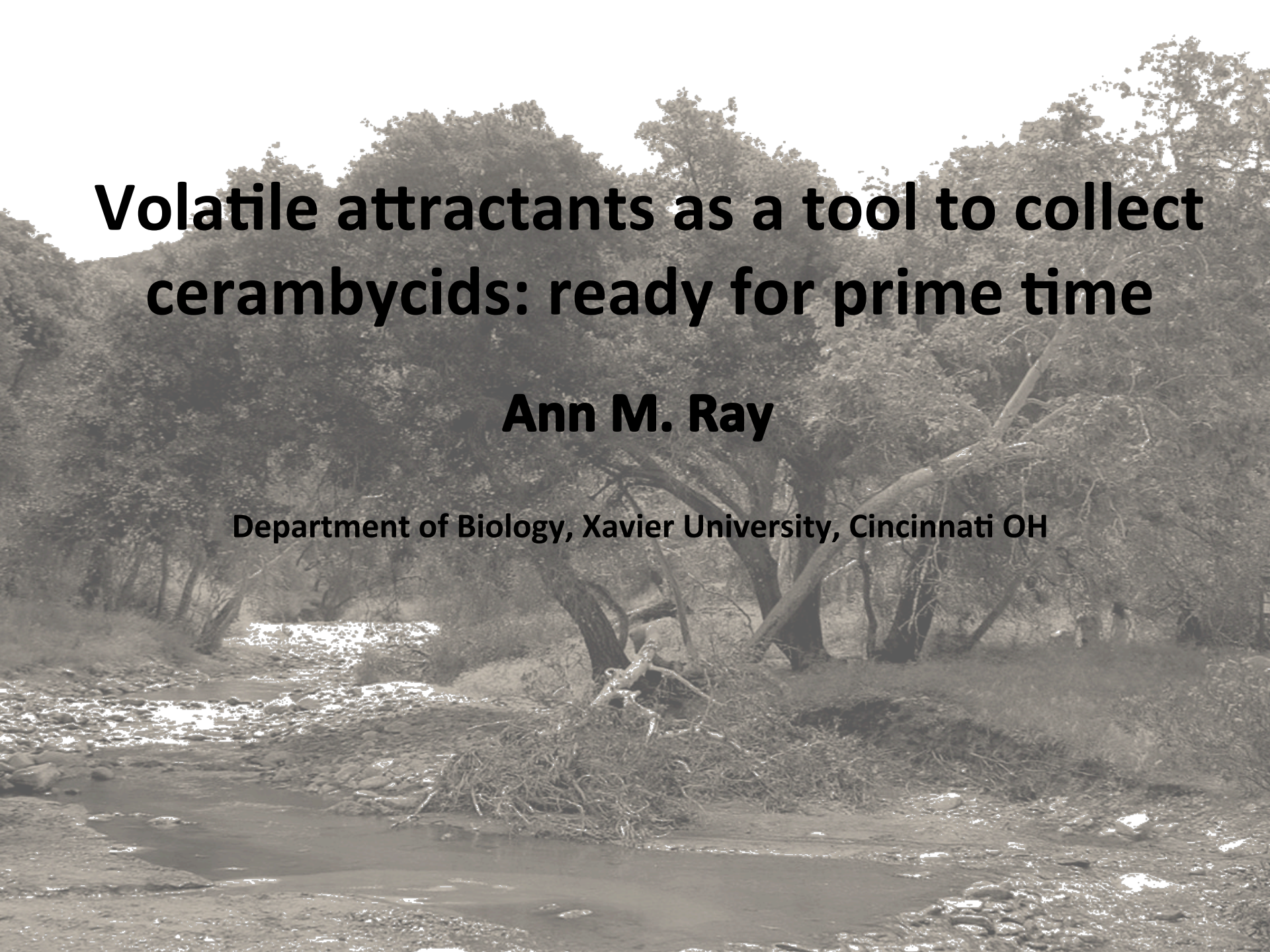
Volatile attractants as a tool to collect cerambycids: ready for prime time

Ann M. Ray

Department of Biology, Xavier University, Cincinnati OH



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Communication in insects

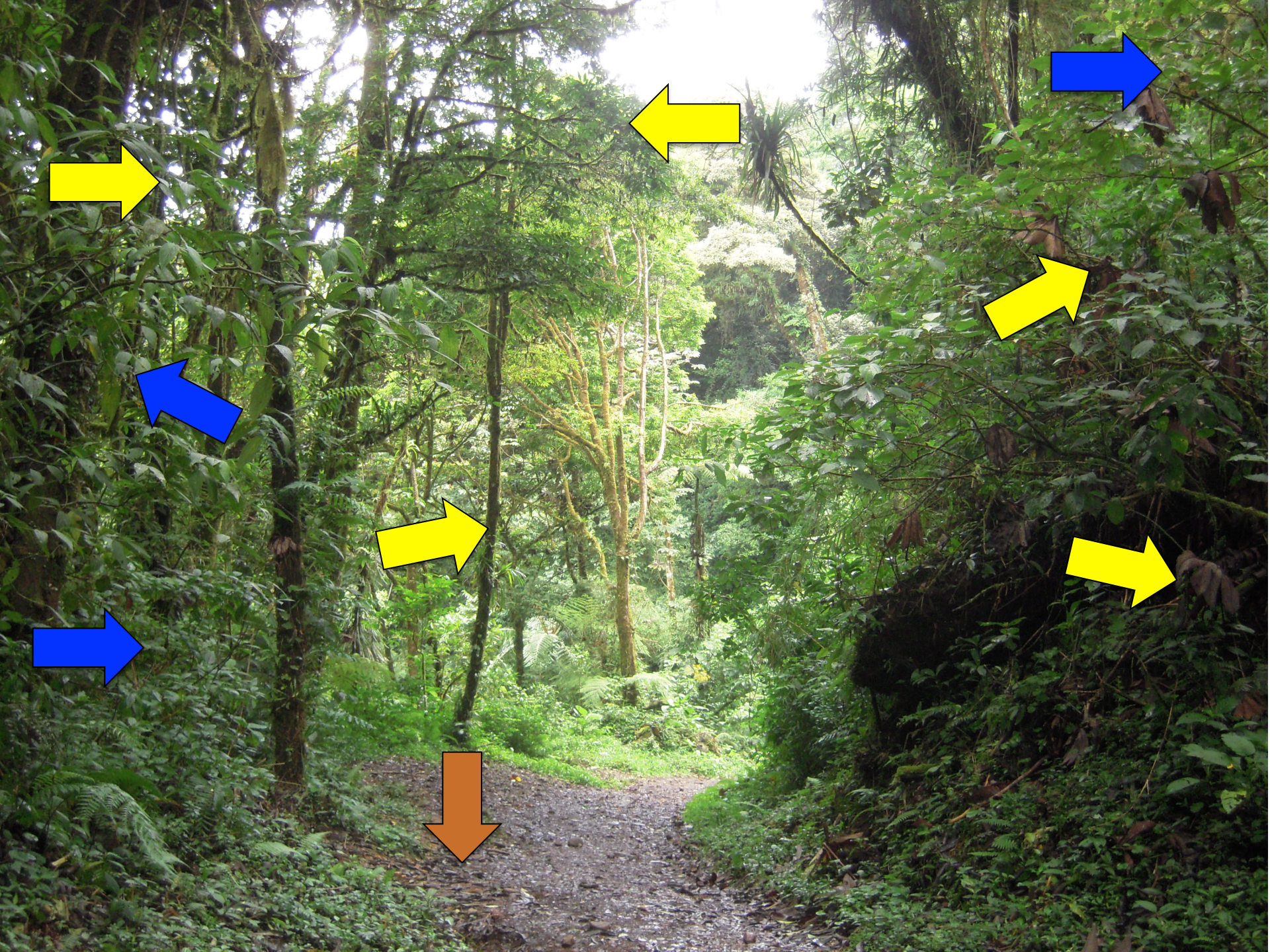
Pheromone: a chemical substance produced by an individual that causes a physiological or behavioral change in other individuals of the same species

Pheromone: a chemical substance produced by an individual that causes a physiological or behavioral change in other individuals of the same species

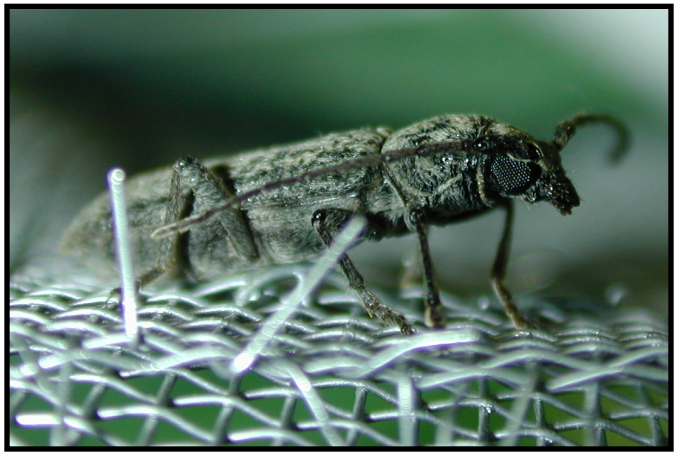
- Contact pheromones (gustation)
- Volatile pheromones (olfaction)

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




© - josef hlasek
www.hlasek.com
Monochamus galloprovincialis 6684

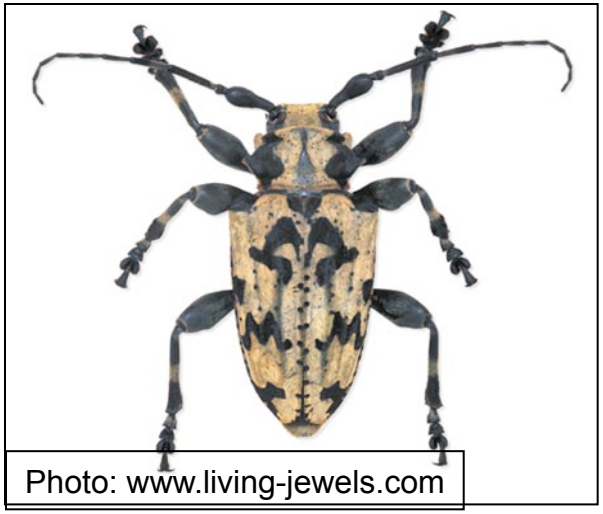
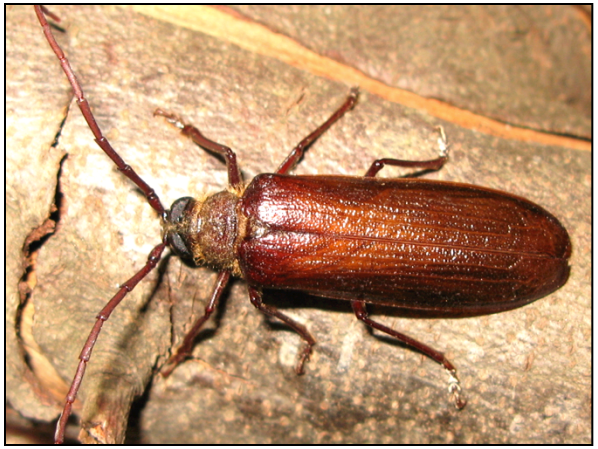
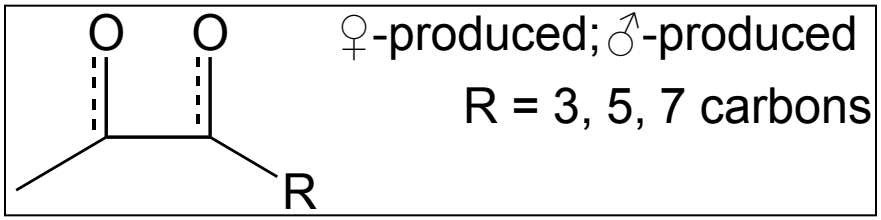


Photo: www.living-jewels.com

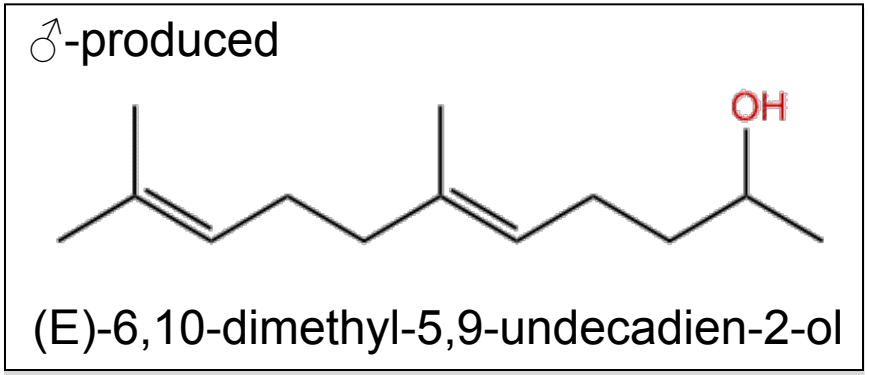


"Generic" pheromones

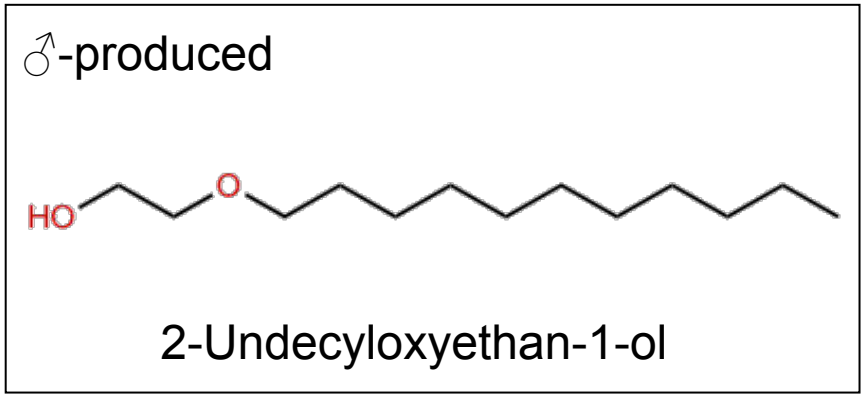
Subfamily Prioninae
Subfamily Cerambycinae



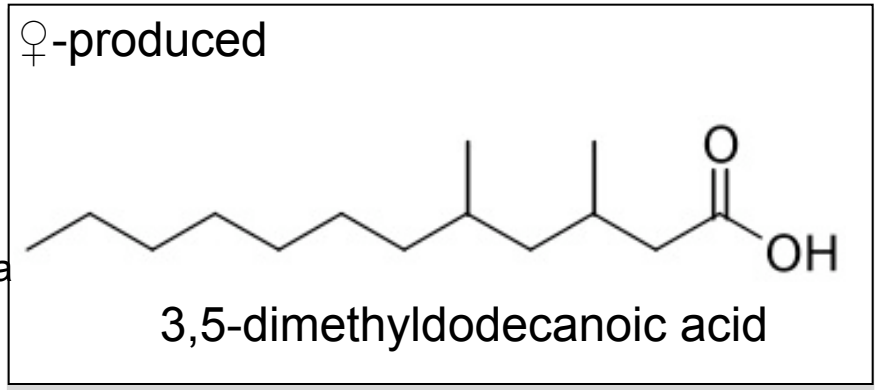
Subfamily Spondylidinae
Subfamily Lamiinae



Subfamily Lamiinae

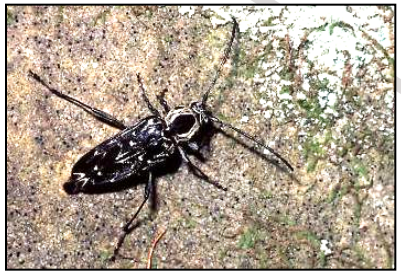


Subfamily Prioninae



Ray et al. 2012; Millar et al. 2009.; Silk et al. 2007; Fonseca et al. 2010; Parajes et al 2010; Zhang et al. 2002; Rodstein et al. 2009


Precison
POWER
PS-900
AM/FM ULTRA SLIM RADIO





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?

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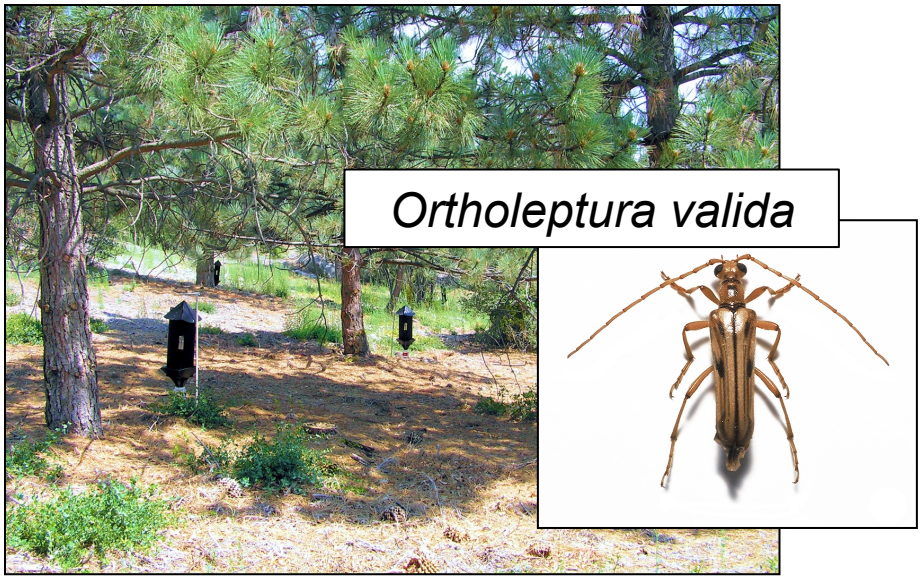
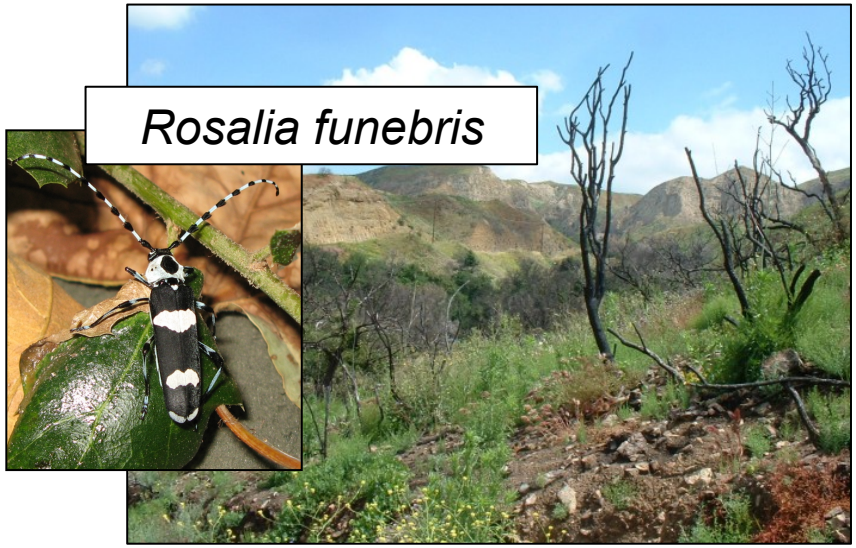
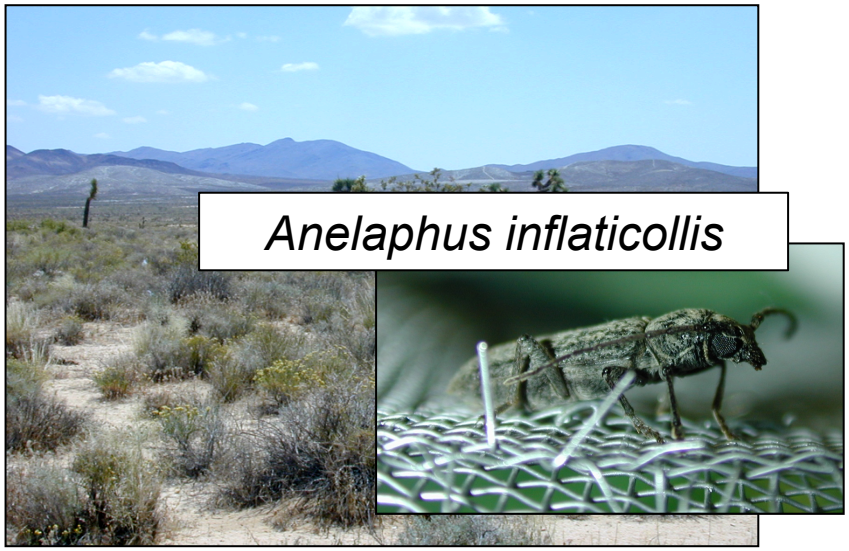
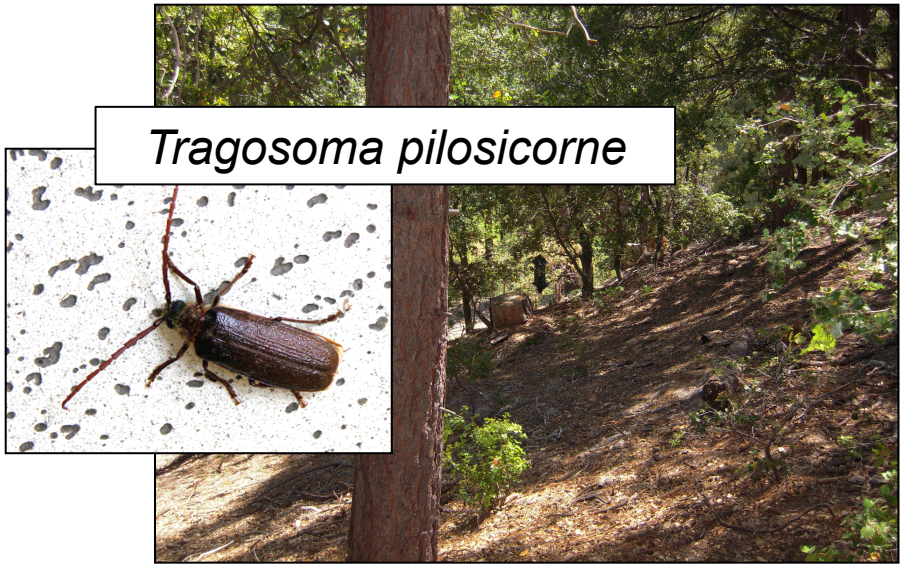
- Phenology and population dynamics of cerambycid communities
- Species inventories

Pheromones as predictors of natural history/behavior



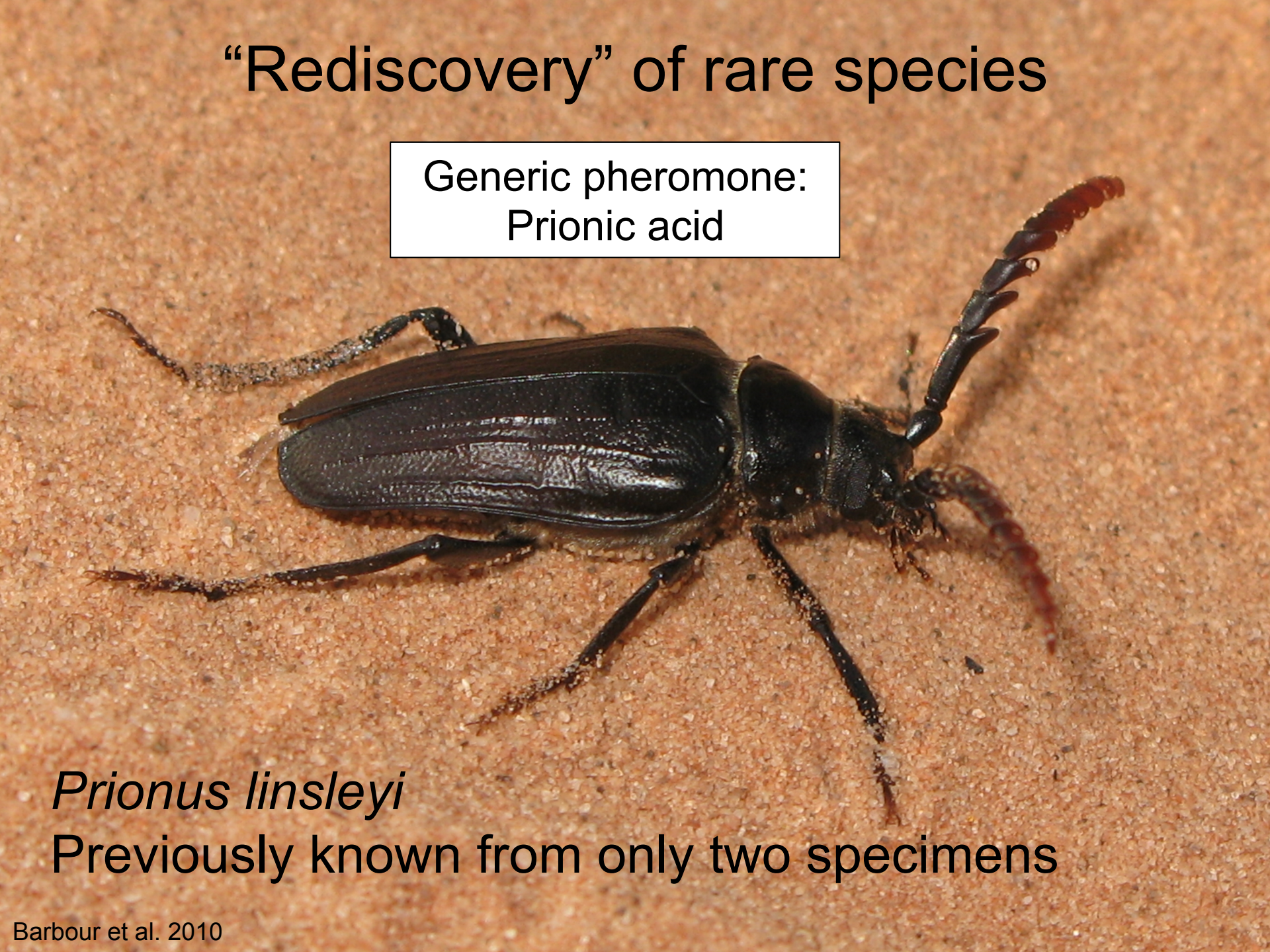






“Rediscovery” of rare species

Generic pheromone:
Prionic acid



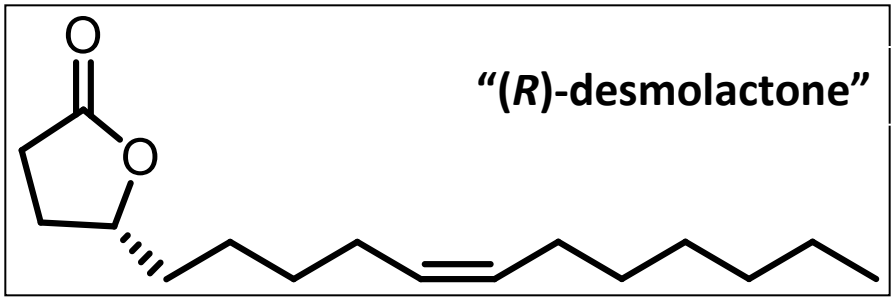
Prionus linsleyi

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

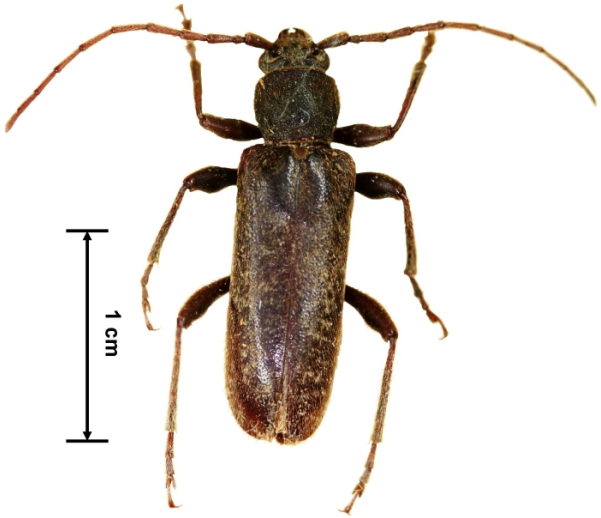


Ray et al., PLOS One, (*in press*)

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

UGA2154045

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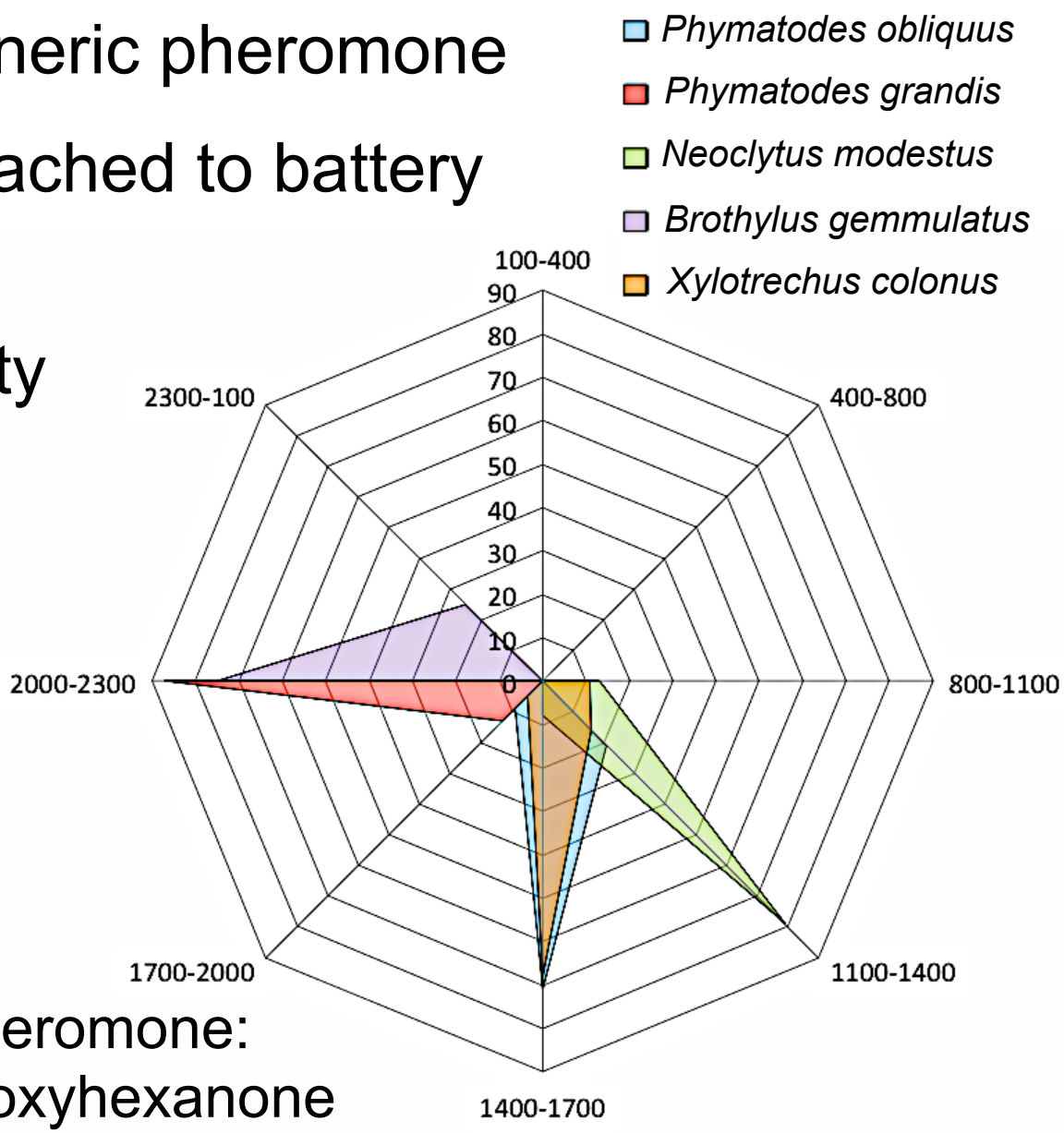
- Species inventories

Characterizing daily phenology

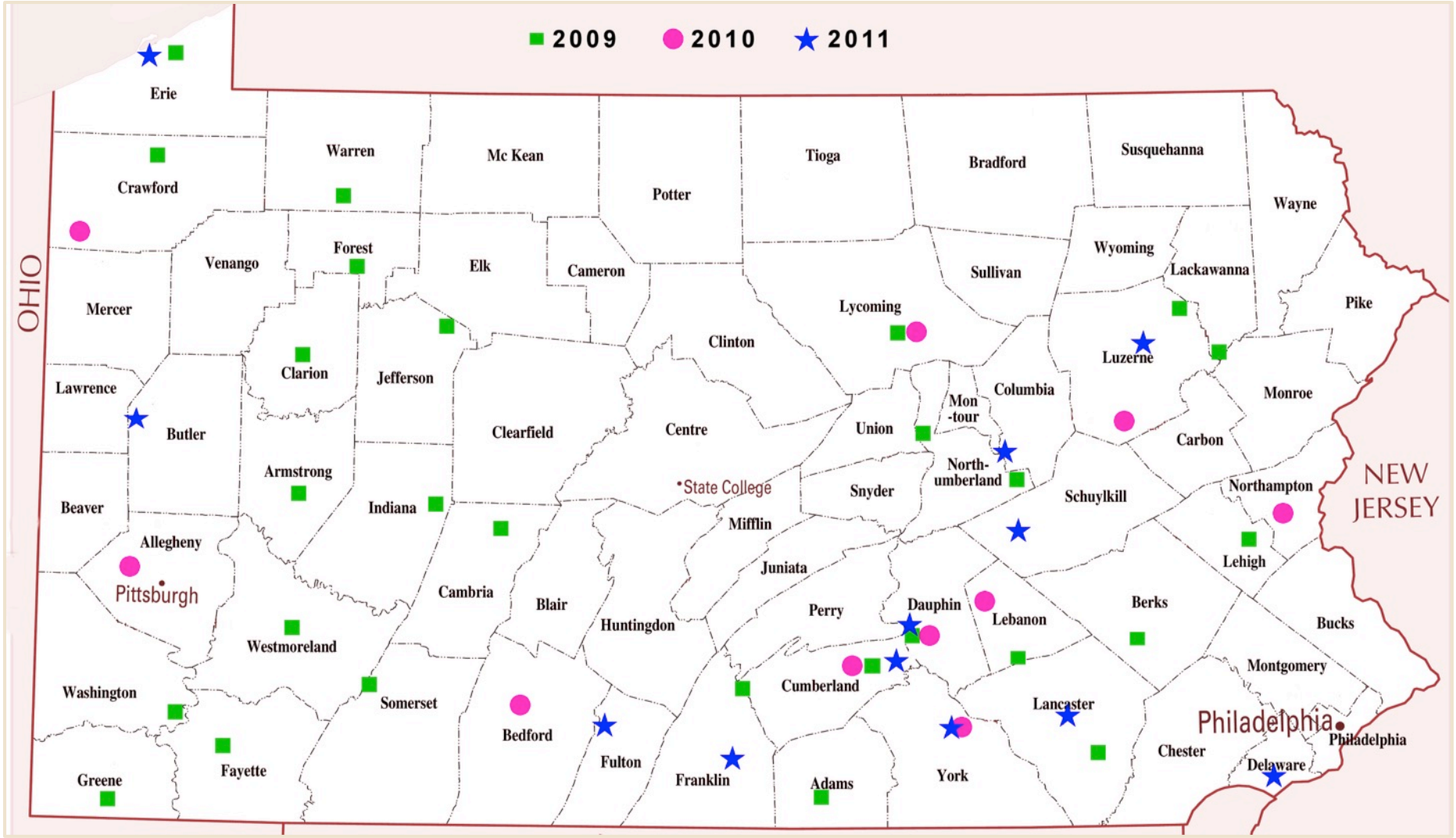
- Trap baited with generic pheromone
- Collecting basin attached to battery powered turntable
- Reveals daily activity of species



Generic pheromone:
(3*R**)-hydroxyhexanone

Characterizing seasonal phenology

Pennsylvania bioassays: 15,400 cerambycids over 3 yr.



Hanks and Millar 2012. Chemoecol.

Characterizing seasonal phenology

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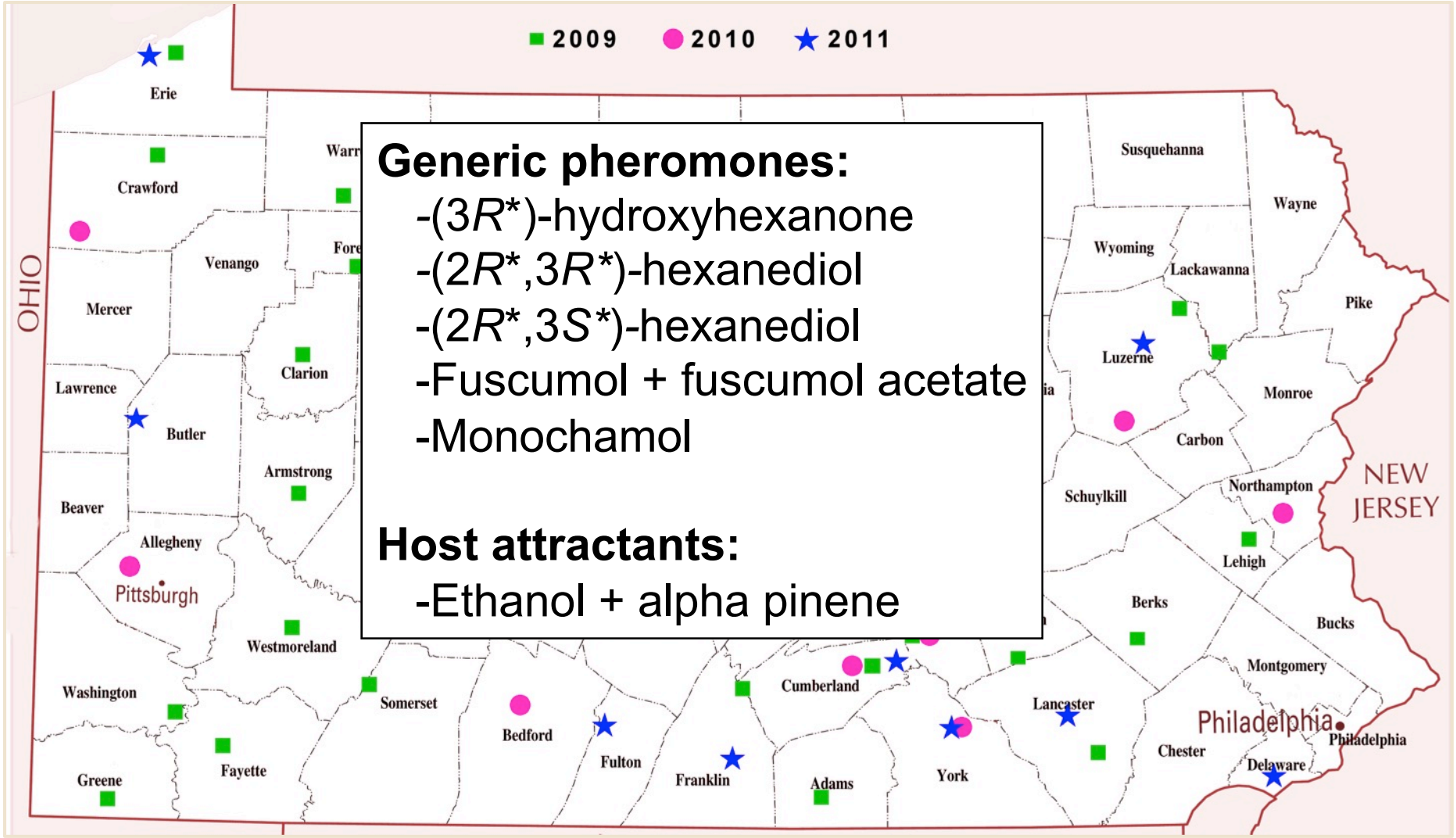
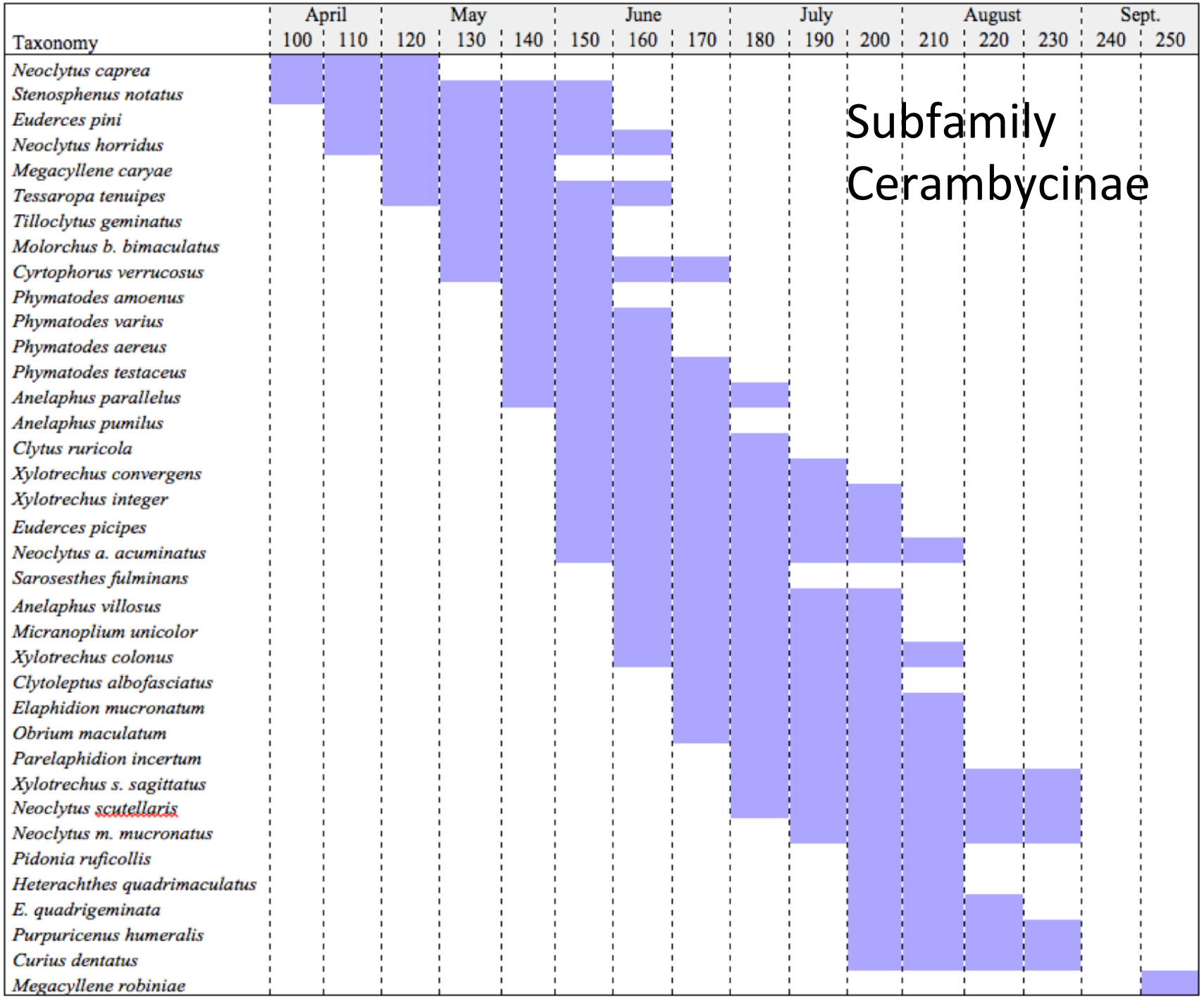
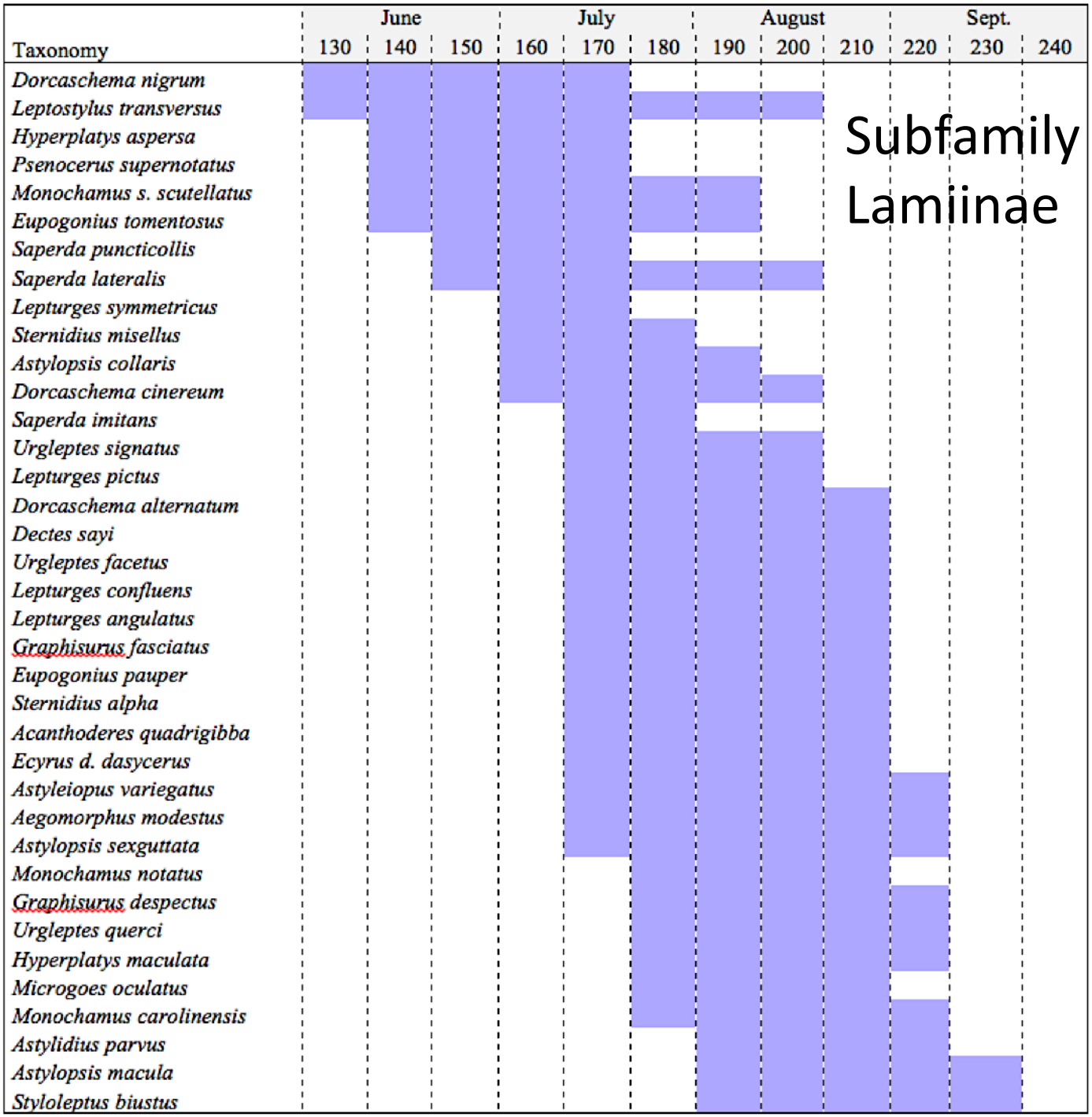


Hanks and Millar 2012. Chemoecol.


Taxonomy
April
May
June
July
August
Sept.
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
Neoclytus caprea
Stenosphenus notatus
Euderces pini
Neoclytus horridus
Megacyllene caryae
Tessaropa tenuipes
Tilloclytus geminatus
Molorchus b. bimaculatus
Cyrtophorus verrucosus
Phymatodes amoenus
Phymatodes varius
Phymatodes aereus
Phymatodes testaceus
Anelaphus parallelus
Anelaphus pumilus
Clytus ruricola
Xylotrechus convergens
Xylotrechus integer
Euderces picipes
Neoclytus a. acuminatus
Sarosesthes fulminans
Anelaphus villosus
Micranoplium unicolor
Xylotrechus colonus
Clytoleptus albofasciatus
Elaphidion mucronatum
Obrium maculatum
Parelaphidion incertum
Xylotrechus s. sagittatus
Neoclytus scutellaris
Neoclytus m. mucronatus
Pidonia ruficollis
Heterachthes quadrimaculatus
E. quadrigeminata
Purpuricenus humeralis
Curius dentatus
Megacyllene robiniae
Subfamily
Cerambycinae


June
July
August
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Taxonomy
130
140
150
160
170
180
190
200
210
220
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240
Dorcaschema nigrum
Leptostylus transversus
Hyperplatys aspersa
Psenocerus supernotatus
Monochamus s. scutellatus
Eupogonius tomentosus
Saperda puncticollis
Saperda lateralis
Lepturges symmetricus
Sternidius misellus
Astylopsis collaris
Dorcaschema cinereum
Saperda imitans
Urgleptes signatus
Lepturges pictus
Dorcaschema alternatum
Dectes sayi
Urgleptes facetus
Lepturges confluens
Lepturges angulatus
Graphisurus fasciatus
Eupogonius pauper
Sternidius alpha
Acanthoderes quadrigibba
Ecyrus d. dasycerus
Astyleiopus variegatus
Aegomorphus modestus
Astylopsis sexguttata
Monochamus notatus
Graphisurus despectus
Urgleptes querci
Hyperplatys maculata
Microgoes oculatus
Monochamus carolinensis
Astylidius parvus
Astylopsis macula
Styloleptus biustus
Subfamily
Lamiinae

What can you do with pheromone traps?

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Long term assessment of cerambycid biodiversity

Taxonomy
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Tessaropa tenuipes
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Saperda lateralis
Lepturges symmetricus
Sternidius misellus
Astylopsis collaris
Dorcaschema cinereum
Saperda imitans
Urgleptes signatus
Lepturges pictus
Dorcaschema alternatum
Dectes sayi
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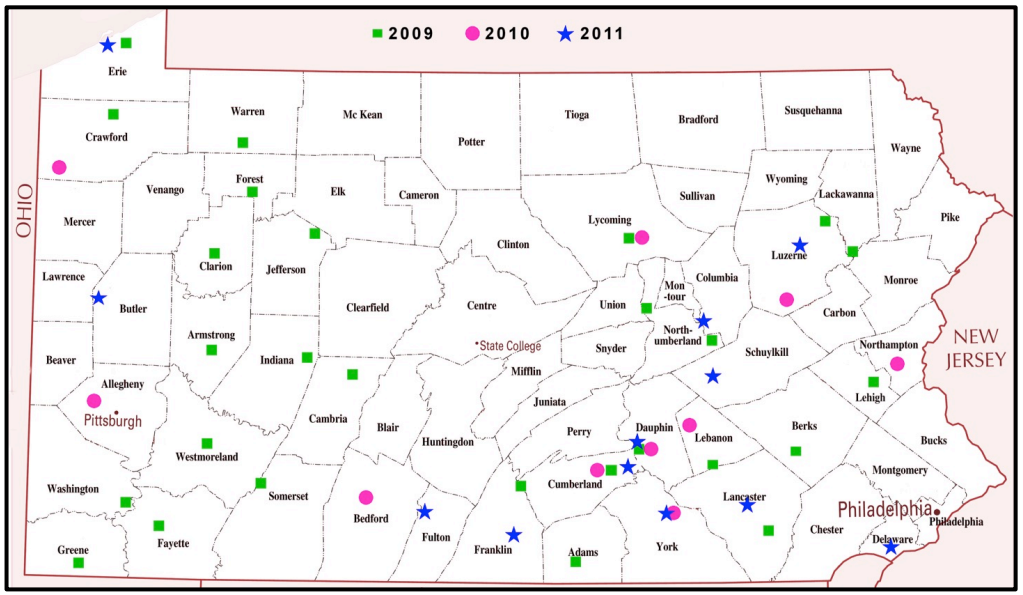
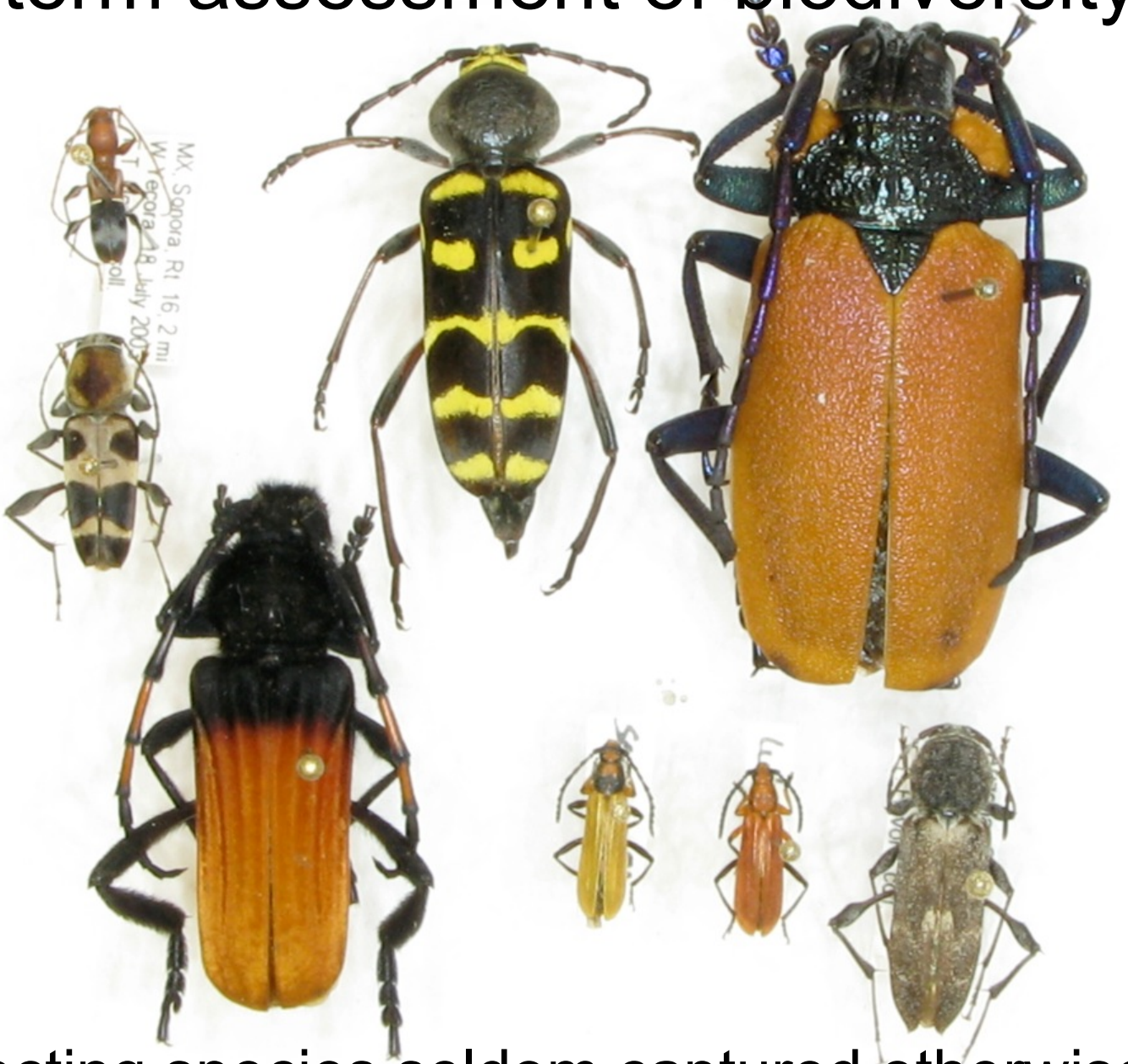


Short term assessment of biodiversity



- Collecting species seldom captured otherwise

What can you do with pheromone traps?

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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:

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

Host attractants:

-Ethanol + alpha pinene

Pheromone lures

Host attractant lure

Sources:

- ChemTica International, S. A. (Heredia, Costa Rica)
- Synergy Semiochemical Corp. (Burnaby, British Columbia)
- Alpha Scents, Inc. (West Linn, OR)
- Bedoukian Research, Inc. (Danbury, CT)

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$$$$$

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