

Educational and Habitat Monitoring Overview

for Audio Bee Booths /Cabinets for solitary bees and wasps September, 2016 (3 pg)

Focus (subject areas of exploration):

Biodiversity, habitat ecologies, native bees, pollinator coevolution with native and non-native plants, unmanaged bees, wasps and their predators; insect communities and ecosystems; community gardening, food production, alternative pollinator management; sustainable land use and land management; landscape architecture strategies; psychology of human perception, soundscape studies, habitat sculpture, earth art; (non-human) performance art; human interactions and relationships with non-humans and the environment.

Learning how to interpret nests and nesting activities:

What do we notice as we observe solitary bees and wasps nesting and the habitats with which they interact?

- a) naturally occurring bee/wasp habitat(s), especially deadwood and partially dead trees
- b) nesting materials (mud, plant resins, leaves, secretions, etc.)
 - identifiable leaves used and properties known about those plants (e.g. anti-microbial properties; exotic vs native species; invasive species; food plants and other cultivars)
 - water sources used with mud
- c) nesting methods
- d) nesting strategies and other behaviors
- e) bee and wasp food sources:
 - bees – types of pollen gathered (rough guess via colour and local plant knowledge, or analysis via a lab); wasps – genus and species of prey (via known associations and/or ID keys);
 - pollinator-plant lifecycle timings (phenologies; seasonality of each animal and plant species' activity);
 - characteristics of flowering plants visited (valued) by bees - such as the smell, size and shapes of flowers; other parts of plants used.
- f) physiological details and differences between and among bees and wasps of differing species (e.g. location of pollen-gathering hairs, if any; other pollen transport methods/structures; tongue lengths; stinger/ovipositor; mandible manipulation; body shapes and sizes)
- g) native bees and/or wasp inhabitants; 'naturalized' and introduced non-natives; abundance and diversity of various inhabitants
- h) nesting competition among bees, among wasps, and between these inhabitants and their 'enemies' (i)
- i) parasites, cleptoparasites and other biota associated with tunnel nests (e.g., parasitic flies, cuckoo bees, cuckoo wasps, mites, fungi)
- j) how listening (via headphones) while observing with a magnifying lens up close clarifies our perception of what we observe, such as inhabitants' interactions with nesting materials, food sources and one another; aspects of their physiology, etc.

continued

Other aspects of pollination ecology which unfold over longer time periods:

- population growth of inhabitants and other biota within the tunnel nests
- competition among and between the primary species - inhabitants
- competition among and between cleptoparasites and other biota
- cumulative effects of organisms which can effect inhabitants and their nests, such as fungi
- the wider implications of surrounding habitat and its changes over time
- presence of invasive plant species in the habitat mix (robust introduced plants)
- presence of robust native plant species in the habitat mix
- presence of robust introduced insects, including non-native bees
- the wider implications of weather patterns, including climate change and its effects on pollinator-plant phenologies
- the wider implications of human presence
- expanded awareness of what biodiversity entails

Extended educational & research approaches:

1. Luminous dye tracking powders ([BioQuip Products](#)) could be used as a means to track pollinator activity via nests that can be observed in the Audio Bee Cabinet, as plants in the vicinity swabbed with various colours might get their pollen brought back to nests which are viewable in the cabinet. Saves expensive and complex pollen IDing.
2. Nest material IDs, such as leaves, are also possible. Scott MacIvor at York U has applied this idea to his research (jsmacivor@gmail.com). This extends to solitary wasps as well as bees. This is possible if the bee nest plank within the cabinet is removed at the end of a season and the plexi covering the nests is taken off.
3. Energetics of foraging for either nest materials and/or nest provisions can be ascertained via directly observing or video recording bees/wasps using the wall and/or the Cabinet. Scott Macivor has used Arduino units with video cameras in some of his research in Toronto with nest boxes: [J Scott MacIvor \(University of Toronto, Toronto\) on ResearchGate](#).
4. Gathering phenological data about various insect-plant relationships from insects using both the wall and the cabinet via daily checks of the cabinet (same time each day) and logging the status of each nest to get phenology information.
5. Aspects of inter-species and intra-species competition for tunnel nesting space. Note that resin-using bees do seem to compete for previous year's tunnel and it's resin.
6. Remove and identify wasp prey from tunnel nests.

References

On bees and pollen: "[Finding Out How Nature Really Works](#)" with biologist David Roubik in Panama (Smithsonian Education), see pollen-gathering at 3:04 into the video. This video shows how you might use pollen reference guides to further interpret your bees' relationship to your local pollen. Though the video is about social bees, in your case you can simply spy on inhabitants in the Audio Bee Booth / Cabinet and use a chopstick or something to steal some pollen while they're away. (Don't forget to listen while spying - sound adds an astonishing degree of resolution to the process of observation.) Note that ID-ing pollen is an extremely difficult enterprise!

At Resonating Bodies (<http://resonatingbodies.wordpress.com>)

[Bee Biodiversity](#) (biology and more) – beyond honey bees

More on safety and stings: Bee Booth FAQ 2012 [Download here](#)

[Odes to Solitary Bees](#) (solitaries creating nests - macro video-audio)

[Pink Bee Condo – Up Close](#) videos:

“Solitary bees and wasps: nesting materials, construction and lifecycles, pt. 1 + 2”

Peter Hallett shows solitary bees and wasps within his nest blocks (Toronto, 2008)

[Inhabitants in the Booths](#) (solitary bees and wasps, their brood and nest provisions and their frenemies)

[Bee Trading Cards, series 1](#)

On using florescent dye tracking powder with plants: [F.A.S.T. Flower Anther Swabbing Team](#) (powder via BioQuip products)

[Resources](#) Pages

[Canadian Wildlife Federation](#) Wild School Programme and Backyard Habitat Programmes and Wild about Bees poster Phone: 1-800-563-WILD (9453).

[The Xerces Society](#) Comprehensive information on the biology and conservation of native bees, including agricultural, parks and other land management guidelines. An international, nonprofit organization that protects wildlife through the conservation of invertebrates and their habitat.

[NSERC-CANPOLIN / Canadian Pollination Initiative](#): Bees of Canada Image Bank, Pollination Nation report and much, much more. Government-funded science you can access!

[Pollinator Partnership](#) & [P2 Canada](#) works to protect the health of managed and native pollinating animals vital to our North American ecosystems and agriculture. **Pollinator Week**, educational materials, Bee Trading Cards and much more.

[CanPolin](#) An online resource for growers, conservationists, students, pollination biologists and anyone interested in pollination and crops.

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Resonating Bodies

Where art, pollination ecology, science and community intersect