

# Bees, wasps, and sawflies: comparing the efficacy of two collection methods in estimating hymenopteran diversity in grasslands



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## Introduction

- Grasslands are among the most endangered ecosystems in North America due to conversion to crop fields or habitat loss through urbanization.
- Documenting biodiversity in grasslands is essential for successful conservation and restoration.
- Pan traps are small, yellow bowls filled with soapy water used to estimate hymenopteran diversity.
- Compared efficacy of pan traps placed on ground or elevated fixed distance from ground for estimating bee, sawfly/wood wasp, and braconid wasp diversity
- These groups represent pollinator (bees), herbivore (sawflies), and parasitoid (braconid wasps) guilds; provide services critical to ecosystem function

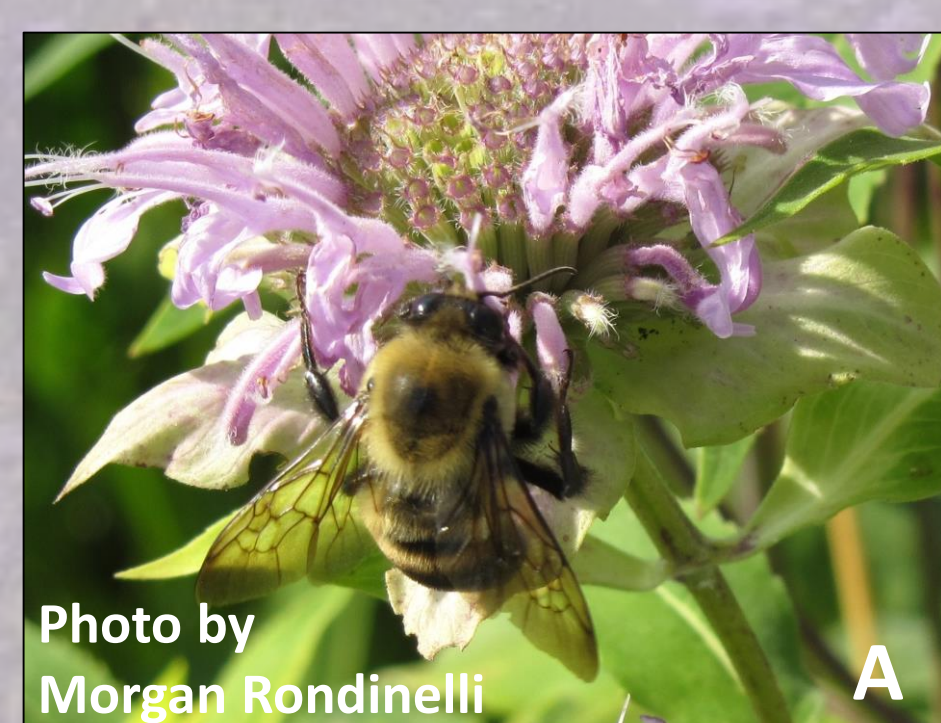


Figure 1. Examples of a bee (A), sawfly (B), and braconid wasp (C).

## Objectives

- Part of broader project assessing efficacy of several methods (i.e., pan trap, Malaise trap, sweep net) for sampling hymenopterans
- Goal: discern which method, or combination of methods, most accurately estimates bee, sawfly, and braconid diversity in grasslands

## Materials and Methods

- Sampled sites in northern Virginia
- Jones Nature Preserve:** 32 ha primarily warm-season grass (WSG) meadow, burned and mowed
- Oxbow Farm:** three 1.5 ha primarily WSG meadows, mowed
- Sampled every two weeks April-October 2014; 6 hr/sampling event
- Three pairs of transects at each site; each transect contained 15 yellow pans placed on ground or elevated 1.22 m from ground
- Pans within one transect were pooled; 12 samples/sampling event
- Specimens identified to genus and determined to species or sorted into morphospecies
- ANOVA ( $\alpha=0.05$ ) and diversity metrics using RStudio and EstimateS 9.1.0



Figure 2. elevated pan traps (A); ground pan traps (B).



Figure 3. Setting out pan traps.

## Results

- Collected 3103 bee, 120 sawfly, and 264 braconid specimens

- Bees:** species richness differed significantly between treatments ( $P=0.0124$ ); diversity was similar between treatments (Morista-Horn=0.76)
- Sawflies:** species richness differed significantly between treatments ( $P=0.0178$ ); similarity in diversity was moderate (Morista-Horn=0.56)
- Braconids:** species richness did not differ significantly between treatments ( $P=0.343$ ); diversity was dissimilar between treatments (Morista-Horn=0.14)

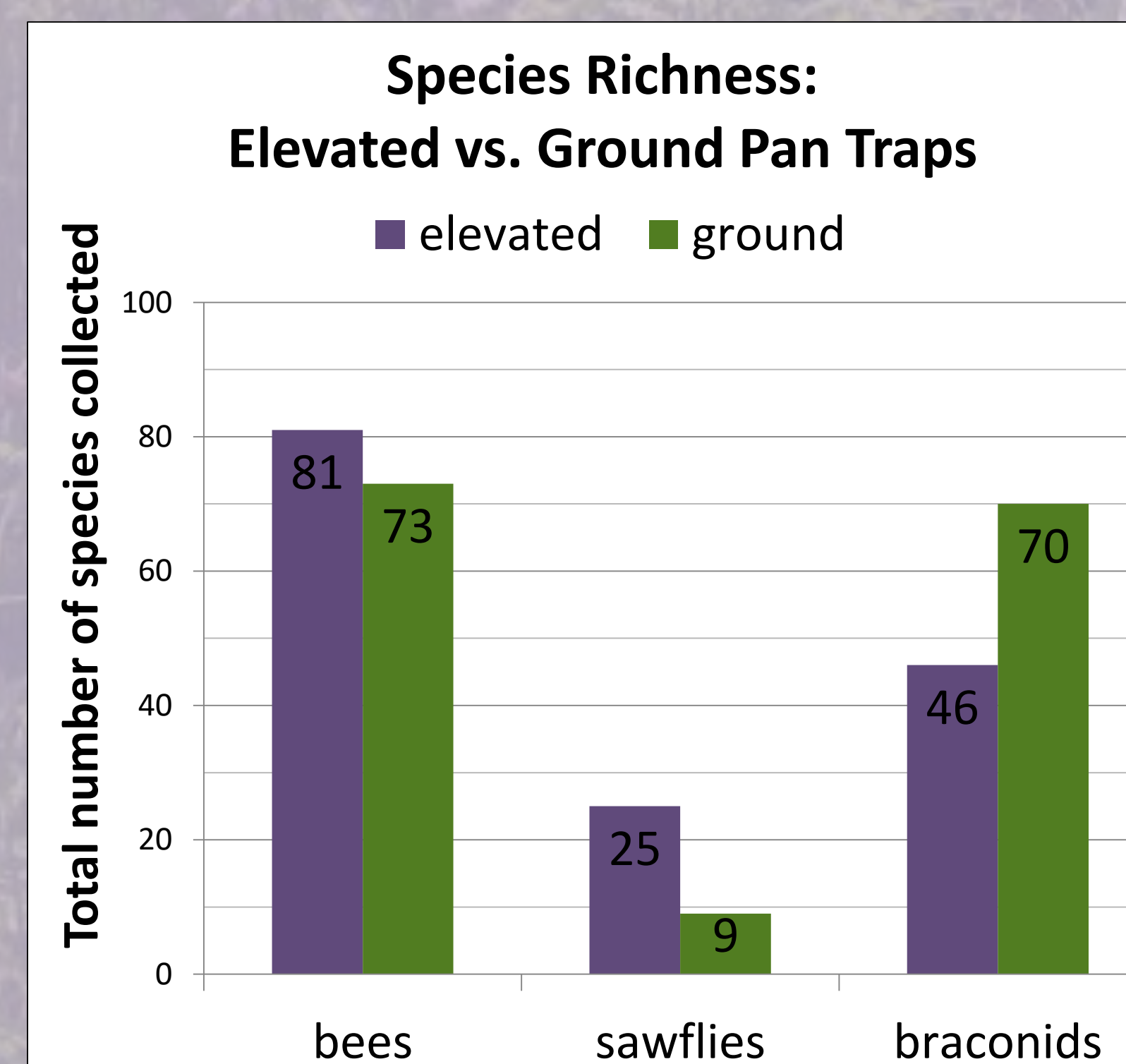


Figure 4. Total number of species collected per guild, separated by treatment.

## Results

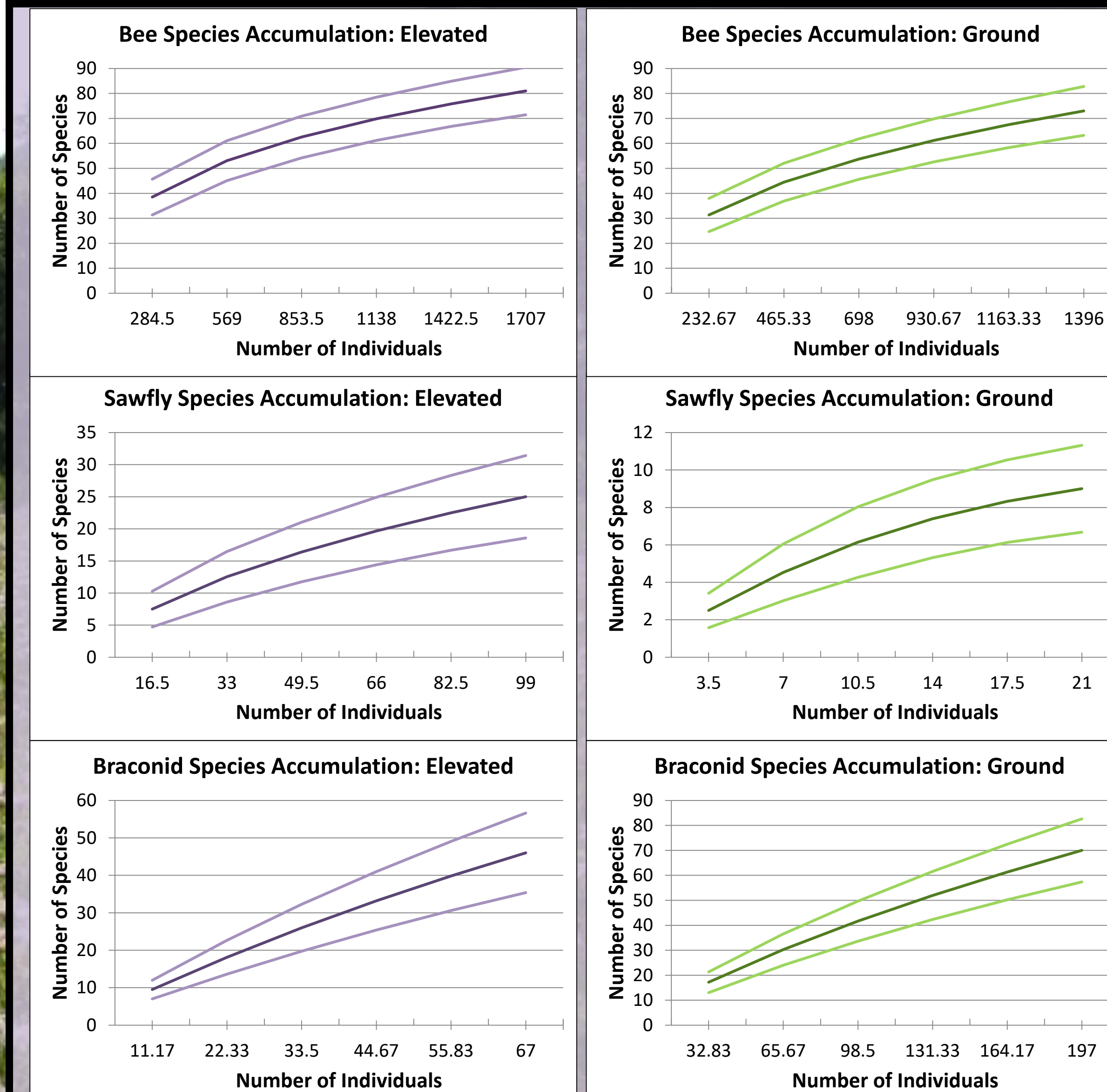


Figure 5. Species accumulation curves for each guild and treatment. Lines represent S(est) 95% CI Upper Bound, S(est), and S(est) 95% CI Lower Bound.

## Discussion

- Elevated pans should be sufficient if only interested in sampling to estimate bee diversity.
- Ground-placed and elevated pans should be used when sampling breadth of hymenopteran taxa; both are necessary for sampling braconids.
- Species collected not saturated so further sampling is necessary.

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