

Tall grass, small wasps: measuring the biodiversity of parasitic braconid wasps (Hymenoptera: Ichneumonidae) in two warm season grasslands

Noah P. Winters¹, Abigail A.R. Kula², and Robert R. Kula³

¹Department of Biology, Kenyon College, Gambier, OH; ²Department of Entomology, Smithsonian Institution, NMNH, Washington, DC;

³College of William and Mary, Williamsburg, VA; ⁴Systematic Entomology Laboratory, Beltsville Agricultural Research Center, USDA-ARS, Washington, DC



Smithsonian
National Museum of Natural History



Introduction:

- Grasslands are the most endangered ecosystem in North America¹; measuring biodiversity in grasslands is therefore critical for conservation

- Calculating parasitic wasp diversity in grasslands provides an indication of potential ecosystem services and overall insect diversity²

- Braconidae (Fig. 1A), a family of parasitic wasps, is of interest given its high species richness and breadth of biological diversity

- Here, diversity was estimated for braconids in two characteristically different warm season grasslands (Fig. 2-3) in the Shenandoah Valley of Virginia

Materials and Methods:

- Oxbow Pond (Fig. 2): 8 ha, burned
- Jones Nature Preserve (Fig. 3): 32 ha, burned and mowed
- 3 SLAM traps (Fig. 1B) at each site March 31-June 30, 2014
- Specimens sorted into morphospecies
- Statistical analysis using SAS 9.2
- Diversity index using EstimateS 9.1.0



Figure 1. A braconid wasp species found at Jones Preserve (A), and a SLAM trap used for collection (B).

Results:

- 575 specimens collected; sorted into 48 genera and 104 morphospecies
- Species richness was 68 at Jones and 63 at Oxbow; mean richness (Fig. 4) did not differ significantly ($P=0.3363$)
- Species diversity differed greatly between the sites as indicated by a Morisita-Horn³ value of 0.294 (max=1)
- 75 species (72%) represented by singletons

Discussion:

- Both sites are surrounded primarily by hay fields (cool season grasses) and eastern deciduous forest
- Jones yielded far more specimens; this could be due to factors such as:
 - Fragment size
 - Management plan
- Differences in species composition could be due to factors such as:
 - Differential colonization
 - Presence of host species
- Lack of species saturation indicates further sampling must be conducted

References:

- ¹Samson, F. B. and F. L. Knopf. 1996. *Prairie Conservation: Preserving North America's Most Endangered Ecosystem*. Island Press, Washington, DC. vii-xiii+339 pp.
- ²Anderson, A., S. McCormack, A. Helden, H. Sheridan, A. Kinsella, and G. Purvis. 2011. The potential of parasitoid Hymenoptera as bioindicators of arthropod diversity in agricultural grasslands. *Journal of Applied Ecology* 48: 382-390.
- ³Colwell, R. K., A. Chao, N. J. Gotelli, S.-Y. Lin, C. X. Mao, R. L. Chazdon, and J. T. Longino. 2012. Models and estimators linking individual-based and sample-based rarefaction, extrapolation, and comparison of assemblages. *Journal of Plant Ecology* 5: 3-21.

Acknowledgements:

I am grateful to Bruce Jones (Jones Nature Preserve) and Beatrice von Gontard (Oxbow Farm) for access to the sites. I thank Danielle Tarry and Morgan Rondinelli (Interns, Smithsonian Institution) for sample and specimen processing, as well as Taina Litwak (Systematic Entomology Laboratory) for imaging the braconid. Dr. Elizabeth Cottrell, Dr. Gene Hunt, and Virginia Power (Directors, Smithsonian Institution NHRE program) kindly provided guidance and support during the REU program. Virginia Working Landscapes of the Smithsonian Conservation Biology Institute provided logistical support for the fieldwork. Funding was provided by NSF EAR-1062692. USDA is an equal opportunity provider and employer.

Oxbow Pond

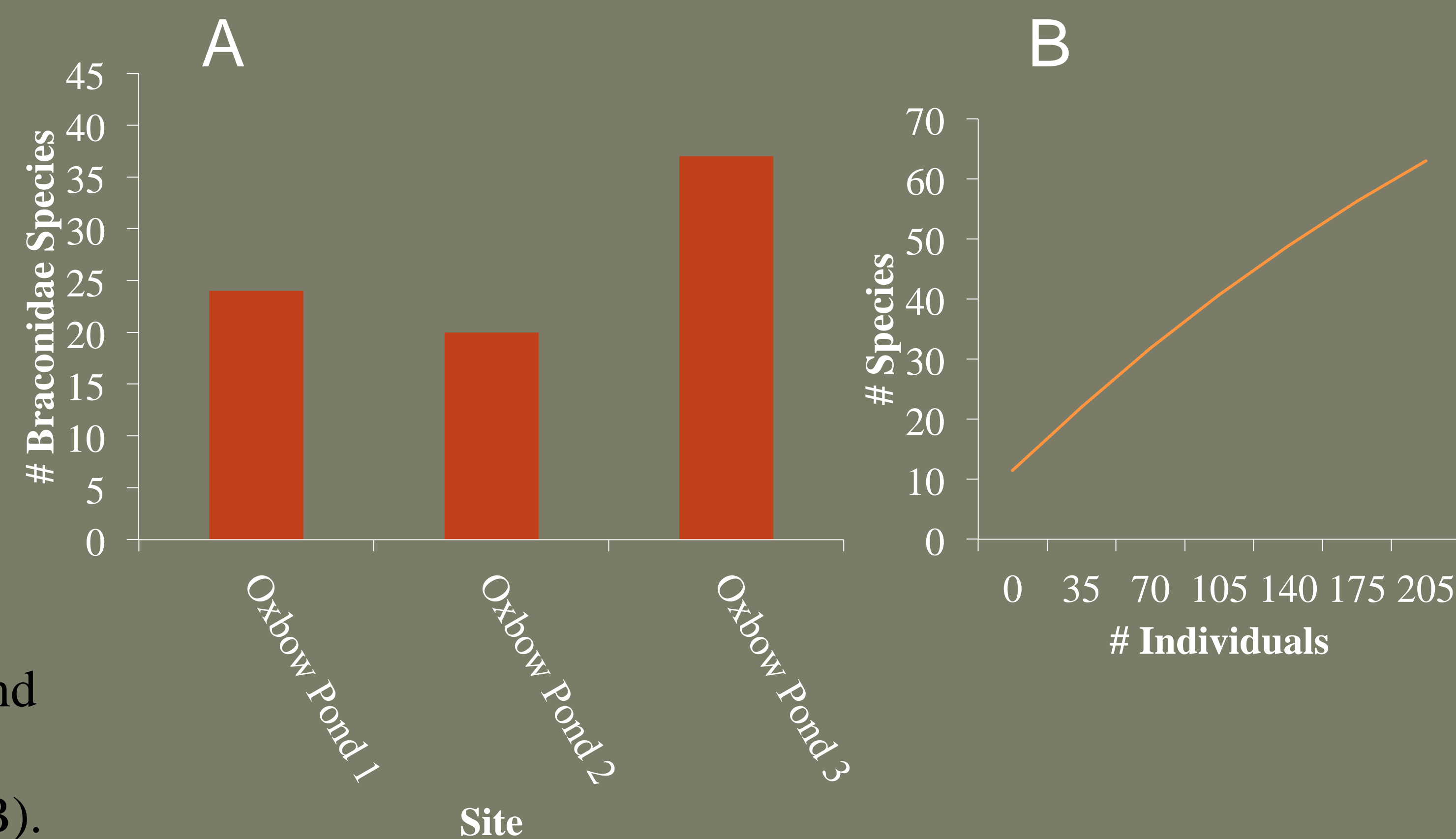


Figure 2. Species richness at each subsite within Oxbow Pond (A) and accumulation of species as a function of specimens collected (B). Singletons represented 67% of the total species.

Jones Preserve

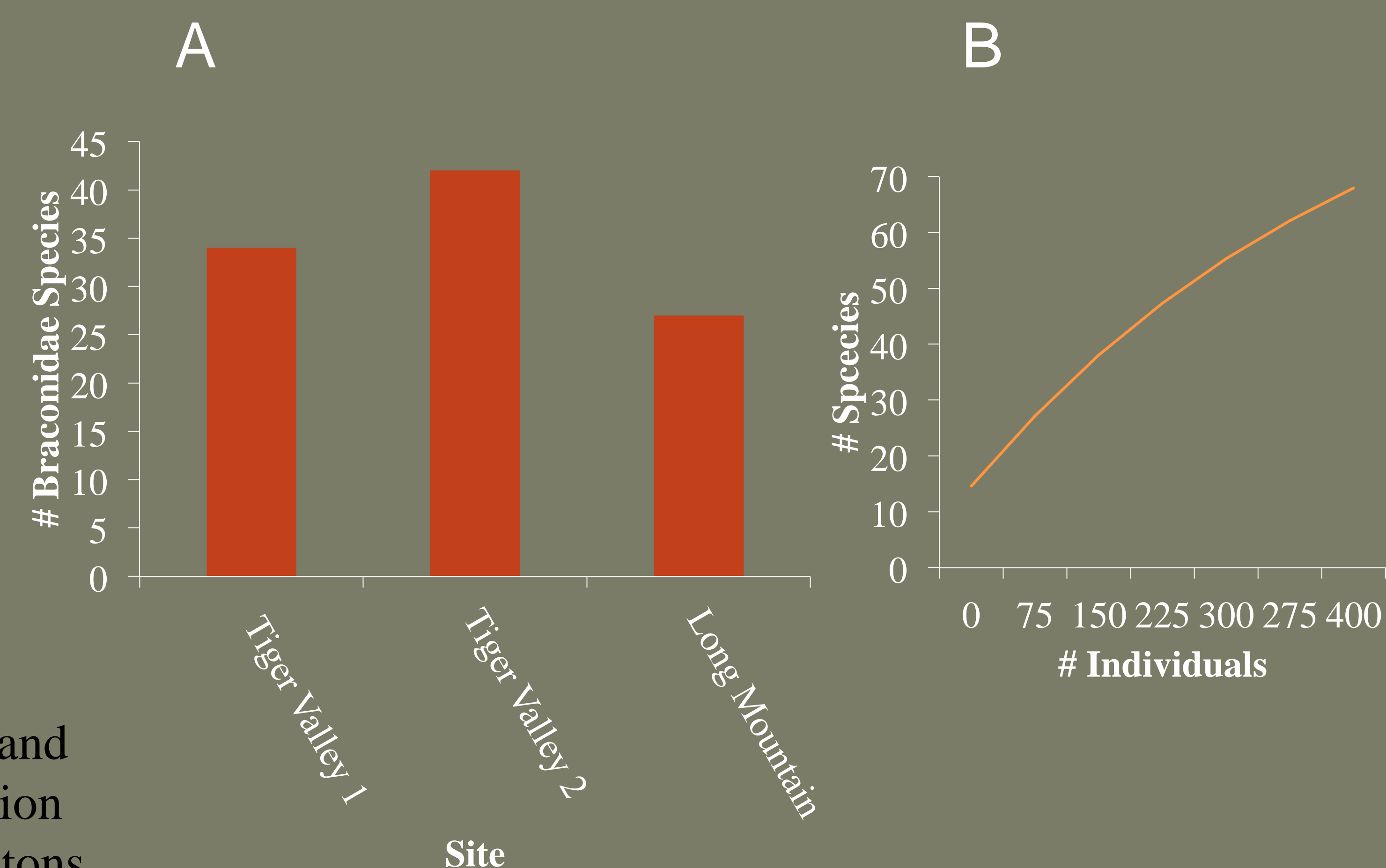


Figure 3. Species richness at each subsite within Jones Preserve (A) and accumulation of species as a function of specimens collected (B). Singletons represented 49% of the total species.

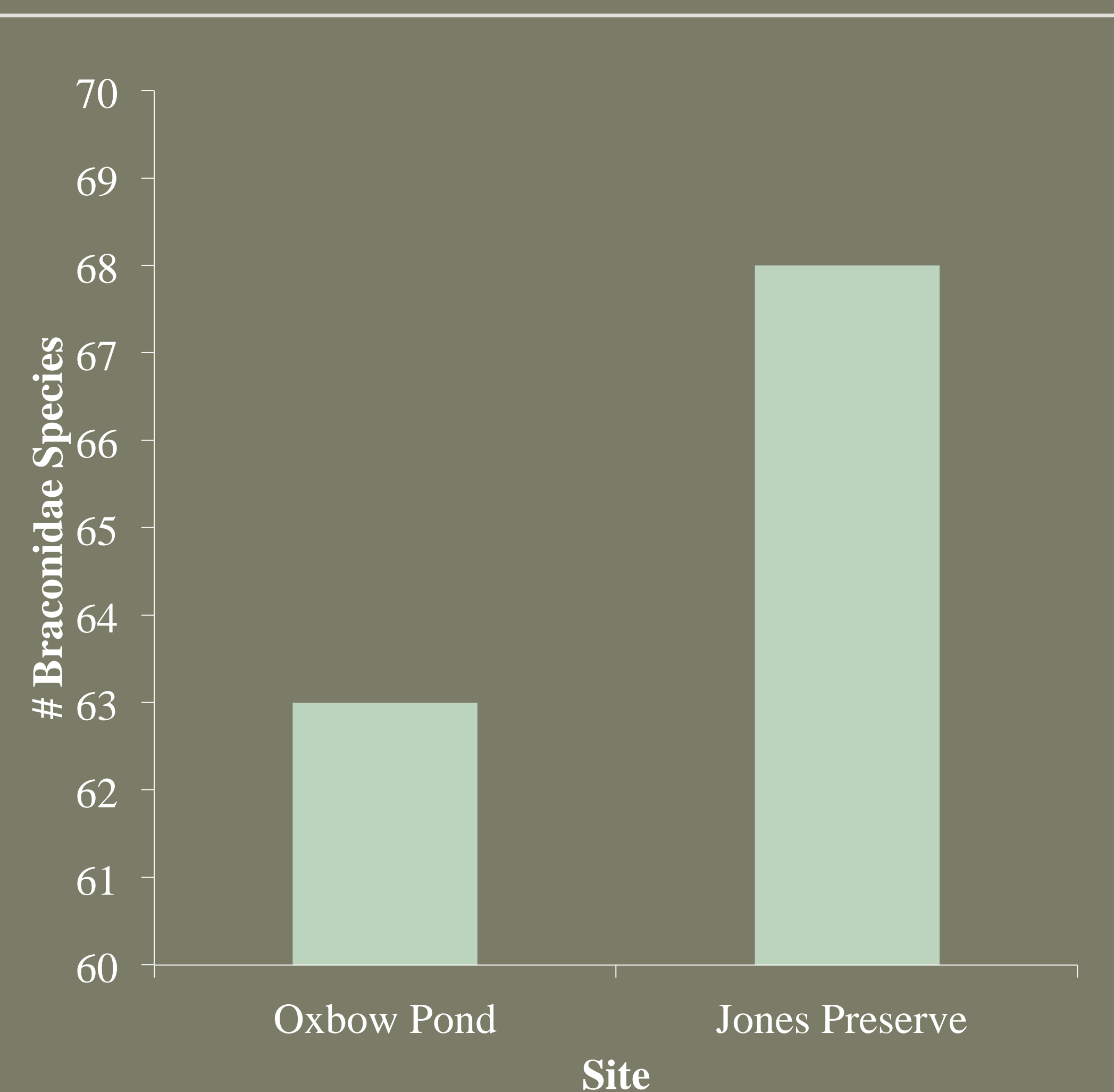


Figure 4. Total number of braconid species encountered at each site. The mean number of braconid wasp species sampled across both sites did not differ significantly ($F=1.19$, $df=1$, $P=0.3368$). The majority of specimens were made up of only 8 species (59%).