



Measuring Odonate Biodiversity: A Comparative Study between Larval and Adult Life Stages

JOSHUA A. SEGURA*, Christopher Anderson, Ph.D**

*Lewis University Biology Department

**Dominican University Department of Biological Sciences

INTRODUCTION

- Throughout the globe, Odonata (dragonflies, Fig.1; damselflies; Fig. 2) are widely distributed with a wide variety of species¹



Fig 1. Dragonfly, *Libellula pulchella*



Fig 2. Damsfly, *Calopteryx maculata*

- The larval stage is spent in an aquatic habitat³
- The adult stage is spent in a terrestrial habitat³
- In conservation standards, Odonata serve as an indicator species, therefore understanding its niche, behavior, and biodiversity can help inform conservation plans²
- Certain environmental factors can affect Odonate numbers such as declines in habitat, pollution, and land development³
- Attaining abundance through means of surveying the count of adult Odonata is an important measure of biodiversity²
- Larval sampling can help assess the breeding activity of Odonata and enhance the understanding of biodiversity²

OBJECTIVE

- Are biodiversity estimates influenced by life stage censused – adult vs larvae?**
- I predicted that larval biodiversity would be greater since the likelihood of any egg maturing to adulthood is low**

METHODS

- For adult data, Odonate records were accessed through the Illinois Odonate Survey (IOS) ⁴
- The subset of IOS sites surveyed for larval abundance in this study included:
 - Sagawau Environmental Learning Center-Lemont, IL
 - Adult records: 2016-2021
 - Larval records: 2021 (this study)
 - Morton Arboretum-Lisle, IL
 - Adult records 2015-2021
 - Larval records: 2021 (this study)
- The adult census protocol was a “Pollard Walk” wherein each adult Odonate was identified and counted along a specific route
- All adult individuals were identified to family with the use of guidebooks
- For collecting larval samples, we used dipnets along bodies of water. Dipnets gathered material in which larvae live
- The material included vegetation, mud, muck, and clay. We sorted through material to collect larvae and preserved in either ethanol or isopropyl alcohol
- The larvae were then classified by family using a microscope and dichotomous key (Fig 3., Fig 4.)



Fig 3. Dragonfly larvae's mandible and water mites



Fig 4. Damsfly larva being identified

- Using Microsoft Excel, adult abundance was compared across years (2015-2021) through use of a line graph for each site
- In addition, Microsoft Excel was used to represent differences between larval abundance and adult abundance for each site during the 2021 census year.

RESULTS

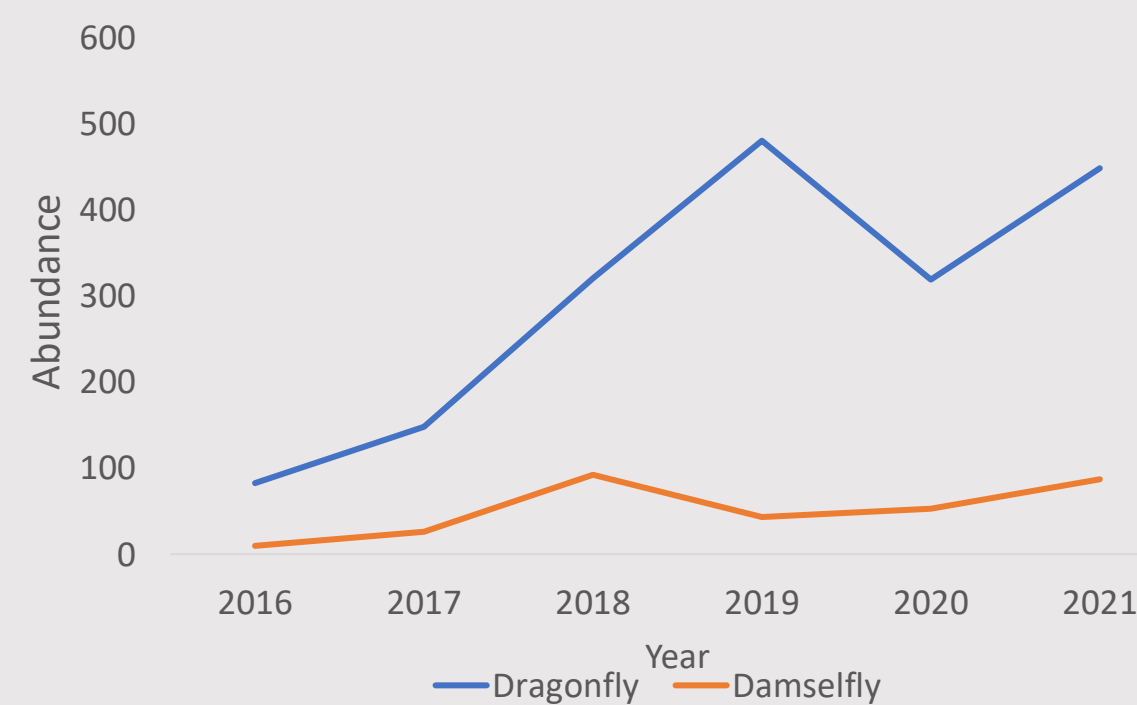


Fig 5. Adult records from Sagawau Environmental learning Center (Lemont, IL)

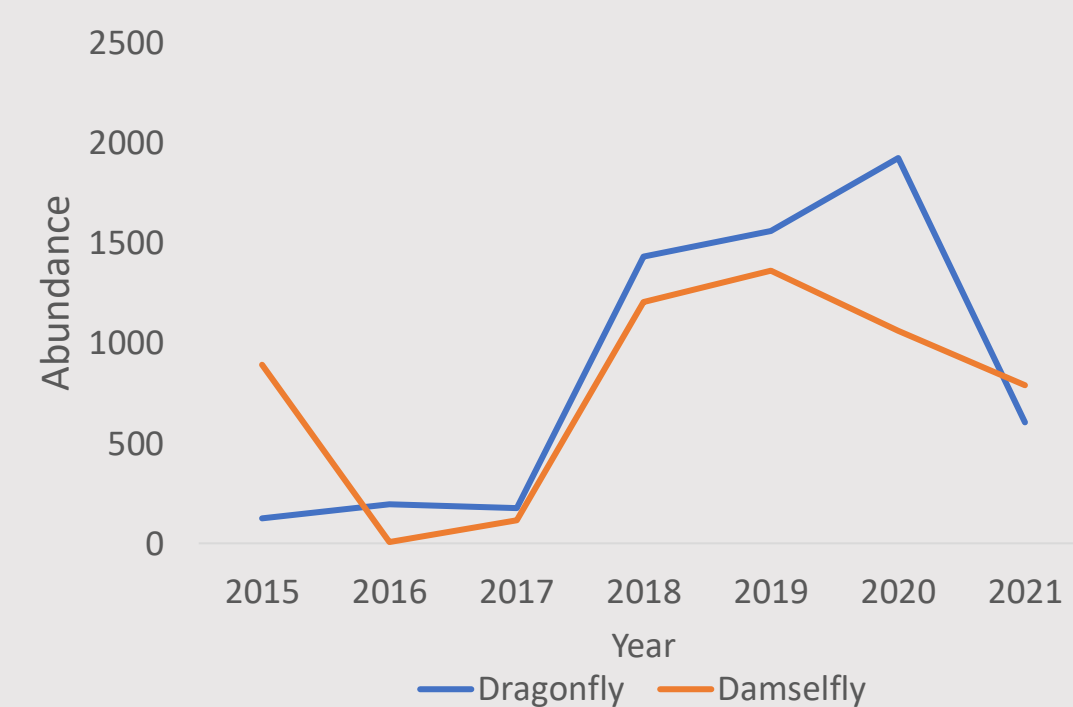


Fig 6. Adult records from Morton Arboretum (Lisle, IL)

Table 1: 2021 Sagawau Environmental Learning Center Larval and Adult Abundances

Family	Larvae	Adult
Aeshnidae	4	9
Cordulegastridae	1	0
Corduliidae	0	6
Libellulidae	4	419
Coenagrionidae	7	85
Lestidae	5	2

2021 Larval and Adult records from Sagawau Environmental Learning Center (Lemont, IL)

Table 2: 2021 Morton Arboretum Larval and Adult Abundances

Family	Larvae	Adult
Aeshnidae	0	102
Corduliidae	0	9
Gomphidae	0	5
Libellulidae	5	366
Calopterygidae	2	116
Coenagrionidae	66	608
Lestidae	0	1

2021 Larvae and Adult records from Morton Arboretum (Lisle, IL)

DISCUSSION

- Adult abundance values from Sagawau Environmental learning center remain relatively stable for damselflies and varies with dragonflies (Fig.5)
- Both dragonfly and damselfly relative abundance follow similar patterns with increases in 2018 and decreases around 2020 and 2021 (Fig. 6)
- The comparison between adult and larval abundance shows there are greater numbers of adult individuals than larvae individuals per family (Table 1 & Table 2)
- For some Odonate families, such as Libellulidae and Coenagrionidae, individuals were detected commonly in both the larval and adult stages (Table 1 & Table 2)
- In other families, such as Cordulegastridae and the Lestidae, larvae were detected with few or no corresponding adult records (Table 1)
- Finally, in other Odonate families, such as Aeshnidae and Corduliidae, adults were commonly detected with few, or no larvae recorded (Table 2)
- A more complete estimate of Odonate biodiversity can be obtained by sampling both the adult and larval life stages.

FUTURE DIRECTION

- Larval sampling effort is likely lower in this study than adult sampling effort, additional larval sampling can help produce better and more accurate measures of breeding activity
- Along with this practice, identifying to the species-level instead of only relying on family identification can offer more insights to the role of species-specific dynamics
- Given inter-year variation, annual comparisons of adult and larval censuses are recommended to estimate each site's biodiversity

Works Cited

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