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Session A, 2015 First Place: Whatever the Case May Be: Investigating Trichoptera Diversity in Three Adirondack Streams

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WHATEVER THE CASE MAY BE: INVESTIGATING TRICHOPTERA DIVERSITY IN THREE ADIRONDACK STREAMS
Caddisflies are members of the order Trichoptera. There are 45 families and about 12,000 species.

They are the most diverse insect order that are exclusively aquatic. Caddisfly larvae belong to many functional feeding groups, from collectors to predators, though they are primarily detritivores.

Larvae construct cases out of sand or organic matter, though some are free-living. Case construction is often family or genus-specific.

They also produce silk from modified salivary glands, which places them in the superorder Amphiesmenoptera with Lepidopterans (Tree of Life Project: Trichoptera, Caddisflies).
INTRODUCTION

- They inhabit streams and rivers, which are the most severely impacted and threatened systems in the world due to mining, agriculture, acid rain, and sedimentation (Holzenthal et al., 2007).

- Anthropogenic development also threatens biodiversity and the value of caddisflies as an indicator species and as a functional component of stream systems (de Moor and Ivanov, 2008).

- They are apneustic and rely on dissolved oxygen in the water for respiration, making them useful indicators of pollution (de Moor and Ivanov, 2008).
Caddisfly larvae are indicators of stream health
- Important factors of the aquatic food web
- Stream presence is critical to overall integrity and structure of the system

High caddisfly diversity also reflects stream resilience to environmental disturbance. (Collier and Smith, 1998).

Can the diversity of caddisfly adults be used as an indicator of stream health?
Hypothesis

- $H_a$: There is no significant difference between caddisfly larvae diversity and caddisfly adult diversity at all three sampled stream locations at the Cranberry Lake Biological Station, NY.

- $H_o$: There is a significant difference in caddisfly larvae diversity and caddisfly adult diversity at all three sampled stream locations at the Cranberry Lake Biological Station, NY.
We collected caddisfly larvae along 10 sites 20 meters apart on three streams: Sucker Brook, North Shore Creek, and Beaver Pond Flow.

We used two sampling methods: d-netting and forceps.

We used the YSI multi-probe to record the temperature, pH, and dissolved oxygen at each site.

Specimens were placed in glass jars for laboratory analysis.
MAP OF SAMPLING SITES

Sampling Unit
n= 33; 1/site

Experimental Unit
n= 6; 3/factor

Factors: Aquatic and Terrestrial
n= 2

Stream 1: Sucker Brook
Stream 2: North Shore Creek
Stream 3: Beaver Pond Flow
Adults were captured using a hanging sheet illuminated by a black light from 8:30-11:30 PM at one location at each stream. After 3 hours of exposure, adults were collected using forceps and placed in a kill jar for later identification and analysis.
In the lab, specimens were identified using a dissecting scope and the *Freshwater Macroinvertebrates of Northeastern North America* and *Kaufman Field Guide to Insects of North America*.

Data were analyzed using
- ANOVA/Tukey’s Test
- Sorenson’s Coefficient
- Shannon-Wiener Index
- Paired t-test
Stream 1 - 8 families:
  - Larvae - Limnephilidae, Glossosomatidae
  - Adult - Beraeidae, Limnephilidae, Lepidostomatidae

Stream 2 - 4 families:
  - Larvae - Limnephilidae, Glossosomatidae
  - Adult - Limnephilidae, Glossosomatidae, Lepidostomatidae

Stream 3 - 7 families:
  - Larvae - Limnephilidae, Glossosomatidae, Lepidostomatidae
  - Adults - Limnephilidae, Lepidostomatidae
ANOVA and Tukey’s Test

- The caddisfly larvae family diversity between the three streams is not significant.
Sorensen’s Coefficient of Similarity
Regression analysis
- There is a relationship between temperature and dissolved oxygen, and temperature and Sorensen’s Coefficient
We determined with the Shannon-Wiener Index that the evenness of the larvae was greater than the evenness of adults at every stream.

- There may be periods of adult emergence during which different families or genera emerge at different times during the year.
However, the paired t-test showed there is no significant difference in caddisfly adult diversity and caddisfly larvae diversity.

Therefore we can assume that adults could be used to assess stream quality.

<table>
<thead>
<tr>
<th>Paired T-Tests</th>
<th>95% Confidence Interval</th>
<th>T-Value</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stream 1</td>
<td>(-0.1615, 0.1612)</td>
<td>0.000</td>
<td>0.999</td>
</tr>
<tr>
<td>Stream 2</td>
<td>(-0.2125, 0.2125)</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Stream 3</td>
<td>(-0.0827, 0.847)</td>
<td>0.000</td>
<td>1.000</td>
</tr>
</tbody>
</table>
Based on the analysis of the data, we reject the null hypothesis that the diversity of caddisfly larvae is different than the diversity of the adults.
Most abundance of Adult Trichopterans found within 30 m of stream (Collier and Smith, 1998).

In a study performed by Stanić-Koštroman et al. 2012, UV light traps were set 1 meter from a stream for 2 hours. After a year of experimentation, they determined that the adults stay close to the water and can be used to assess water quality.

- Diversity of adults differed from the headwaters to mid-waters as well
- The flight peaks were observed during warm spring and summer months, June had the highest species count and May had the highest individual count.
DISCUSSION

- Due to many constraints, we feel we have insufficient data that does not reflect the true caddisfly diversity of the streams.

- Therefore, if we were to repeat the study, we would make the following changes:
  - More adult and larvae sampling to determine diversity
  - Time, weather, and equipment
  - Sample different streams off campus
CONCLUSION

- We found no significant difference in caddisfly larvae diversity between each stream.

- Similarity between adult and larval families varied due to temperature and dissolved oxygen concentration.

- Ultimately, we reject our null hypothesis, and conclude that caddisfly adult diversity can be indicative of larval diversity, and therefore of stream health.
ACKNOWLEDGEMENTS AND REFERENCES

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References


QUESTION?