Anisoptera at the University of Notre Dame Environmental Research Center: Summer 1994

Bios 569-Practicum in Aquatic Biology

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ABSTRACT

A survey of the Anisoptera of the University of Notre Dame Environmental Research Center was conducted throughout the summer and 24 species were collected from various habitats. Three new species were discovered and may be added to the list compiled by odontologists from previous summers. A new successful method of preservation was applied involving the use of acetone. In addition to collecting and preserving dragonflies, routine observations were made of their relationship with their surroundings.

INTRODUCTION

The UNDERC property at Gogebic County, Michigan provides an ideal habitat for dragonfly populations. It consists of 7345 acres which includes approximately 30 lakes and bogs. This allows an abundance of dragonfly species. They can be found nearly everywhere within the property, and because the property is fairly well isolated and virtually untouched by human civilization, it allows for an abundance of dragonfly populations that are free from external influences or disturbances.

Throughout the period of May 19, 1994 and July 22, 1994, the following objectives were accomplished:

1. 24 species of dragonflies were collected, including both sexes in many cases.
2. 3 species have been added to the list compiled by previous odontologists.
3. Using the acetone preservation technique, a better, more accurate representation of the population was attained than if a photographic manual had been compiled.
4. Routine observations were made of certain species and their relationship with the surrounding environment.

5. Observance of the emergence process of various species was performed both within the natural environment and within the the laboratory.
6. Observance of the quality of food eaten by various species of dragonflies was performed.

METHODS

Various pieces of equipment were necessary for a typical day of dragonfly collecting. Such pieces included an aerial net, one or more killing jars which contained potassium cyanide, wax envelopes, and an empty metal band-aid box.

A day of collecting entailed a visit to about 5 or 6 designated sites. Although about 18 sites were surveyed, the preservation process was fairly extensive and I found it to be more manageable to divide the collection from various sites to different days of the week. Visits to each site was in most cases 1 to 2 hours in length. Each day of collecting was followed by the acetone preservation technique performed immediately in the lab; this was to insure that minimal self-mutilation occured by the alive captured specimen.

Throughout the summer, I made sure to visit each site at least three

times with approximately 1 to 2 weeks in between each visit. The frequency of visits was necessary in order to obtain a constant observance of the population throughout the summer despite different emergence times. Weather conditions, however, sometimes made this goal difficult. This resulted in data for collections with longer intervals between each visit. Yet despite this difficulty, I was able to develop an understanding of the various emergence times for different species.

I found the most important tool for collecting to be the aerial net. Initially, I was using a medium- rimmed white colored net with adequate success; however, I later found that a large-rimmed forest colored net with a much larger handle proved to be more effective. The larger handle allowed a higher reach that made high flying dragonflies more accessable, and the forest green color seemed to disguise the net allowing for more successful captures. The most successful catching movement consisted of sweeping the flying dragonfly with the net followed by a twisting of the handle that covered the net's rim with the sack-like end of the net. However, depending upon the position of the dragonfly and whether or not it was flying or resting on the ground, various capture techniques were employed. If I spotted a dragonfly on the ground ahead of me, I would attempt to sneak up from behind in order to remain unseen by their keen eyesight, and when close enough, I would drop the net on top of the

specimen. Most of the techniques were developed as the summer progressed where I learned from experience which methods resulted in more successful captures.

Successful capture was also strongly dependent upon the weather. It was incredible to observe how the presence of sunlight determined the presence of dragonflies. With just the movement of the sun behind the clouds, most of the dragonflies within the area would cease flying and would rest on nearby vegetation. To compensate for this, I would sweep my net over the surrounding vegetation to force them into the air for capture. This weather dependency made collections very difficult to perform on periods of rainy or cloudy weather. Unfortunately there is usually about a two week portion of time around June that seems to hinder most odontologists, including myself, from performing an accurate survey.

When the weather was appropriate, I found the easiest collecting time to be around 10:30 to 11:00 am. This seemed to be the time when most of the dragonflies were in flight and visible for capture. Although the early morning hours may be conducive to collecting because the dragonflies seemed to be less agile and quick, very few insects were seen in flight. It was usually around 2:30 to 3:00, the hottest time of the day, that I acquired the most frustration during collecting. The dragonflies seemed to be at their best at this time in terms of agility and speed and

they also seemed to be more aware of my presence making them all the more difficult to catch. Certain species of of the family Aeshnidae seemed to be most easily caught during the evening hours. It appeared that the abundance of mosquitos may have caused these large dragonflies to come out in search of their prey. Their large wingspan made them relatively easy to see flying against the evening sky.

Following capture of the dragonfly within the net, I would remove the dragonfly from the net with my fingers by gently folding its wings and removing it. This may be difficult to accomplish for a beginner since the dragonfly, especially the larger specimens, tends to look rather ominous as it fights with the surrounding net upon capture, but they are harmless and easy to hold onto by their wings. I would then place the dragonfly in a wax enelope in the same folded position. I folded the top of the envelope to prevent them from escaping and then placed them in the metal band-aid container. This container was necessary for it protected the specimens from possible damage throughout the course of the day.

I initially used the killing jars for collection when the summer first began. As hard as this is to admit, I was a little fearful of dragonflies when I first started collecting. I would transfer the dragonfly from the net into the killing jar without actually touching the specimen but by placing the jar into the net and easing the specimen inside with my other

hand on the outside of the net. Then I would cover the top of the jar with my hand with the net between us and using my other hand, holding the jar between my knees in a sitting position, I would quickly cover the jar with its lid. This ardous process quickly ended, however, as did my fear of them and I was soon able to grab them off leaves with my bare hands by the end of the summer. Thus the killing jar proved to be of little practical use as the summer progressed. In addition to its inconvenience, many specimens already placed in the killing jar were badly damaged upon the addition of particularly irate specimens such as *Cordulia shurtleffi.*

Upon returning to the lab with envelopes containing the newly collected live specimens, I placed them in the refrigerator to slow their metabolism. This usually took about two hours depending upon the size of the specimen. Then, under a laboratory hood, I filled a glass bowl with about an inch level of acetone. I then placed the cold dragonflies within the bowl and soaked them with acetone for about five minutes to insure their death. Following this, I usually removed them and placed them on a paper towl, where one at a time, I unfolded their wings and arranged their legs in a presentable fashion using watchmakers tweezers. I found it best to work with only 4 to 5 dragonflies at a time; otherwise, the dragonflies that are sitting on the towel become dry and difficult to arrange. While trying to maintain the arranged position, I placed the dragonfly back into

the envelope, this time with the wings unfolded. It is important to note that it is necessary to cut of the corners of the wax envelope; this allows for a free circulation of acetone within the envelope after the dragonfly is placed back into the glass bowl. After arranging the remaining specimens and placing them in the bowl as well, addition of acetone was necessary to insure that each specimen was treated. Then the specimens were left within acetone, underneath a hood, for 6 to 12 hours depending upon the size of the specimen. For smaller specimens, 6 hours was adequate otherwise they became to dry and shriveled looking. This, unfortunately, was the case for a few of my earlier attempts as I gradually became familier with the technique. The larger specimens required about 12 hours, and it usually worked fine to finish setting them about 7:00 pm and to remove them from the acetone the next morning.

After removing them from the bowl, the envelopes usually were fairly crispy and sometimes even a bit moist, but most of the acetone in the bowl had evaporated. I was able to easily remove the specimen from the envelope. I would then mount them onto a standard index card using clear nail polish which acts as an adhesive substance and is barely noticeable when dry. I found it best to lightly coat the underside of the thorax and abdomen and then center the specimen on the card. Specimens only required about 5 to 10 minutes for drying. Upon drying, I would place

the completed specimen within a plastic envelope and place it with other specimens in a shoebox for protection.

This was the first time that this preservation technique was employed involving dragonflies. Prior to this summer, specimens were first killed in an cyanide killing jar and then pinned and arranged on a mounting board. They were immediatedly photographed after capture to insure no loss of color occured. This proved difficult because most of the time bad photographs were taken, and by the time this was realized, the dragonfly had lost most of its color, making it nearly impossible to obtain an accurate photo of the same specimen. The acetone technique is useful for the acetone is an excellent means for preserving color. It preserves a real specimen with much color retention, and to comprise a manuel with such specimens would be an excellent tool for further identification. Although the acetone technique is difficult and time consuming, I am proud to say that I believe the resulting collection may prove to be much more useful than a photographic manuel.

BIONOMIC KNOWLEDGE

It was interesting to observe the various types of feeding behaviors amongst dragonflies. Many times I would catch specimens that contained

mosquitoes, moths, damselflies, and even other dragonflies within their labium. Even in my net, the dragonflies continued their chewing mechanism. The dragonflies displayed an impressive agility and speed when attacking their prey, and much to the delight of other UNDERC students, they would commonly attack deer and horse flies, and other insects that notoriously attacked us. The Aeschnids were commonly observed to be a predacious species. There were a few times when I caught an Aeschnid with a *Ladona julia* in its labium.

A few attempts were made to dissect the abdomen of the dragonfly in order to better identitify its food source; however, this proved difficult for much of the stomach contents were indistinguishable with an ordinary light microscope. Thus, I found more success through observation of the dragonflies within their natural habitat.

The Aeschnids are by far the largest and most colorful of all the families present on the UNDERC property. Most species within this genus were high fliers and demonstrated a tremendous agility and speed which made them more difficult to catch. While only two species were caught this summer, *Aeschna juncea* and *Epiaeschna heros*, *Anax junius* was observed at Bog Pot and Tenderfoot Lake throughout the months of June and July. This species was particularly difficult to catch. Known for their tireless flight, the Aeschnids were commonly found near lakes,

either skimming across the lake surface or flying around the lake shore. No Aeschnids were observed near swampy or marsh-like regions. Their pattern of flight was large, making it difficult to observe territorial behavior for possible capture. A more detailed description of the behavior of the various species of dragonflies collected may be found in Appendix A.

The Corduliids, also known as the green-eyed skimmers, are most easily spotted by their metallic green eyes. This intense color fades, however, after death even with the acetone preservation technique. Corduliids displayed a variety of direct flight patterns and were usually very aggressive. I was always able to tell if I caught one due to the particularly angry way it fluttered its wings against the net. The genus' *Somatochlora* and *Epitheca* within this family were spotted near marsh-like habitats. They commonly flew at moderate heights and were faily easy to catch.

The Gomphids were a popular group within the UNDERC property and commonly found near the camp site. *Gomphus spicatus* was found mostly on the ground or roadside, commonly located near dry vegetation. They were fairly easy to catch since most of the time they were resting and were easily recognizable by their characteristic green or yellow stripes.

Out of all the dragonflies observed over the summer, the Libellulidae

family consisted of the greatest number of species on the UNDERC property. The very first dragonflies I caught at the start of the ten week period were *Leucorrhinia frigida* and *Leucorrhinia glacialis*. This family contained species of a variety of sizes and colors from the tiny *Nannothemis bella* to the larger specimens of the Libellulids. I found many of the species to be around for much of the summer particularly *Ladona julia*, while *Nannothemis bella* and those of the *Sympetrum* genus were noted for their late emergence. The *Leucorrhinias* were seen mostly around bogs while the *Libellulids* were observed around lakes and ponds. The *Leucorrhinias* were slower and lower fliers than the *Libellulids* and were found to be much easier to catch.

Unfortunately, I was unable to find dragonflies within the fifth and final family previously observed on the UNDERC property, the Macromiids.

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APPENDIX A

Family	Genus/species	Sex/Site	Date
Aeschnidae	*Anax juncea*	m. Reddington	7/7
		m. Morris Lake	7/3
		m. Tenderfoot Lake	7/10
	Epiaeschna heros	m. Morris Lake	7/3
Corduliidae	*Cordulia shurtleffi*	m &f. Bolger	5/15
		m. Cranberry	5/29
		m & f. Ed's Bog	6/7
		m. Plum/Inkpot	5/22
	Epitheca spinigera	m & f. Tuesday	6/22
		m. Tendfrt. Lake	6/22
		f. Plum/Inkpot	6/16
		m & f Peter/Paul	6/16
	Dorocordulia libera	m. Tuesday Lake	6/10
		m. Morris Lake	6/10
	Somatochlora kennedyi	f. Tuesday Lake	6/15
Gomphidae	*Gomphus exilis*	m. Camp site	5/30
		m & f. Crampton	6/4
		m. Ed's Bog	6/4

	Gomphus graslinellus	m. Morris Lake	6/12
	Gomphus cornutus	m. Peter/Paul	6/10
		m. Cranberry	5/30
	Gomphus spicatus	m. Brown	6/30
		m & f. Plum/Inkpot	6/30
	Gomphus minutus	m. Crampton	6/25
		m & f. Brown	6/22
	Gomphus ventricosus	m. Plum/Inkpot	6/18
		m & f. Morris	6/18
	Gomphus fraternus	m. Brown	6/22
Libellulidae	*Calithemis elisa*	m & f. Ed's Bog	6/12
		m. Peter/Paul	6/12
		m. Crampton	6/25
	Ladona julia	m. Tuesday	6/12
		m & f camp site	6/10
		m. Crampton	6/6
	Leucorrhinia frigida	m. Tuesday	5/20
		m & f. Ed's Bod	5/30
	Leucorrhinia glacialis	m. Tuesday	6/12
		m &f. Ed's Bog	5/30
	Leucorrhinia hudsonica	f. Bolger Bog	6/28

	f &m. Tuesday	6/12
Leucorrhinia intacta	m. Ed's Bog	7/2
Leucorrhinia proxima	m. Bolger Bog	6/30
Libella pulchella	m. Brown	7/7
Libella quadrimaculata	m. Bog Pot	6/6
	m & f Ed's Bog	6/28
Nannothemis bella	m & f. Tuesday	6/30
	m. Ed's Bog	7/5
Plathemis lydia	m. Tuesday	6/30

RESOURCES

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