A Survey of the Aquatic Insects Collected Using Malaise Traps Along the Checkhall River and Respective Tributaries

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Abstract:

A survey of the aquatic insects at ATREC was trapped using Malaise traps at the Checkhall River. The specimens were identified to at least family, and selectively devised into morphogroups. Further collecting needs to be accomplished in order to get accurate representation of the aquatic insects. Our research and observations are described and depicted below.

Introduction

In a previous year the aquatic insect larvae of the Checkhall river along ATREC were surveyed. This study has attempted to make a connection by sampling the adult insects present along the river. The insect fauna studied in this survey spend their

larval stages in an aquatic environment, therefore malaise traps were placed in areas that would maximize the capture of emerging adult insects.

Materials and Methods:

In this study insects were collected using both aerial malaise traps and ground malaise traps- four total. The ground malaise traps were set along the Checkhall river and one of its tributaries, all within the grounds of ATREC. The aerial malaise trap was placed over a small stream that ran alongside of the station, N 15° 20' 44.1" and W 61° 22' 9.2". The first ground malaise trap was set perpendicularly to the river, over a rocky offshoot stream. It was suspended about one meter from the water and gained support from a decaying log. The second ground trap was set over a silt bed at the base of a tributary flowing from ATREC. This area was primarily inhabited by *Piper dussii* and razor grass. The solid ground was primarily decaying logs. The third ground trap was situated over a rock embankment and was not over any flowing water; however, the stream was within a meter of the trap. This area consisted of *Heliconia* and *Piper dussii*. One aerial malaise trap was set over a neighboring stream to the station and was suspended from a breadfruit tree (*Artocarpus altilis).* It faced a leveled portion of the stream. The stream vegetation consisted of reeds and elephant ears (Araceae). Each ground trap was set within the coordinates of N 15° 20' 45.9" and W 61° 22' 45.9" The samples were exchanged by replacing the used sample with fresh ethyl alcohol; each nalgene bottle was labeled depending on which malaise trap sample it contained. Upon return to the lab, each sample was separated according to order and subsequently into family, using the keys available in "Borror

and Delong's Introduction to the Study of Insects". Each vial was labeled with malaise trap information as well as family name in order to determine malaise trap success. Malaise traps were checked in four day intervals; the first interval for ground traps one and two was May 30, 2008 – June 2, 2008. The fourth ground malaise and the aerial malaise trap were run from May 31, 2008 – June 3, 2008. The third ground malaise trap was set from June 2, 2008 – June 6, 2008. All of the specimens collected were assigned to their appropriate orders. Only insects that were aquatic in origin were identified to family level. The following families were targeted: Culicidae, Simuliidae, Veliidae, Gerridae, Ceratopogonidae, Chironomidae, Psychodidae, Leptohyphidae and Hydroptilidae**.** All of the specimens were stored in ethyl alcohol, inside 20mL scintillation vials.

Results

A total of five hundred and thirteen aquatic insects we trapped in four Malaise traps which were set over a seventy two hour time period. The order diversity of the insects consisted of four hundred and eighty-nine dipterans, four ephemeropterans, fourteen trichopterans, and six hemipterans. (See Table 1) These orders were then identified further to family level. Diptera was identified into five families, Psychodidae, Ceratopogonidae, Chironomidae, Cilicidae, and Simuliidae. Malaise trap one contained forty-eight Psychodidae, thirty Ceratopogonidae, thirty two Chironomidae, fourteen Culicidae, and thirty-three Simuliidae. Malaise trap two consisted of one hundred and ninety-nine Psychodidae, twenty-six Ceratopogonidae, one hundred and eight Chironmidae, fourteen Culicidae, and nine Simuliidae.

Malaise trap three contained only two families. One fly was identified as a Psychodidae, while five of the flies were placed into the family Chironomidae. The fourth and final Malaise trap was separated into thirty-five Psychodidae, two Ceratopogonidae, three Chironomidae, and two Culicidae. (See Table 2)

Table 1

Order	Total Numbers in all Malaise Samples
Diptera	489
Ephemeroptera	4
Trichoptera	14
Hemiptera	6

Table 2

Family	**Malaise 1**	**Malaise 2**	**Malaise 3**	**Malaise 4**
	Ground	**Ground**	**Aerial**	**Ground**
	Rocky, Offshoot Stream	**Silt Bed at Base of Tributary**	**Shallow Stream, Silt**	**Rock Embankment within meter of water**
Psychodidae	**48**	**199**	**1**	**35**
Ceratopogonidae	**30**	**26**	**0**	**2**

Chironomidae	**32**	**108**	**5**	**3**
Culicidae	**14**	**14**	**0**	**2**
Simuliidae	**33**	**9**	**0**	**0**

Figure 1

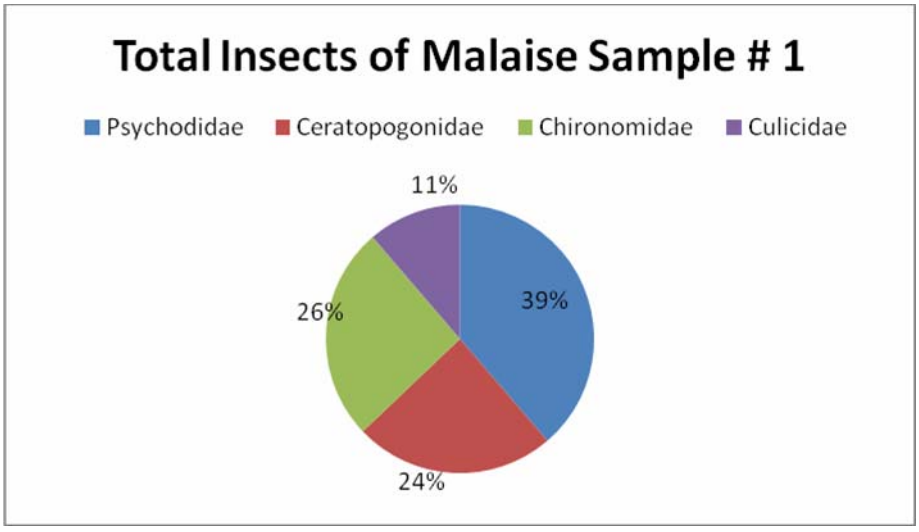


Figure 2

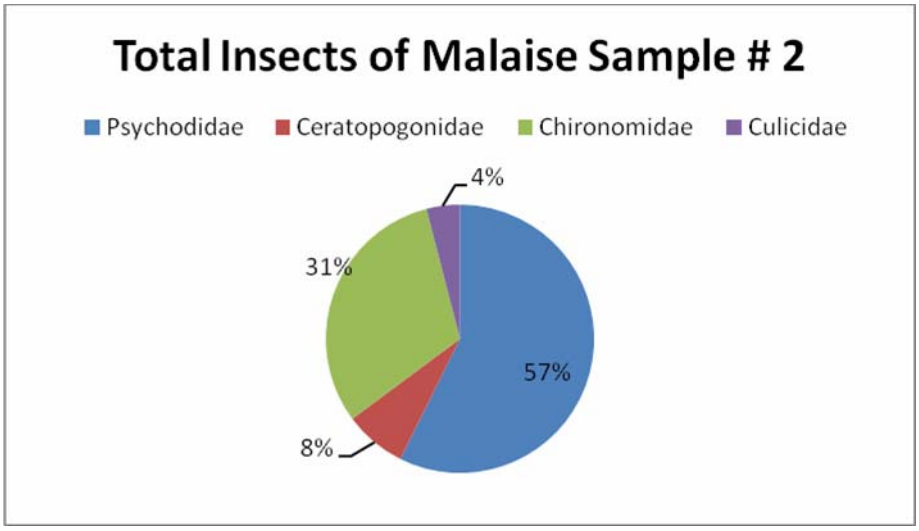


Figure 3

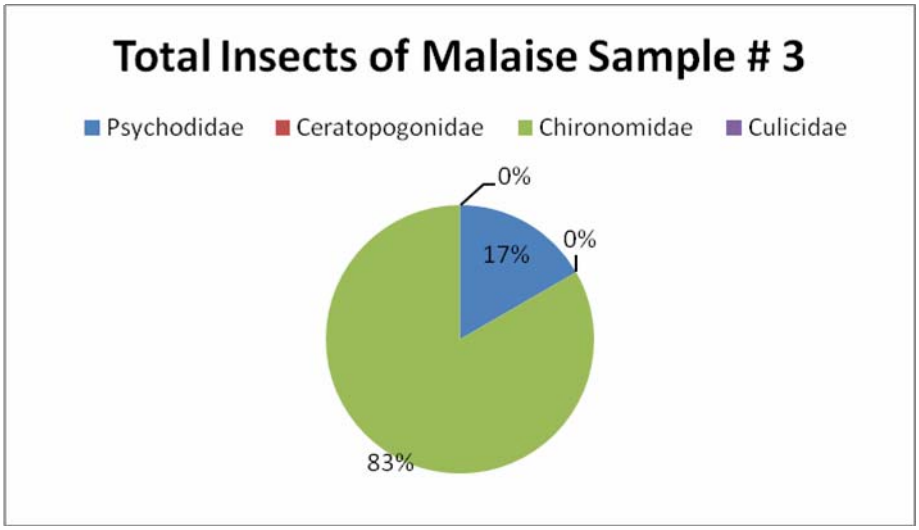
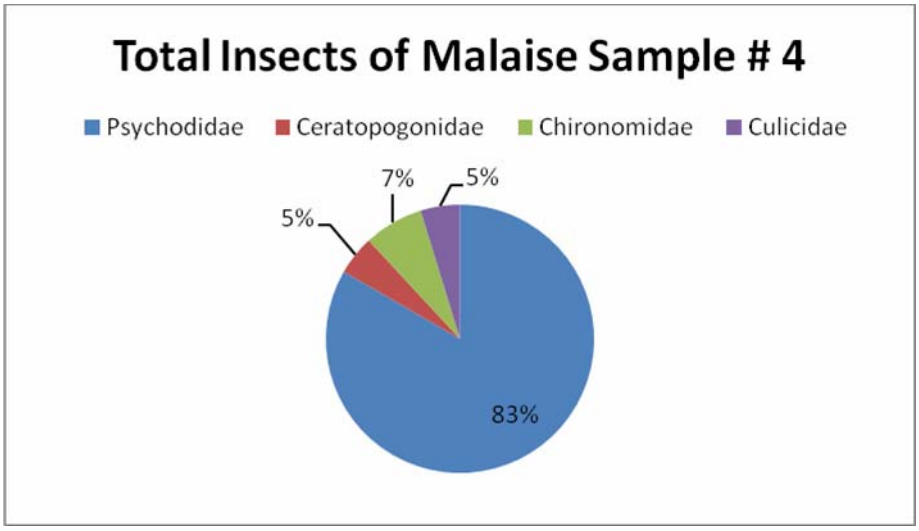


Figure 4



The family Psychodidae was further separated into morphogroups A,B,C,D, and E. Morphogroup A was defined by a spotted wing, B was characterized by an elongated wing, C was identified by a stout and long body, D was defined by a stout and short body, and E was characterized by a long, not stout body. Morphogroup A consisted of sixty-five Psychodidae. Morphogroup B contained thirty-nine Psychodidae, C contained fifty-nine Psychodidae, D consisted of one hundred and ten Psychodidae, and morphogroup E consisted of ten Psychodidae. Malaise trap 1 was divided into all five morphogroups, two specimens in A, eleven specimens in B, twenty-five specimens in C, nine specimens in D, and one specimen in E. Malaise trap number two was also defined into all five morphogroups; sixty specimens in A, twenty-six specimens in B, nine specimens in C, ninety-seven specimens in D, and seven specimens in morphogroup E. Malaise trap number three consisted of only

one specimen which was identified into morphogroup D. Malaise trap number four was able to be divided into all five morphogroups; three specimens in A, two specimens in group B, twenty-five specimens in group C, three specimens in group D, and two specimens into morphogroup E. (See Table 3)

Table 3

Morphogroup	Malaise 1	Malaise 2	Malaise 3	Malaise 4
A-Spotted wing	2	60	0	3
B-elongated wing	11	26	0	2
C- Stout & Long Body	25	9	0	25
D-Stout and Short Body	9	97	1	3
E- Long, Not	1	7	0	2

Stout Body				

The four ephemeropterans which were captured were classified into one family, Leptohyphidae. Two of the specimens which were captured in Malaise trap 1, and two of the specimens were captured in Malaise trap two. (See Table 4). Fourteen trichopterans were captured; nine in Malaise trap one and five in Malaise trap two. These were each identified into the family Hydroptilidae. (See Table 4)

Table 4

Family	Malaise 1	Malaise 2	Malaise 3	Malaise 4
Leptohyphidae	2	2	0	0
Hydroptilidae	9	5	0	0

Discussion

Order:Diptera

Dipterans make up a very large and diverse order that contains what are commonly known as flies. The key characteristic for fly identification is the presence of a pair of halteres in place of the hind wings. This study focused on families within the suborder Nematocera. These flies are known as the long-horned flies and are distinguishable from short-horned flies by the presence of filamentous antennae, consisting of six or more free segments (672, Triplehorn and Johnson, 2005).

Ceratopogonidae

The familiy Ceratopogonidae includes the biting midges. These insects are hemophagous and can be distinguished from chironomids by the medial vein which is two branched. The legs can also be compared; hind legs of a ceratopogonid are typically the longest. The larvae of this insect are aquatic and are often found near and in decaying matter (708, Triplehorn and Johnson 2005).

Chironomidae

This family includes the midges, they are similar to culicids upon first glance however they lack scales on the wings and do not have piercing mouthparts. Midges can also be distinguished by having the forelegs as the longest pair , the metanotum has a keel as well. The larvae of this family are aquatic and can be found in areas rich in organic matter (709, Triplehorn and Johnson 2005).

Culicidae

This family is well known as a common vector of disease, the adults are easily recognized by having a piercing proboscis, mosquitoes also have scales along the wing veins(710, Triplehorn and Johnson 2008). The larvae can be found in lentic systems, which include slow moving areas along the Checkhall River.

Psychodidae

Moth flies are very common in drainage systems as well as other nutrient rich aquatic habitats. They are easily distinguished from other nematoceran flies by their

four branched radial sector and pointed apex of the wing. The wings as well as the body are often densely covered in setae or hair. The larvae are common in aquatic systems that have high levels of decaying vegetable matter or silt laden areas (708, Triplehorn and Johnson 2005).

Simuliidae

Black flies are another commonly encountered fly around aquatic systems. This fly is easily distinguished by its broad wings and weak posterior veins. They are commonly dark in coloration and carry a rather humpbacked stature. The larvae are common in streams and attach themselves to stones using a suction structure near the apex of the abdomen (714, Triplehorn and Johnson 2005).

Order:Hemiptera

This order contains the "true bugs" and the majority of them are phytophagous, however the two families targeted in this survey are predaceous and belong to suborder Heteroptera. These insects are distinguishable from other orders by the possession of a beak.(Triplehorn and Johnson, 2005).

Gerridae

The Water Striders are a common family found on the water's surface, skating about searching for deposed insects to consume. Water Striders live in along the margins of

aquatic systems and tend to lead gregarious lives They move about using the middle and hind legs and feed with the first pair, an identifying feature of both veliids and gerrids is the ante-apical tarsal claws. The differentiating feature between gerrids and veliids is the leg attachment; the middle pair of legs in gerrids are placed much closer to the hind pair (293, Triplehorn and Johnson 2005). The specimen hand collected for this survey was found along the Checkhall River beneath a vegetative overhang .

Veliidae

Veliids are also common surface inhabiting insects, they feed upon diminutive insects and are often gregarious. They can be found in the same microhabitat as gerrids however they will also frequent riffle areas of streams (293, Triplehorn and Johnson 2005). The individuals hand collected for the survey were found along a margin of the Checkhall River.

Order: Trichoptera

Caddisflies are similar in appearance to moths however they possess mandibulate mouthparts, although they are typically reduced and have antennae that are usually as long or longer than the body. Their larvae are aquatic and can be found in a wide range of aquatic habitats (558,Triplehorn and Johnson, 2005).

Hydroptilidae

The microcaddisflies are smaller caddisflies that bear a purse shaped case only in the last larval instar. The adults can be recognized by being very hairy and having narrow and apically pointed hind wings (567,Triplehorn and Johnson,2005). All of

the caddisflies collected in the malaise samples were keyed to this family, they were dark in coloration.

Order: Ephemeroptera

The mayflies are easily identifiable by the presence of large triangular forewings as well as two or three caudal filaments. They can be found in a variety of aquatic habitats including streams and rivers. Their larvae are found in these in aquatic situations often feeding on detritus. The larvae may live actively in lotic systems or may lead benthic lifestyles as burrowers(181, Triplehorn and Johnson,2005).

Leptohyphidae

This family is typical in tropical areas and the nymphs live in rivers and streams. The adults can be recognized by the three caudal filaments and the failure of the MP2 vein to reach the base of the forewing. This family typically lacks the hind wing however males of some genera possess a costal projection(190, Triplehorn and Johnson,2005). The individuals collected in this survey did possess the costal projection in the males.

Malaise trap number one had the second lowest diversity of dipterous insects, only four of the five target families were accounted for. Chironomidae was not present in the first sample, this seemed odd because all of the other traps contained at least a few. However this trap was set over swiftly moving water so it may have been that midges weren't necessarily present in any large amount around that trap. The family with the most individuals was Psychodidae, forty-eight specimens. Out of

these, five morphogroups were classified, the majority being Psychodidae-C, with twenty-five individuals. The other families that made up the sample were: Simuliidae, Ceratopogonidae and Culicidae, in order of decreasing occurrence. Only one family of ephemeropterans was identified , Leptohyphidae. The same trend occurred with the trichopterans as well, only one family was collected, Hydroptilidae. Malaise trap number two had the highest diversity of dipterous insects, all five target families were accounted for. Once again the psycodids were the most prevalent with one hundred and ninety-nine specimens. The psychodids were then sorted into five morphogroups, the largest group being Psychodidae-D with ninety-seven members. The second most prevalent family were the chironomids with one hundred and eight individuals. Both the psychodid and chironomid results fit the expected outcome, since the trap was located over a silt laden, slow moving portion of the stream, high in decaying vegetable matter. Another notable result is the sharp decrease in Simuliidae numbers from the first trap, this is plausible because simuliid larvae tend to attach to rocks in swiftly moving streams. The least occurring family was Simuliidae. The diversity among ephemeropterans was rather high compared to traps three and four with two individuals of the family Leptohyphidae. The trichopteran fauna consisted of only one family, Hydroptilidae. Malaise trap number three, the aerial trap, did not have any substantial numbers. The most abundant family was Chironomidae with five individuals, the only other family present was Psychodidae with one member. This trap must have been in a poor location as the yield seems to be unrepresentative of what should have been there and what had been collected on a previous light trapping occasion. More traps need to be set along

the stream in order to fully determine the aquatic dipterous diversity. Malaise trap number four, was the third least diverse in aquatic dipterous insects. The most prominent family was Psychodidae with thirty-five individuals and all five designated morphogroups. The most prevalent morphogroup was Psychodidae-C. No simuliids were in the sample and approximately equally low numbers of chironomids, culicids and ceratopogonids were present. This indicates that all of the target aquatic dipterans except Psychodidae remain within extremely close proximity of a water source. The psychodids present then must either move around considerably more than the other families, or the larvae are present in the mud and moist detritus located around and underneath the rock embankment that the malaise trap was situated over. None of the other target families were found in the sample.

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Work Cited

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