School Malaise Trap Program

Fall 2015 Program Report

The Fall 2015 School Malaise Trap Program was a huge success and your participation made it happen. This short report summarizes the program — its procedures and results — and all of the interesting discoveries from your work. Before we get to the results, let's review what the School Malaise Trap Program was all about and how we worked together to complete it.

The Biodiversity Institute of Ontario (BIO), at the University of Guelph, is a research institute dedicated to rapidly identifying and documenting life in Canada and in the world. This is no easy job since there are millions of different species of animals and plants across the globe, and about 100,000 of them occur in Canada. In addition, it's often difficult to separate closely related species by their appearance, even for experts. Fortunately, BIO has developed a new tool that makes identifying species quick and easy — it's called DNA barcoding. Just like a can of beans in a grocery store, where the barcode lets the cashier quickly know it is different from a can of peas, each species has a small piece of DNA that can be used to distinguish it from other species. BIO is assembling a DNA barcode reference library for all of the world's species, called Barcode of Life Data Systems, and we're doing it through a huge research project called the International Barcode of Life project. We need help to complete it, and that's where your class and the School Malaise Trap Program fit in.



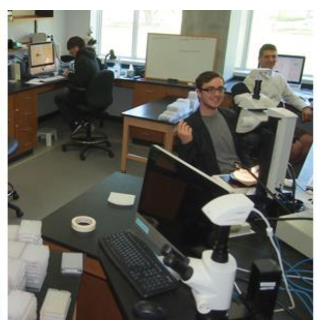
Collecting Specimens

In September 2015, we sent out Malaise trap kits to 54 schools and 10 outdoor education sites across Canada. Each kit included a Malaise trap and an instructional video that gave each class a lesson on biodiversity, DNA barcoding, and the star of our program — the Malaise trap. Because this tent-like apparatus is so effective at collecting insects we asked each school to set up its Malaise trap and collect insects during the same two weeks (September 21 – October 2). At the end of the two weeks, all traps and collection bottles were returned to BIO to allow analysis to begin.

Sorting Specimens

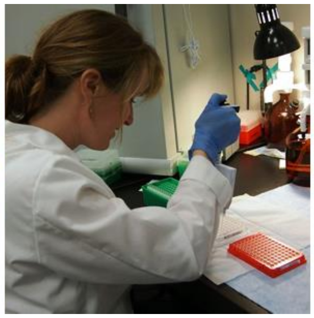
Once the collection bottles arrived, BIO staff recorded details on the collection locality from each bottle and compiled the weather data recorded by the students in each class. Next, the contents of each bottle were poured into a sorting dish, and, using a microscope, every specimen was counted in each trap. Our staff then attempted to pick as many different species as possible, selecting up to 285 animals to DNA barcode from each trap. Each selected specimen was then placed in an individual well of a DNA tissue plate. If a specimen was too large to fit in a well, one leg was removed and placed in the well. This process led to the assembly of 176 full plates and 1 partial plate, with each full plate containing tissue from 95 specimens for a total sample size of 16,798 individuals! Once these plates were ready, they were transferred to the molecular laboratory for the next phase of barcode analysis.






Sequencing Specimens

The first step in the laboratory was DNA extraction. All of the plates, each containing 95 specimens or legs, were incubated overnight in a special solution that extracts DNA out of the cells. The next day, the DNA was separated from other cell materials using one of our robots, lovingly called Franklin (after Rosalind Franklin, who helped to discover the structure of DNA in the 1950s). The second step in our analysis employed a clever technique called the polymerase chain reaction or PCR. By adding a cocktail of reagents to the DNA, then rapidly heating and cooling it several times, we created millions of copies of the DNA barcode region for the sample of DNA in each well. All these copies are necessary for the final laboratory step — DNA sequencing where each well was analyzed on one of our DNA sequencers that use a laser to read the letters (A, C, G, and T) of each DNA barcode. And there you have it, that's how we determined the DNA barcode for each insect (or other invertebrate) caught in your trap!

For a fun classroom activity that shows how to query a DNA barcode on Barcode of Life Data Systems, click here.

Analyzing the Sequences

Although the molecular work was complete, there was one more critical step – the analysis of your sequence results. Your DNA barcodes needed to be compared with the records in BOLD, the Barcode of Life Data Systems to obtain identifications. When one of your DNA barcodes matched a record in BOLD, we could confidently assign its source specimen to that species, for example, to the European garden spider (*Araneus diadematus*) or to the Eastern ash bark beetle (*Hylesinus aculeatus*). In other cases, BOLD indicated that your record derived from a distinct species, but it could only assign it to a group such as the ichneumon wasps (Ichneumonidae) or one genus of tortricid moths (*Acleris*). In some cases, your barcodes did not find a match; they were brand new DNA barcodes for BOLD! We will discuss these exciting discoveries later in this report. All of the identifications were then compiled for each trap to create the report that you are now reading. We're very excited to share the news, so let's get to the results.

European garden spider (*Araneus diadematus*)

Eastern ash bark beetle (*Hylesinus aculeatus*)

Ichneumon wasp (Ichneumonidae)

Tortricid moth (*Acleris sp.*)

Fall 2015 Program Results

Drumroll please! It's time to share results for the Fall 2015 School Malaise Trap Program. Let's begin with a general summary. The Fall program involved 64 sites in 53 cities, 81 classrooms, and 2,357 amazing students. Your classroom's trap was one of 64 traps deployed from September 21 to October 2, 2015. Overall, we had relatively warm weather across the participating sites, especially during the first week of the trap deployment period. Average daytime temperatures were 19°C for Week 1, and 17.7°C for Week 2.

To check out where all the schools and traps were located, play with the interactive map here. Click on each of the icons to see the school name and the results from that trap.

The 64 traps collected an average of 349 specimens during Week 1, and 407 specimens in Week 2, for an average total of 750 specimens for the collecting period. The total number of specimens showed substantial variation among traps, from a low of 51 to a high of 3,672 specimens. It might surprise you that so many insects were collected in your schoolyard. If so, remember that you only collected for two weeks while insects fly in many regions of Canada for eight months of the year!

The staff at BIO sorted the 47,711 specimens present in your 64 traps and selected 16,798 specimens for barcode analysis. When the molecular work was complete, 15,034 (89.5 %) of the specimens delivered a DNA barcode. Because we excluded a few short barcodes, the final dataset included 14,397 barcodes. The analysis of these barcodes revealed that you collected 3,515 species in just two weeks of sampling. That's very impressive because the estimated total number of terrestrial arthropod species found in Canada is 63,000, so you collected 5.58% of them. Some of these species were uncommon, with 1,864 species only being collected in a single trap. More excitingly, your collecting efforts provided the very first records for 247 species.

For an advanced classroom activity, it would be interesting to test these three hypotheses:

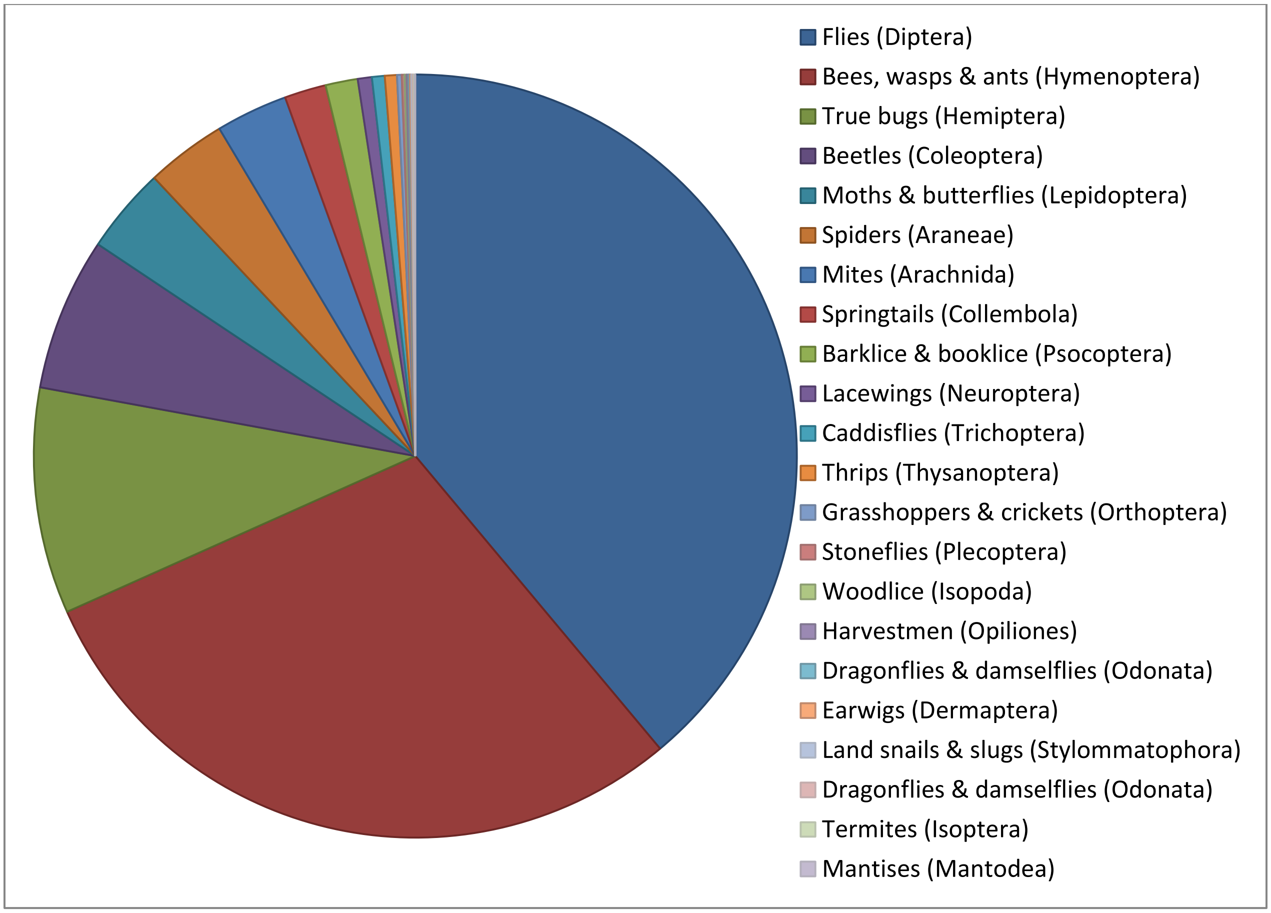
1) Were the number of individuals and species collected higher in Week 1 than in Week 2?

2) Were the number of individuals and species collected associated with the average daytime temperatures of the site?

3) Were the number of individuals and species collected associated with the population of the city/ town where the trap was deployed?

Furthermore, we are pleased to announce that since its inception in 2013, the School Malaise Trap Program has recently attained several incredible milestones through reaching approximately 15,000 students and educators from across Canada, representing over 300 schools and 22 comparison sites. All six of the programs considered, the School Malaise Trap Program Team has sorted through 322,114 specimens, barcoding a total of 85,727 selected specimens, which ultimately represented 8,119 species (this number does not include species overlap between programs). In total, 1,288 of these species were new to BIO's online barcode reference library, BOLD, and several species collected by the sites were new records for Canada and a few are possibly new species to science! You, as citizen scientists, have made an enormous and extremely valuable contribution to the International Barcode of Life Project as well as to your local community and school. Congratulations to you all!

Fall 2015 School Malaise Trap Program Overall Species Pie Chart



To see a list of all 3,515 species collected in the Fall 2015 School Malaise Trap Program, click here. To just see a picture of each species, click here.

Most of the 3,515 species that you collected were arthropods — invertebrates with a hard external skeleton. If you look at the pie chart above, you'll notice that many (39%) of the species were flies (scientific name: Diptera). Some groups of flies were particularly diverse; there were 290 species of midges (Chironomidae), 127 species of fungus gnats (Sciaridae), as well as 154 species of gall midges (Cecidomyiidae). In addition, just like the Spring 2015 and Fall 2014 programs, the most abundant species was a midge. After flies, the next most species diverse group was the bees, wasps, and ants (Hymenoptera), followed by the true bugs (Hemiptera). Most of the species in these groups have wings, so it's not surprising that they were collected in your Malaise traps. However, you also collected some groups that don't fly such as springtails (Collembola), spiders (Araneae), and land snails and slugs (Stylommatophora).

And now the section of the report that many of you have been waiting for — to see how your schoolyard compared with the other schools across Canada. There are many ways to measure biodiversity, but we have adopted four metrics for comparisons among the sites:

Click here to view the results from all 64 trap sites. In addition to the specimen and species counts, we've also compiled the weather and population data associated with each.

The simplest metric compares the number of specimens collected by each trap. The great advantage of this method is that anyone can do it — so long as you can count! In practice, it's not a very informative measure of biodiversity, since it can be affected by one or a few very common species. However, there was variation in the total number of specimens caught, ranging from a low of 51 individuals, to the winner for this category — Eastdale C.I., in Toronto, Ontario, which had a catch of 3,672 specimens -- congratulations!

Number of Specimens Caught – Top 3:

School/Comparison Site	Province/Territory	Trap #	Total Specimens
Eastdale C.I.	Ontario	EQP-CLL-605	3672
Lorne Park Public School	Ontario	EQP-CLL-754	3120
Nukko Lake Elementary	British Columbia	EQP-CLL-558	3105

If you would like to see how your school ranked in these four categories, click here for tables of all the results.

The second way to compare biodiversity, and certainly one of the best ways, is to count the total number of species in a sample. By using DNA barcoding, we were able to quickly determine the number of species at each site, even if some could not be assigned to a particular species. The total species count varied among sites. The winners for the most species collected, with an extraordinary 169, were Hamilton District Christian High School in Hamilton, Ontario, and Toronto Botanical Gardens in Toronto, Ontario.

Number of Species Caught – Top 3:

School/Comparison Site	Province/Territory	Trap #	Species Count
Hamilton District Christian H. S.	Ontario	EQP-CLL-610	169
Toronto Botanical Gardens	Ontario	EQP-CLL-889	169
Two Hills School	Alberta	EQP-CLL-553	166
Preeceville School	Saskatchewan	EQP-CLL-911	162

A third way to compare biodiversity is to consider the rarity of the species that were collected. The Barcode of Life Data Systems (BOLD) has over 4.5 million DNA barcodes, including records for over 40,000 Canadian terrestrial arthropod species, so it is not very often that one is able to add coverage for a new species. As a result, we were amazed that 247 new species were detected in your collections. When we compared the number of new species detected at each site, the numbers were close — congratulations to our winner Mount Moresby Adventure Camp on the Haida Gwaii Islands, British Columbia for collecting 12 species new to BOLD.

Number of New Species Added to DNA Barcode Library – Top 3:

School/Comparison Site	Province/Territory	Trap #	Species New for BOLD
Mount Moresby Adventure Camp	British Columbia	EQP-CLL-855	12
J. V. Clark	Yukon Territories	EQP-CLL-852	9
Nukko Lake Elementary	British Columbia	EQP-CLL-558	9
Columbia Park Elementary	British Columbia	EQP-CLL-580	8
David Hoy Elementary	British Columbia	EQP-CLL-517	8
Woodbine Junior High School	Ontario	EQP-CLL-908	8

Finally, biodiversity between sites can be compared by examining the overlap in species among sites. With 64 traps deployed for the same period, any species that was only collected in a single trap is certainly a 'rare' species. In total, there were 1,864 rare species. Nukko Lake Elementary in Nukko Lake, British Columbia had the lead in collecting rare species with 66. Let's give them a big round of applause!

Number of Species Unique to Trap – Top 3:

School/Comparison Site	Province/Territory	Trap #	Species Unique to Trap
Nukko Lake Elementary	British Columbia	EQP-CLL-558	66
Camp Heidelberg Nature Centre	Ontario	EQP-CLL-598	65
Colchester North	Ontario	EQP-CLL-919	53





Did you know that the School Malaise Trap Program team is on Facebook and Twitter? Like or follow SMTP_Canada so you can share in the #bioSMTP experience.

The Fall 2015 School Malaise Trap Program Team

We would like to conclude by thanking all of the participants in the Fall 2015 School Malaise Trap Program. This project would not have succeeded without the enthusiasm, curiosity, and dedication of every student, teacher, and colleague. Please check our website periodically for updates, and we'll be in touch when we roll out the next program!

Some fun insect jokes to tell your friends in the schoolyard:

Q: Why did the fly never land on the computer?
A: He was afraid of the world-wide web!

Q: How do bees brush their hair?
A: With a honey comb!

Q: How do fireflies start a race?
A: Ready, Set, Glow!

Q: What do moths study in school?
A: Mothematics!

Q: What do you call a wasp?
A: A wanna-bee!

Q: Why wouldn't they let the butterfly into the dance?
A: Because it was a mothball.

Q: What creature is smarter than a talking parrot?
A: A spelling bee!

School Malaise Trap Program

Discoveries for Fall 2015

Wasps (Order: Hymenoptera)

The Hymenoptera are one of the largest orders of insects, comprising the sawflies, wasps, bees and ants. Over 150,000 species are recognized, with many more remaining to be described. The name refers to the wings of the insects, and is derived from the Ancient Greek ὑμήν (hymen): membrane and πτερόν (pteron): wing. During the Fall 2015 School Malaise Trap Program you collected 1034 species of Hymenoptera across all participating schools. We have highlighted some of your interesting finds below.

German Yellow jacket (*Vespula germanica*)

When we think of wasps, we usually have in mind a small group of species that is also known as Yellow jackets. Yellow jacket is the common name of wasps in the two genera *Vespula* and *Dolichovespula*. Most of these wasps have a black and yellow striped pattern on their abdomen. Some are black and white like the bald-faced hornet, *Dolichovespula maculate*. Yellow jackets live in colonies and many people fear them because the females of all species are capable of stinging and, as opposed to bees, they can sting repeatedly.

Three species of *Vespula* are very common in Ontario and all of them showed up in the School Malaise Trap samples. One of them is *Vespula alascensi*s, which until 2010 was thought to be the common wasp (*Vespula vulgaris*). Actually, the common wasp is only found in Eurasia and has been introduced to Australia and New Zealand. Although it is often said to occur in North America as well, the North American populations are a separate species, *Vespula alascensis*.

The Eastern Yellow jacket (*Vespula maculifrons*) is a very common species in Eastern North America and we were able to find it in several traps this fall. Even more abundant in our samples was the German wasp (*Vespula germanica*). As the name suggests this is a wasp that is native to Europe, but it was introduced and is now well-established in many other places such as North America (since 1975).

Bees (Order: Hymenoptera)

Bees, like ants, are actually a specialized form of wasp. They play an important role in pollinating flowering plants. In July 2013 the world's 20,000th bee species was officially described by a researcher from York University in Toronto. Your Malaise traps collected 18 species of bees and among those were the tricoloured bumble bee (*Bombus ternarius*) and the western honey bee (*Apis mellifera*).

Megachile perihirta, commonly known as the Western leafcutting bee, is a bee in the genus *Megachile*. This bee species is native to western North America, and as such, it was not surprising to find them in Malaise traps which were located at Salt Spring Elementary School and Glenwood Elementary School in British Columbia.

Megachile perihirta often inhabits meadows and orchards and will transport pollen using rows of modified hairs found under the abdomen rather than on the legs. The most familiar leafcutter bees cut conspicuous circular chunks out of leaves and use them to line the cells of their underground burrows. Each cell contains pollen and nectar, and then a single egg is laid inside.

Western leafcutting bee (*Megachile perihirta*)

Ants (Order: Hymenoptera)

The other big group of social Hymenoptera is the ants. Ants form colonies that can range in size from a few dozen individuals living in small natural cavities to highly organized colonies that may occupy large territories and consist of millions of individuals. Ant societies are often very sophisticated. They have division of labour, communication between individuals, and an ability to solve complex problems. Overall you collected 54 species of ants in your Malaise traps.

Acorn ant (*Temnothorax ambiguous*)

Among the species of ants collected was a single specimen of *Temnothorax ambiguous* from Elmvale District High School in Ontario. *Temnothorax ambiguous,* commonly known as the Acorn ant, has a typical range from eastern Canada, New England and west to the Dakotas. This species is known to nest in small hollow cavities near the soil surface and enjoys a close-knit colony of around 100 workers.

Acorn ants mainly scavenge for their preferred food of insect parts, various liquids and a variety of other materials including the contents of your kitchen. Most colonies do not last the year as scientists estimate that anywhere from one third to one half of all nests are gone by the end of winter due to colony collapse or migration-related destruction.

Beetles (Order: Coleoptera)

Beetles are the largest group in the animal kingdom, representing 25% of all known animal species. While 400,000 species have been described so far, many scientists believe that there are as many as 1 million beetle species on Earth. Beetles have inhabited our planet for more than 300 million years which means they were around even before the dinosaurs.

Among the 228 beetle species caught in the Fall 2015 School Malaise Trap Program were quite a few pest beetle species, especially those of the leaf beetle family (Chrysomelidae), such as the strawberry rootworm (*Paria fragariae*). Beetles from this family are known to feed on particular fruits and vegetables as you can easily tell from their common name.

Strawberry rootworm (*Paria fragariae*)

One of the more peculiar finds during the Fall 2015 School Malaise Trap Program was a species of beetle from the genus *Rhantus* of the family Dytiscidae. This family is commonly known as "predacious diving beetles" and these species are rarely found in Malaise traps due to their need and love of water. There are approximately 500 species of these aquatic beetles found in North America with their habitats ranging from small streams to giant lakes; however the easiest way for an enthusiastic entomologist to locate them is by checking along the shallows of a weedy pond.

Predacious diving beetle (*Rhantus sp.*)

Predacious diving beetles are excellent swimmers and can be observed gliding to and from the surface of the water with smooth, speedy strokes. Once it reaches the water's surface, the diving beetle must pause in order to refill its oxygen supply. Much like a human uses a scuba tank in order to breathe underwater, the diving beetle will tuck a bubble of air under its wing to use as an oxygen supply. This air supply will last for quite a length of time because it acts like a temporary gill. As the oxygen is used, the amount of carbon dioxide in the bubble increases causing more oxygen to diffuse in from the water. Eventually the bubble will collapse sending the beetle swiftly to the surface for a fresh one.

Congratulations to Fr. Scollen School in Calgary, Alberta for collecting the only species of predacious diving beetle found during the Fall 2015 program! We wonder if you located your trap by a pond?

True bugs (Order: Hemiptera)

True bugs are an insect order scientifically known as Hemiptera with about 80,000 species. You might know representatives such as cicadas, aphids, planthoppers, leafhoppers, and, most prominently, stink bugs and bed bugs. In the Fall 2015 School Malaise Trap Program, the leafhoppers (family Cicadellidae) were the most diverse group, with 133 species collected.

The family Cicadellidae is distributed all over the world and constitutes the second-largest hemipteran family, with at least 20,000 described species – 2,500 of which reside in North America.

Leafhoppers are plant feeders that suck on the sap from different kinds of grasses, trees, and shrubs with their strawlike beaks. However, you will need to look quite closely in order to spot these minute creatures before they spring away once they detect your presence.

Leaf hopper (*Jikradia olitoria*)

Like all bug beaks, leafhopper beaks have two channels, one for inserting saliva and the other for sucking up the food. Due to their feeding activities, leafhoppers can transmit plant pathogens such as viruses and bacteria to their plant hosts by inserting an infected beak into the plant tissue and moving from one host to another. In some instances, the plant pathogens distributed by leafhoppers are also pathogens of the insects themselves, and can replicate within the leafhoppers' salivary glands causing infection.

Butterflies and moths (Order: Lepidoptera)

Owlet Moth (*Aplectoides condita*)

Another huge group of insects with perhaps 200,000 species worldwide are the moths and butterflies (together called Lepidoptera). Malaise traps are not the best traps for collecting lepidopterans, but a few always find their way into our traps. This fall, your traps collected 128 species! Interestingly, the most common family collected were the Noctuidae or owlet moths, which include more than 35,000 known species worldwide. Owlet moths were collected at 24 different sites during the Fall 2015 School Malaise Trap Program.

Bagworm moth case by Stephen Little

Another interesting lepidopteran collected during this program was *Dahlica triquetrella,* a species of Bagworm moth from the family Psychidae. The Bagworm moth family is fairly small, with about 1350 species described globally. As per their name, bagworm moths have a peculiar habit of constructing tubular houses in which they live from various materials such as plant litter, soil, and lichens. These cases are then attached to trees and rocks while resting or during their pupal stage, but are otherwise mobile.

In many species, the female Bagworm moth will be wingless and spends her whole life in the bag, emitting a pheromone which attracts the winged males of the species. In some species, parthenogenesis is known to occur which is a natural form of asexual reproduction in which the growth and development of embryos occur without fertilization.

Specimens of *Dahlica triquetrella* were collected at Monsignor J.S. Smith School in Calgary, Alberta and Patrick Fogarty Catholic Secondary School in Orillia, Ontario.

True flies (Order: Diptera)

Nonbiting Midge (*Chironomus sp.*)

Chironomidae, commonly known as nonbiting midges, are a family of flies which can be found all over the world. A species from the subfamily Chironominae was the most common insect during the Fall 2015 School Malaise Trap Program with specimens being found at 52 sites! These midges come from a very large family of insects; experts estimate that there are well over 10,000 different species of Chironomidae worldwide! Many of these species superficially resemble mosquitoes, but they lack the wing scales and elongated mouthparts which a mosquito uses to feed on blood. The larvae and pupae of nonbiting midges are important food items for fish and other aquatic organisms. Furthermore, chironomids are important indicator organisms, meaning their presence or absence in a body of water can indicate whether pollutants are present or if environmental changes have taken place. This sensitivity to environmental changes also makes chironomids a potential source of information when reconstructing past climate. Lake sediments dating as far back as 10,000 years contain the head capsules shed by chironomid larvae during development. These head capsules allow for species identification and, because chironomid species differ in their tolerances to various environmental factors such as temperature and drought, the identity and abundance of chironomid species present in the sediment indicate the climate at that point in time.

Spiders and their relatives (Class: Arachnida)

While Malaise traps are most useful for capturing flying species, 120 species collected in the Fall School Malaise Trap Program were spiders which certainly don't fly! These 120 spider species belonged to 66 different genera of 15 families - a very diverse group! Camp Heidelberg Nature Centre in Waterloo, Ontario collected the greatest number of spider species with 20.

"Pale Orb-weaver" by John Flannery

Most participating schools during the Fall 2015 School Malaise Trap Program had a relatively warm fall with the 2 week average daily temperature across sites being 18.3 °C. We are certain that these warm fall days led several adventurous classes outdoors where they may have spotted the unique craftsmanship of a well-known family of spiders called "orb-weavers".

Orb-weaver spiders are members of the spider family Araneidae. They are the most common group of builders of spiral wheel-shaped webs often found in gardens, fields and forests. "Orb" was previously used in English to mean "circular", hence the English name of the group. Many species of orb-weavers tend to hide during the day and become active in the evening. It is at this time that the spider will typically consume the old web, rest, and then spin a new one near the previous location.

Humpbacked orb-weaver (*Eustala anastera*)

One of the most recognizable features of an orb-weaver web is called the stabilimentum, which is comprised of crisscross bands of silk running through the centre of the web. Although scientists have not yet agreed as to the use of this family signature, it is hypothesized that the stabilimentum may be a lure for prey, a means of camouflaging the spider, or a cause of confusion for flying insects and prey.

Overall, 9 different species of orb-weavers from 7 different locations were found in your Malaise traps, including a Humpbacked orb-weaver (*Eustala anastera)* collected at Swan Lake Outdoor Education Centre in Richmond Hill, Ontario.

Mantises (Order: Mantodea)

This find is certainly a first for the School Malaise Trap Program! We were quite surprised when sorting through your specimen bottles to come across a mantis which was collected by Elmvale District High School in Elmvale, Ontario. As the Malaise trap is designed to efficiently collect flying insects such as wasps, flies, and bees, it is very uncommon to encounter a species from the order Mantodea in the trap.

Picture of two mantids in Elmvale D. H. S.'s Malaise Trap

A blog post written by the participating class from Elmvale may help to explain how this specimen ended up in their collection bottle:

"On Wednesday, two mantids were taking advantage of the trap to make their search for food easier. Our class is not sure how many insects that were on their doomed path to the alcohol bottle were consumed by the mantids. However, the mantids themselves seemed to have themselves been added to our catch volume."

The European Mantis (*Mantis religiosa*) is native to the Mediterranean region and Asia. It was introduced to North America in 1899 and is now very common in Canada and the northern parts of the United States.

European Mantis (*Mantis religiosa*)

Mantises are generalist predators which means that they eat a large variety of insects, e.g. butterflies, grasshoppers, and bees. Larger species can actually prey on small vertebrates including hummingbirds. Their front legs are modified into perfect tools for grasping and holding prey, which is eaten alive. At rest, the folded front legs give the impression of a posture of prayer, hence the common name praying mantis.

Mantises have incredibly good eyesight. Some species have a visual range of 20 m which is a lot for a rather small animal. Their compound eyes may comprise up to 10,000 individual eyes.

These animals are also famous for cannibalism of males by females but it seems that this is not the rule among all mantis species.

Booklice and Barklice (Order: Psocoptera)

Have you ever heard of barklice before? These delicate and beautiful little creatures are often overlooked due to their relative size and perhaps daunting name. It is worth noting that barklice and booklice are not parasitic like species from the order Phthiraptera, however they choose to gnaw on dead organic matter such as leaf litter, tree bark, and assorted foliage.

For a fun classroom activity, you could write similar descriptions for the interesting discoveries your classroom made.

Barklice and booklice come from quite an ancient order named Psocoptera. They first appeared in the Permian period, 295–248 million years ago and are often regarded as the most primitive of the hemipteroids. Currently, there are approximately 250 described North American species, and you collected 48 of these species from 50 different sites!

Once you get to know a little bit more about barklice and booklice, you will realize that they are easily recognizable by their large head with a big bulge at the front as well as their long antennae. A great way to observe some barklice would be to place a white sheet under the branch of a conifer and then shake the branch. You will notice several tiny scurrying scavengers who are likely eager to get back to their lunch of chewing on organic matter with their large mouthparts called mandibles.

Loving barklouse (*Anomopsocus amabilis*)




Fall 2015 School Malaise Trap Program Memorable Moments

Columbia Park Elementary, Revelstoke, BC

Eastdale C.I., Toronto, ON

Holy Cross Catholic School, Grande Prairie, AB

St. Michael School, Calgary, AB

Fall 2015 School Malaise Trap Program Memorable Moments

La Jolla Library, La Jolla, CA

New Horizons School, Sherwood Park, AB

Hamilton District Christian High School, Hamilton, ON

Crestview Public School, Kitchener, ON