Diptera Survey
on the
Island of Dominica

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Abstract:

An insect that can be found all around the world is a fly. A fly is part of the hugely diverse order Diptera. The purpose of our project was to survey the variety of families on the island of Dominica. A few different methods were used in collecting Diptera: sweeping, light traps, aerial malaise traps and ground malaise traps. We set our traps in different locations all around Dominica: Mt. Joy, Cabrits National Park and Emerald Pool. From the first samples, it was clear that the ground malaise trap by the Bee House on Mt. Joy was the one that collected the most flies. There were a total of 16 families of Diptera captured by all methods. The family Tachinidae was the most abundant in our survey. The light trap at the field station proved to have the most diversity of all of our traps.

Introduction:

Diptera is an order of diverse insects commonly known as flies. They display a variety of lifestyles and biologies. Diptera are one of the most species rich orders of insects in the world. They are characterized as having fully developed fore wings, with hind wings reduced to halteres. Halteres are used for balance when in flight. They can be medically important, as vectors of diseases such as malaria, yellow fever, dengue, sleeping sickness and others. Other flies are pests of crops, livestock pests, scavengers, pollinators, or parasitoids of other insects (Triplehorn and Johnson, 2005).

There are approximately 180 families of flies worldwide. Of these families, 22 are considered large, having more than 2,000 species. The largest families are mostly well known to scientists and the general public, but some of the most speciose families are not well known. In

Central America, the largest families are estimated from the species known from Costa Rica. These large families are not commonly known to individuals other than entomologists. As rainforests are destroyed in the tropical regions of the world, much species diversity is being lost. Since most people think of flies as biting pests or transmitters of disease, they are less apt to worry about the loss of a couple hundred species of flies. In reality, many species are helpful to humans, either as pollinators or as population control devices for other harmful organisms. Countless other species are harmless to humans, and while this may not seem like an important reason to stop deforestation, they are vital parts of ecosystems and are needed to decompose organic matter, be obligate pollinators for highly evolved plants, or feed other birds or mammals that specialize in one food source.

This biodiversity study will show the varied biology of the Diptera on the island of Dominica. A small biodiversity survey such as this can be used to generate species richness data for an area. Using this data, it can be shown how important this habitat is to the overall biodiversity on the planet.

Materials/Methods:

To begin the survey, we started by using a net to sweep along the perimeter of the Archbold field station. In addition to this method, we set up a total of nine malaise traps, two aerial malaise traps and seven ground malaise traps. A malaise trap is a large, tent-like structure used for trapping flying insects, particularly Hymenoptera and Diptera. Two of the seven ground traps were set around the Bee House near Mt. Joy. Another was set near the top of the former Mt. Joy estate along with an aerial malaise trap. The remaining four malaise traps were set up in different locations. Two were set at Cabrits National Park. Of these, one was near the

Commandant Headquarters and the other at the East Cabrits Summit. The remaining traps were set up at Emerald Pool, two ground and one aerial. These traps were set up using stakes, trees, pvc pipes (aerial traps only) and rope.

To set up a ground trap, we began by tying the head of the trap to a sturdy tree and staking the bottom to hold tightly in place. Once this was complete, we used the same method to secure the opposing side of the trap. Additional securement was required to hold up the sides of the head and end of the trap by means of rope and stakes. We also added 95% alcohol to the bottles that are attached to the ground malaise trap.

For the aerial trap, we used a slingshot to shoot a hex nut tied to fishing line above and around a branch that was relatively high. After quite a few attempts, we finally got it over and had to climb trees to untangle the fishing line from miscellaneous branches. Once the hex nut was reachable from the ground, we tied the rope to the hex nut and reeled in the fishing line over the branch until the whole fishing line was replaced with the rope. We proceeded to tying the rope to the top of the aerial trap. After tying the rope to the top, we filled the top bottle halfway with 95% alcohol and pulled up the trap just enough for us to slide in the pvc pipes through the top side of the trap. We then pulled up the trap a little more to slide in the pvc pipes through the bottom side of the trap, and filled the bottom bottle with halfway with 95% alcohol. Finally, we pulled the trap up as close as we could to the high branch and tied the rope to a tree.

Results:

See attached chart

Suborder: Nematocera

The suborder Nematocera are flies that have distinctly long antennae with many segments. It is generally agreed that the Nematocera are a paraphyletic group consisting of all flies that are not Brachycera. The members of this group are often small and mosquito-like or midge-like in appearance. Many are economically important and some vector diseases (Triplehorn and Johnson, 2005). Many nematocerans also have long maxillary palps and a long slender body. Larvae are characterized by having a well developed head capsule. Most larvae are aquatic, though some live within plant tissue. (Zumbado, 2006).

Family: Tipulidae

The family Tipulidae is mosquito-like in form with a size ranging between 2 mm and larger than 35mm. The adults lack ocelli, have long antennae (Zumbado, 2005) and a v-shaped suture on the mesonotum (Triplehorn and Johnson, 2005).

Family: Psychodidae

These flies are commonly known as moth flies and sand flies. Their bodies are usually very hairy and moth like. The most common species hold its wings rooflike when at rest. Adults of this family live in moist, shady places and are abundant near water. (Triplehorn and Johnson, 2005).

Family: Culicidae

Flies in the family Culicidae are commonly known as mosquitoes. Their body is slender and generally 3-8 mm in length. Adults have scales on their head and mouthparts, and usually on the thorax, abdomen, legs or wing veins. The mouthparts are well adapted for piercing and sucking. Antennae in males are often plumose, while females possess more simpler antennae. The wings are held over the body while at rest (Zumbado, 2005).

Family: Cecidomyiidae

Cecidomyiids are small, delicate flies. Most are 1-5 mm in length, but some can be 8 mm. They have reduced wing venation and long legs and antennae. Many species form galls as larvae. Many species are crop pests, others are pollinators and some are predatory on scales, thrips or mites (Zumbado, 2005).

Suborder: Brachycera

The suborder of Brachycera is very diverse with many different body forms. The antenna is short, usually three segments, with an arista arising from the terminal segment. Larvae have a reduced head capsule and are colloquially called maggots (Zumbado, 2006; Triplehorn and Johnson, 2005).

Family: Stratiomyidae

This family is commonly known as the soldier fly. These flies are medium to large in size, brightly colored, wasp-like and usually found on flowers. Many of the species in this family are dark colored with or without light markings . Some species however have yellowish or light brown. (Triplehorn and Johnson, 2005).

Family: Asilidae

Flies in the family Asilidae are commonly referred to as Robber Flies. Individuals in this family are highly variable in size and body form. They can range in length from 3 mm to 27 mm and be long and slender, stout, elongate and cylindrical. Some are covered in hair, while others are nearly hairless. They can be identified most easily by the large eyes, which are the highest point on the head, with a sunken vertex. The mouthparts are hardened and adapted for piercing exoskeletons of their arthropod prey (Zumbado, 2005).

Family: Syrphidae

Flies of this family are commonly referred to as hover flies or flower flies. These flies are characterized by being brightly colored and resembling various bees and wasps. They may resemble these Hymenoptera but they do not bite or sting. (Triplehorn and Johnson, 2005).

Family: Calliphoridae

Flies in this family are medium to large size. They generally measure between 5 mm and 14mm. They are usually metallic blue or green. The thorax has two notopleural bristles and the subscutellum is not developed.

Family: Tachinidae

Flies in the family Tachinidae are very diverse. They can range in size from 2mm to 22mm. They are also very varied in form and shape and hair cover. They can range in color from brown, grey or black with lighter stripes on the thorax to metallic blues, greens, reds or yellows. They are identified most easily by the presence of two notopleural bristles and a well

developed subscutellum. Larvae of this family are parasitoids of other insects. (Triplehorn and Johnson, 2005).

Family: Micropezidae

Micropezids are medium sized flies. They can range in size from 5 mm to 14 mm. The body and legs are generally long and slender. These flies are often dark colored, though some may be grey and blue or have contrasting markings. The fore legs often have white bands and the antennae are generally short (Zumbado, 2005).

Family: Neriidae

Flies in the family Neriidae are small to medium sized, with body lengths ranging from 4-12 mm. They are characterized by strong legs and a slender but stout body. They are often brownish but sometimes with yellow or orange markings. The dorsal margin of the face projects forwards and and wraps around the base of the antennae. The antennae project forwards and are often elongate. The wings are slender and are usually transparent or somewhat smoky in appearance (Zumbado, 2005).

Family: Piophilidae

These flies are part of the family commonly known as the skipper flies. They are generally less than 5 mm long and are somewhat metallic black or blue. The larvae of these flies are called cheese skippers because they can jump. (Triplehorn and Johnson, 2005).

Family: Tephritidae

This family is known as the fruit flies. They can be identified by their small to medium sized body, with spotted or patterned wings. Another characterizing feature is found in the

subcosta,which is apically bent forward almost at a right angle. The adults of this family are usually found on flowers or vegetation. (Triplehorn and Johnson, 2005).

Family: Ulidiidae

Members of this family are also known as picture-winged flies. The members are small to medium sized that have markings on their wings with black/brown/yellow with their body usually metallic. They are normally very abundant in moist places such as the tropics. (Triplehorn and Johnson, 2005)

Family: Lauxaniidae

The family Lauxaniidae are small bodied flies that are either compact or elongated. This group is fairly large and these specimens are usually found in moist, shady places. They can usually be distinguished from other muscoids by their complete subcosta, the lack of oral vibrissae, the postverticals converging, and the preapical tibial bristles. (Brown 2009)

Discussion:

The order Diptera is extremely abundant all around the globe. On the island of Dominica alone, 16 different families were surveyed. Some of these families were very commonly found and look like a typical fly such as the Tachinidae. Other families such as the Psychodidae are not so common, and sort of resemble a micro-Lepidoptera at first glance. Different areas caught different families of flies. To study this phenomenon, we calculated a Shannon-Wiener Diversity Index for each collection with Excel to observe which exhibited the greatest diversity.

After calculating the Shannon-Wiener Diversity Index, we found the most diversity in the area around the Springfield station using a light trap with Shannon-Wiener value of 1.4868772. Closely following this was the Bee House ground malaise with 1.4536338, Mt. Joy ground malaise with 1.191945, Cabrits National Park, East Cabrits Summit ground malaise with 1.0397208, sweeping around Springfield with 0.7258654, Emerald Pool ground malaise with 0.5004024 and lastly Mt, Joy aerial and Emerald Pool aerial both with 0. These values suggest that some areas had larger numbers of families represented by more specimens; meaning that more flies were abundant and diverse in certain areas compared to others. For example, the Bee House ground malaise trap caught a total of 31 flies, with 8 different families, while the Commandant Headquarter at Cabrits National Park caught zero flies. This can lead to skewed data since the distribution of number of flies were not even, though these data might in fact represent habitat specific association of the different fly families this would be a topic for future research.

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