

BIBLIOGRAPHY

TONGED, ESTHER C. APRIL 2009. Diptera Inhabiting Selected Vegetations at BSU Nature Park. Benguet State University, La Trinidad, Benguet.

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ABSTRACT

The study was conducted to identify the different families of Diptera; to record the distribution of Diptera; and to determine which among the families has the most abundant in species on the different vegetations. Collecting was done through sampling of the different traps from May to September 2008 at Bektey, Puguis, La Trinidad, Benguet.

The collected specimens at BSU Nature Park yielded a total of 50 species belonging to 31 families of Diptera.

The distributions of Diptera in both vegetations were 32 species, 11 species from the mixed forest and 7 species in coffee under pine tree.

In both vegetations, the families with the most abundant in species were: *Calliphoridae*, *Anthomyiidae*, *Agromyzidae*, *Cecidomyiidae*, *Culicidae*, *Drosophilidae*, *Muscidae*, *Stratomyiidae*, *Heleomyzidae*, and *Tachinidae*.

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INTRODUCTION

Order Diptera or true Flies is composed of 99 families. It has so many species with so many different styles thus it is difficult to generalize. Typical adult have a single pair of membranous wings, rarely scaled. The wings have few cross veins and moderate number of veins. Only a pair of slender knobbed balancing organ called halteres represents the hind wings. Mouthparts are of various types; in some groups they are modified for piercing and sucking, in other groups for rasping and lapping. The body form is diverse. In a few groups, the adults are completely apterous. The eyes are usually large and their antennae vary from three to forty segments. These are holometabolous insects with legless larvae, usually either with distinct mandibulate head or with an external sclerotized skeleton attached to a pair of hook-like mandibles. The pupa is either free or formed with the skin of the third instar larvae.

As a group, fly larvae are moisture loving, the great majority living in water, rotting flesh, inside the bodies of other animals, in decaying fruits or other moist organic materials, or inside living plant tissue. A few live in relatively dry soil or more about exposed to the air.

Flies has the largest number of pest and one of the best vector pathogen that may harm and kill animals, high volume crops that may lead to low cost value of the livestock. And usually have low returns to the farmers investments, low quality vegetables, fruits and cut flowers because of the diseases of the pathogen that have been introduced or of the insects daily activities, completing its lifecycles in or out of the host plant resulting to its defoliation and all the related parts of the crops will be affected by flies, considered nuisance pest (Professional Pest Control, 2004), domestic of filth flies (Lyon, 2004).



These best known to transmit diseases like conjunctivitis, poliomyelitis, typhoid fever, tuberculosis, anthrax, leprosy, cholera, diarrhea, and dysentery (Lyon, 2004). Dura pest control (2004) added hepatitis, diphtheria, scarlet fever, yaws, pink eye, tapeworm and hookworm. Bloodsucker insects are directly responsible for the transmission of malaria, filariasis, leishmaniasis, trypanosomiasis (sleeping sickness) and a wide range of arboviruses including yellow fever, dengue, and various encephalitides. Most of the vector species are the mosquitoes.

At present sustaining biodiversity of plants and animals is now becoming a concern worldwide. This is brought about by the conversion of forested areas into agricultural areas with monocrops, building of houses and industrial areas with toxic waste and many more. As a result, incidences of pest outbreak on crops occur and even human diseases. With the realization that species and habitats as well as fertile lands are being lost, the International Union for Conservation of Nature (IUCN) was established to help and encourage nations to conserve wildlife and natural resources.

Insect fauna in Benguet State University (BSU) Nature Park need to be studied and identified before they become extinct and need to be preserved as a basis for the next generation.

The results of the study may provide a benchmark data on the students who wishes to study more on the different families under Diptera and a basis or guide to anyone whose studies are related to Insect Systematic. These also provide information regarding families of Diptera inhabiting at the BSU Nature Park.

The study aims to come up with a general idea on Diptera inhabiting on selected vegetations at BSU Nature Park. Specifically, it aims to: identify the different families of



Diptera; and to record the distribution of Diptera and which among the families has the most abundant in species on the different vegetations.

The study was conducted at BSU Nature Park, Bektey, Puguis, La Trinidad, Benguet from May to September 2008.



REVIEW OF LITERATURE

Characteristics of Flies

The major morphological feature, which distinguishes flies from other insects, is their reduced hind wings, termed halteres. The halteres are small, club-like structures that function as balancing organs during flight. Thus, adult flies have only one pair of functional wing, hence their scientific name- Diptera (di-two, pteron-wing). A few other groups of insects have also convergent, attained a similar two-winged form such as coccids (Hemiptera-*Sternorrhyncha*). A few flies have lost their wings (and halteres) altogether (CSIRO, 1990).

The mouthparts of flies are also characteristically suctorial and many have large fleshy pads with drainage canals termed pseudo tracheae for efficient liquid uptake.

Habitat

Larvae occur in aquatic, semi aquatic and moist terrestrial environments, as endoparasites of other animals or as miners within plant tissues, but because their cuticle is soft and susceptible desiccation, only a few live in dry environments.

Adults are usually terrestrial, active in the day time, and almost free-living, the exception being the ectoparasitic adults of the louse flies (family *Hippoboscidae*, *Streblidae* and *Nycteribiidae*) (Borror, 1976).

Feeding Ecology and Diet

Larvae are phytopagous (feeding on leaves, fruits or roots of plants), filter organic matter, or are scavengers of algae, predators, parasitoids and sarcophagus feeders or decaying organic matter including vegetables, dead animals or dung. Endoparasitic larvae include



those in the family *Tachinidae*, which parasitise other insects, particularly spiders and centipedes; those in family *Pipunculidae*, which parasitize the larvae of cicadas and leaf hoppers; and some species of bee flies (family *Bombyliidae*), which develop in the eggs or larvae of bees and wasps, other flies, beetles and butterflies.

Adults typically consume liquid food such as nectar and other plant exudates or decomposing organic matter, or they prey on other insect or mollusk; adult of some species for all little or nothing at all. Females of some groups may take blood meals from vertebrates (Sci-tech Encyclopedia, 2005).

Characters Used in the Identification of Diptera

The principal characters used in the identification of Diptera are those of the antenna, legs, wing venation, and chaetotaxy (the arrangement of the bristles, chiefly on the head and thorax). Occasionally various other characters are used such as the presence or absence of certain sutures, the shape of the head or abdomen, the form of the mouth parts, and the presence or absence of the ocelli.

Description of Families of the Insect Order

Agromyzidae. This are small to minute flies and usually blackish or yellowish in color. The larvae are leaf miners and the adults occur almost everywhere. Most species are more easily recognized by their mines than by the insects themselves. There mesopleural bristles are present; tibia without preapical dorsal bristles, female abdominal segments 7 enlarged, entirely esclerotized (Borror, 1976).



Anisopodidae. These are usually found in moist places on foliage and larvae live near decaying organic matter and fermenting sap. Two branches of their wings (Rs) not connected were not connected by the cross vein and antennae with 12-16 segments.

Asilidae. Also called the robber flies. They have the top of the head hollowed out between the eye, the face more or less bared, and they have a stout thorax, with long strong legs. Most of them were elongate, with the abdomen tapering, but some are stout bodied and very hairy.

Anthomyiidae. The members of this group are very similar to the Muscidae but they differ in having the anal vein (Cu₂+2A) reaching the wing margin, at least as a fold; most of them are dark bodied and rather slender and some are quite hairy.

Bibionidae. The members of this group are small to medium-sized, usually colored, stout-bodied flies with rather short abdomen at rest; the wings of midges are usually more elongate, and are held roof-like over the abdomen at rest.

Calliphoridae. Most blowflies are about the size of a housefly or a little larger, and many are metallic blue or green. They have the arista on the antennae plumose to the tip. The hind most posthumeral bristle is usually more laterally located than is the presutural bristle.

Canaceidae. The canaceids are small flies that resemble the Ephydriids in appearance and habits, but have only a single break on the Costa, they have an anal cell, and the ocellular triangle is quite large.

Cecidomyiidae. These are minute delicate flies with long legs and usually relatively long antennae and with reduced wing venation. Their eyes are meeting above the antennae and with two or three ocelli.



Chamaemyiidae. This chamaemyiids are small flies that are usually grayish in color with black spots on the abdomen. R5 cell not narrowed apically; legs not usually long and slender; length usually less than 7 mm and post verticals converging or absent.

Clusiidae. The clusiids are small, 3-4 mm in length and the body color vary from pale yellow to black; some species have the thorax black dorsally and yellowish laterally.

Culicidae. This family was recognized by the characteristic wing venation, the scale along the wing veins and the long proboscis extending clypeus. The prominent mouth brush of setae present on either side of labrum, antennae well separated and with short apical setae.

Dolichopodidae. These are small to minute flies that are usually metallic in color, greenish, bluish or coppery. They lack of frontal sub suture and have a characteristic wing venation: the r-m cross vein is very short or absent and is located to the basal fourth of the wing, and there is often swelling of Rs where it forks.

Drosophilidae. They are small flies or pomace flies. They are 3-4 mm in length and usually yellowish in color, and are generally found around decaying vegetations and fruits. They have reclinate fronto-orbital bristle near the eye.

Empididae. Small to minute flies; found in moist places; with large thorax and long tapering abdomen, the male genitalia are terminal and often are rather conspicuous. The r-m cross vein located beyond the basal fourth of wing; fork of Rs not swollen and body are not metallic.

Gasterophilidae. These flies are somewhat similar to honey bees in general appearance. Adults have vestigial mouthparts and all species are brown in color and it has patterned wings.



Heleomyzidae. These flies are medium size and lack femoral bristles and has R1 ending beyond the middle of the wing. In profile, the third antennal segment appears rounded, and the face is slightly concave below the antennae.

Lauxaniidae. They are small, relatively robust flies, rarely over 6 mm in length, and some have patterned wings; they vary considerably in color. The complete subcosta, no oral vibrissae, and the post verticals converging can distinguish them.

Lonchaidae. The lonchaeids are small, shining blackish flies, with the abdomen in the dorsal view oval and somewhat pointed apically; they occur chiefly in moist or shady places.

Micropezidae. The members of this group are small to medium sized elongate flies with very long legs. The first posterior cell is narrowed apically, and the anal cell is often long and pointed. The adults are found near moist places.

Milichiidae. The milichiids are small flies, usually black or silvery in color. A pair of lower fronto-orbital bent towards and oral vibrissae weakly differentiated. The first segment of hind tarsi not swollen and longer than second segments.

Muscidae. This is a large group and its members are to be found almost everywhere. They are small medium sized Diptera with fleshy proboscis. Oral vibrissae are present and adults are characterized by bristle on the mesonotum.

Neriidae. Head elongate, post vertical bristles convergent; Costa usually without distinct break; CuA+1A not reaching margin; pregenital lobes of male absent; protandrium asymmetrical; segment 9 elongate.



Phoridae. The phorids are small to minute flies that are easily recognized by the humpback appearance. The wings are folded flat over the abdomen at rest, and the legs, particularly the hind femora are strongly developed.

Psychodidae. The psychodids are small to minute flies, usually with hairy moth-like flies. The wings span rarely exceeding 8 mm, usually much less. In most, wings are broadly ovate, and folded roof like over the abdomen.

Sepsidae. These flies are small, shining blackish flies that have head spherical and the abdomen narrowed at the base; many species have dark spots along the costal margin of the wing near the tip. They are ant like flies with the habit of continuously waving the wings when at rest.

Sphaeroceridae. These are very small, black or brown flies that can usually be recognized by the characteristic hind tarsi. Hind base tarsus much swollen, or shortened or compressed; vibrissae distinct; fore leg not raptorial; tarsal claws not normal.

Stratomyiidae. Most of these flies were small to medium sized and many species are brightly colored and wasp like in appearance. Their branches of the radius are rather heavy and are crowded together toward the costal margin of the wing.

Sarcophagidae. Flesh flies are very similar to some blowflies, but are generally blackish with gray thoracic stripes (never metallic). The abdomen with pearly maculae or dark round maculae. Body densely plumose and with three or more notopleural bristle present.

Syrphidae. The syrphids flies are almost found everywhere. The adults are often common about flowers and frequently do a great deal of hovering. Different species vary



quite a bit in appearance but can recognize by the spurious vein in the wing between the radius and the media. Many are brightly colored and resembles as bees.

Tachinidae. Subscutellum strongly developed, stout bodies, strongly bristled and drab in coloration. They range in size from small species about half as big as a housefly.

Family Tephritidae. The members of this group are small to medium sized that have usually spotted or branded wings. They can be recognized by the structure of the subcosta, which bends forward at almost a right angle and at fades out; in most species the anal cell has an acute distal projection posteriorly.

Basic Control Strategies of Flies

The basic strategy for control flies on diseases is to reduce the amount of potential breeding locations. The primary fly breeding locations are in fresh manure, bedding materials such as straw in calving areas around hatches and decaying plant materials such as silage or hay. Composting grass clippings are also suitable breeding locations for some flies. More expensive steps for fly control may include biological control and insecticides (Kirk, 2007).



MATERIALS AND METHODS

Materials

The materials used in the study were the following: insect net, killing jar, microwavable plastic containers, forceps, syringe yellow plastic plate, cellophanes, grease, plastic containers, banana peelings, pork, microscope, lamp, digital camera, pins, syringe, ruler, paper envelope, vials, mothballs, 70% ethyl alcohol, forceps, pen and notebook and other references like Entomology books.

Site of Collection

The sites of collection were the selected vegetations found at the BSU (Benguet State University) Nature Park, which is about three kilometers away from the BSU main campus. The two vegetations are the mixed forest vegetations (Figure 1) and the coffee under pine tree (Figure 2). The collection site has a sloping area and non-probability sampling was used.

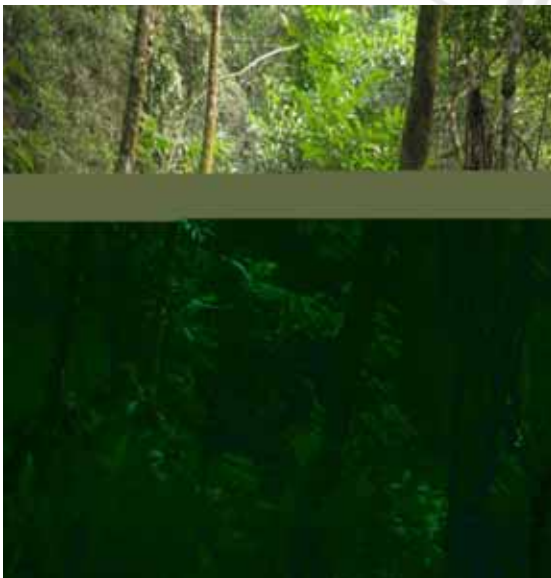


Figure 1. Mixed forest vegetation



Figure 2. Coffee under pine tree



Time of Collection

Collecting of Diptera were done twice a month for the months of May to September 2008.

Four methods of collecting techniques were used – the yellow plastic plate (Figure 3), carrion trap (Figure 4), fruit trap (Figure 5), and the natural insect trap (Figure 6).



Figure 3. Yellow plastic plate



Figure 4. Fruit trap



Figure 5. Carrion trap



Figure 6. Natural insect trap



Trapping of Diptera

Yellow plastic plate. In each sites, 10 yellow plastic plates were set. This trap was made up of plastic plate with a diameter of 30 centimeters, cellophanes and grease. The grease was spread on the cellophanes with paper plastic plate inside. The trap was hanged on the branches of trees with a height of four feet above the ground. Settings of this trap were done three days before collecting. A forceps was used in gathering the trapped flies and placed on vials with 70 % ethyl alcohol.

Fruit trap. This is a plastic container with pieces of banana peelings inside and with a stand of two feet above the ground. Fine holes were made at the bottom of the container to provide drainage for the rainwater. Five fruit traps were set on each site. Setting of this trap was done three days before collecting the specimens. Insect net was used in collecting the flies. The flies were put on killing jar and placed on vials with 70 % ethyl alcohol.

Carrion trap. One kilo of pork was bought from the market and was divided into four pieces. The pork was place inside a container with a stand of two feet above the ground. Two carrion traps were set on each sites and setting was done three days before collecting the specimens. Insect net were used in collecting the flies and placed on 70% ethyl alcohol.

Natural insect trap. The natural trap used was the trap used by Sumingwa, 2004.

1. Fermented plant juice. Two kilo of banana trunk (cardava variety) were finely chopped and mixed with one kilo of crude sugar and contained in a clay jar. The jar was covered and left to stand for a day to let the contents settle at the bottom. The following



day, the jar was stored in a cool and a shaded place for fermentation for seven days. The fermented juice was extracted and transferred to a container.

2. Decoction of vinegar. One gallon of pure white coconut vinegar was mixed with half kilo grounded crude sugar. The mixture was heated until it reached its boiling point. The boiled mixture was set aside to cool and was used in preparing the attractant.

3. Preparation of mixture. 350 millimeters of concentrated plant juice were measured and added to the cooled decocted vinegar. The mixture was set aside and was set for testing.

4. Setting of trap. The traps were made up of pet bottles containing one and one half inch thick natural trap. Two opposite sides of the bottles were opened as the entrance of the flies attracted. Five traps were set on each sites and setting were done three days before collecting the specimens. Forceps was used in picking the flies and they were placed in 70 % ethyl alcohol.

Preservation of Flies

Immediately after the flies' dies inside the killing jar it was placed in a paper envelope. This serves as the temporary storage of flies collected that cannot be fixed immediately. The flies were placed in a vial with 70% ethyl alcohol.

Identification of Flies

The different families of Diptera were collected were seen under a stereo zoom microscope for proper identification at MPRH building. Collected specimens were classified according to their family and species. The Insect of Australia book and through



surfing the internet was used in classifying and naming the specimens. The specimens that were collected were fixed and pictured (Figure 7).



Figure 7. Researcher taking picture of the collected specimens

Data Gathered

1. Identity of Diptera. Naming the specimens with their respective families and species.
2. Distribution of Diptera. Distribution was recorded by after knowing the different families of the specimens that are present in the vegetations and number of species was also counted.



RESULTS AND DISCUSSION

Diptera Collected at BSU Nature Park

Thirty-one families of Diptera were collected in the park. The specimens collected through the different traps of the two vegetations were identified according to their family and species.

Family Agromyzidae



Figure 8. *Cerodontha* sp.(40x)

The *Cerodontha robusta* were colored yellow and the body length was six millimeters. The type of antennae was aristate.



Figure 9. Unidentified (40x)

The Unidentified were colored black and with body length of five millimeters.



Family Anisopodidae



Figure 10. *Anisopus* sp. (40x)

The *Anisopus* species were with a body length of four millimeters, red compound eyes and with eleven-segmented abdomen.



Figure 11. *Sylvicola* sp. (40x)

The *Sylvicola* species has body length of five millimeters, brown compound eyes and with seven segments of abdomen.

Family Anthomyiidae



Figure 12. *Chrisosia* sp. (40x)

The *Chrisosia* species were colored brown, nine millimeters body length, dark brown compound eyes and with six segment on abdomen.





Figure 13. *Hydrophoria* sp. (40x)

The *Hydrophoria* species were black in color, seven millimeters body length and with five segments of abdomen.



Figure 14. *Pegomya* sp. (40x)

The *Cerodontha* species were colored gray brown with eight millimeters body length and seven-segmented abdomen.

Family Asilidae



Figure 15. *Cryptopogon* sp. (40x)

The *Cryptopogon* species were collected under this family. The bodies were with 5 mm, body colors were black and brown, they have stout thorax and their abdomen were elongate with 7 segments.



Family Bibionidae



Figure 16. *Doliphus* sp. (40x)

Under this family, their thorax was large, large compound eyes and is elongate in size. The *Doliphus* were the only species collected under this family. The body length was 16 millimeters and antennae were filiform with seven segments.

Family Calliphoridae



Figure 17. *Lucilia cuprina* (40x)

The *Lucilia* species were colored blue green and with five segments of abdomen.



Figure 18. *Cnomyopsis* sp. (40x)

Cnomyopsis species colored dark blue and with six segments on their abdomen.





Figure 19. *Phaenicia* sp. (40x)

Phaenicia species were colored green and abdomen with six segments.



Figure 20. *Phormia* sp. (40x)

The *Phormia* species were with dark blue color and abdomen with six segments.

Family Canacidae



Figure 21. *Albiceps* sp. (40x)

The *Albiceps* were the only species collected under this family. Body length was five millimeters and their antennae are aristate. Their color was black and the abdomen has five segments.



Family Cecidomyiidae



Figure 22. *Meridionalis* sp.
(40x)

Meridionalis species were with black color, eight millimeters body length and with six abdominal segments.



Figure 23. Unidentified (40x)

The Unidentified were colored light brown with five segments of abdomen.

Family Chamaemyiidae



Figure 24. *Pseudodinia* sp.
(40x)

These flies were ant like and they are colored black. The body length was six millimeters and with elongate abdomen which has four segments. The *Pseudodinia* were only the species collected under this family.



Family Clusiidae



Figure 25. *Clusiodes* sp. (40x)

The species collected under family was the *Clusiodes*. It has a body length of four millimeters with brown thorax and black abdomen with five segments. The type of antennae is aristae.

Family Culicilidae



Figure 26. *Aedes egypti* (40x)

The *Aedes* were with black spots on their body, antennae and proboscis has the same height while their maxillary palp is short.



Figure 27. *Anopheles* sp. (40x)

The *Anopheles* species were with short antenna and maxillary palps and proboscis were with same heights.





Figure 28. *Culiseta* sp. (40x)

The *Culiseta* were colored gray and they are thinner than the *Aedes* and *Anopheles* species.

Family Dolichophilidae



Figure 29. *Cingulipes* sp. (40x)

Heteropsilopus cingulipes is the only species collected under this family. It has a body length of 12 millimeters and colored greenish. It has large compound eyes and with elongate abdomen with eight segments. It has filiform type of antenna with 14 segments.



Family Drosophilidae



Figure 30. *Drosophila* sp. (40x)

The *Drosophila* species has body length of four millimeters; red eyes, yellowish in color and with five segments of abdomen.



Figure 31. *Amiota* sp. (40x)

Amiota species were with 4.5 millimeters body length; light black color, and with seven segments of abdomen.



Figure 32. Unidentified(40x)

The Unidentified were with body length of six millimeters, black colored and with 6 segments of abdomen.



Family Empididae



Figure 33. *Axelempis* sp.(40x)

Under this family, their colors were light brown. Their body length was 4 mm and abdomen has 4 segments. The *Axelempis* species were the only species collected under this family.

Family Gasterophilidae



Figure 34. *Intestinalis* sp.(40x)

Gasterophilus intestinalis were the only species found under this family. They were brown in color with black spots on their wings. Their body length is seven millimeters and with aristate antenna while the abdomen has seven segments.

Family Heleomyzidae



Figure 35. *Pseuchloleria* sp.(40x)

The *Pseuchloleria* species has gray color with body length of 6 mm and it has aristate antenna.





Figure 36. *Suillia* sp.(40x)

The *Suillia* species were reddish in color; body length with 5 mm and the abdomen were with black color with 7 segments.

Family Lauxaniidae



Figure 37. *Striatepennis* sp.(40x)

The *Striatepennis* has 6 mm. body length, the body and wings were with black spots and abdomen with 6 segments.



Figure 38. *Minetteia* sp.(40x)

The *Minetteia* has 5 mm body length, red compound eye and with 4 segments of abdomen.



Family Lonchaidae



Figure 39. *Lonchaea* sp.(40x)

The *Lonchaea* species were collected under this family. Their bodies were black in color, 7 mm body length, filiform antennae with 5 segments and their abdomen with 8 segments.

Family Micropezidae



Figure 40. *Metopochetus* sp.

The *Metopochetus* were the only species collected under this family. The body was spotted with black color. Body length was 8 mm and with 7 segments of abdomen.

Family Milichiidae



Figure 41. *Leptometopa* sp.(40x)

The *Leptometopa* species were with five millimeters body length with black color, they have filiform antenna and abdomen with 5 segments.





Figure 42. *Milichiella* sp.(40x)

The *Milichiella* species has larger body with a body length of 6 mm; compound eyes were light brown, 6 segments of abdomen and with aristate antenna.

Family Muscidae



Figure 43. *Rostrata* sp.(40x)

The *Rostrata* species were colored black and tier body length wren 5 mm,



Figure 44. *Vetustissima* sp.(40x)

The *Vetustissima* species were with white and black color and with hairy body. These species were with abdominal segments of 5 mm.



Family Neriidae



Figure 45. *Angusticollus* sp.(40x)

The *Telostylus angusticollis* were the species collected in this family. The head were elongate, with 7 mm body length, with black spots on wings and legs and with 7 segments of abdomen.

Family Phoridae



Figure 46. *Gymnophora* sp.(40x)

The *Gymnophora* species were collected under this family. It has a hunchback appearance and they were colored brown. Their body lengths were 6 mm. and with 9 segments, while the abdomen were with 8 segments

Family Psychodidae



Figure 47. *Albipunctata* sp.(40x)

These flies were grayish in color with hairy wings and body. They have a body length of 3 mm and with filiform antennae with 16 segments. The species collected were the *Albipunctata*.



Family Sarcophagidae



Figure 48. *Hardyi* sp.(40x)

The *Hardyi* were the only species collected under this family. It has a body length of 7.4 mm, with red compound eyes and with 7 segments of abdomen

Family Sepsidae



Figure 49. *Sepsis* sp.(40x)

The *Sepsis* species were the only species collected under this family with a body length of 4 mm, they were black in color, aristate antennae and abdomen were with five segments.



Family Sphaeroceridae



Figure 50. *Copromyza* sp.(40x)

These flies have 5 mm body length with brown color. The antennae were filiform with 12 segments, while the abdomen has 5 segments. The *Copromyza* species were collected under this family.

Family Stratomyiidae



Figure 51. *Actina* sp.(40x)

The *Actina* species has body length of 7 mm, with blue thorax; elongate abdomen with 7 segments and with moniliform antenna.



Figure 52. *Berkshiria* sp.(40x)

The *Berkshiria* species were with body length of 4.5 mm, they were black in color, and large abdomen with 6 segments and the antenna were aristate





Figure 53. *Pachygaster* sp.(40x)

While the *Pachygaster* species were with body length of 7.5 mm, with black thorax, spotted wings and moniliform antenna with 8 segments

Family Syrphidae



Figure 54. *Mellinum* sp.(40x)

These flies were with color patterned on their elongate abdomen. Their body length was 6 mm, antenna moniliform and their abdomen with 7 segments. The species collected under this family were the

Melanostoma mellinum.

Family Tachinidae



The *Marmoratus* species has 9 mm body length, aristate antennae and with 6 segments of abdomen.



Figure 55. *Marmoritus* sp.(40x)



While the *Ventralis* species were colored black, with a body length of 8 mm and with 5 segments of abdomen.

Figure 56. *Ventralis* sp.(40x)

Family Tephritidae



The *Dorsalis* were the only species collected under this family. It has a body length of 8 millimeters, yellow and brown color and with 6 segments of abdomen.

Figure 57. *Bactocera dorsalis*
(40x)



Table 1. Distribution of Diptera from the different vegetations at the BSU Nature Park from May to September

| FAMILY | SPECIES | POPULATION OF SPECIES PER VEGETATION | |
|---------------|---------------------|--------------------------------------|------------------------|
| | | Mixed forest | Coffee under pine tree |
| Agromyzidae | <i>Cerodontha</i> | P | P |
| | Unidentified | P | P |
| Anisopodidae | <i>Anisopus</i> | P | A |
| | <i>Sylvicola</i> | P | P |
| Anthomyiidae | <i>Chrisosia</i> | P | A |
| | <i>Hydrophoria</i> | P | A |
| | <i>Pegomya</i> | P | P |
| Asilidae | <i>Cryptopogon</i> | P | A |
| | <i>Doliphus</i> | P | P |
| Calliphoridae | <i>Lucilia</i> | P | P |
| | <i>Cnomyopsis</i> | P | P |
| | <i>Phaenicia</i> | P | P |
| | <i>Phormia</i> | P | P |
| Canacidae | <i>Albiceps</i> | P | A |
| | <i>Meridionalis</i> | P | P |
| Cecidomyiidae | Unidentified | P | P |
| | <i>Pseudodinia</i> | P | P |
| Clusiidae | <i>Clusiodes</i> | P | P |
| | <i>Aedes</i> | P | P |
| Culicidae | <i>Anopheles</i> | P | P |
| | <i>Culiseta</i> | P | P |
| | <i>Cingulipes</i> | P | P |
| Drosophilidae | <i>Drosophila</i> | P | P |
| | <i>Amiota</i> | P | P |
| | Unidentified | P | P |



Table 1. Continued...

| FAMILY | SPECIES | POPULATION OF SPECIES PER VEGETATION | |
|-----------------|----------------------|--------------------------------------|------------------------|
| | | Mixed forest | Coffee under pine tree |
| Empididae | | | |
| | <i>Axelempis</i> | P | A |
| Gasterophilidae | | | |
| | <i>Intestinalis</i> | A | P |
| Heleomyzidae | | | |
| | <i>Pseucloleria</i> | P | P |
| | <i>Suillia</i> | A | P |
| Lauxaniidae | | | |
| | <i>Striatepennis</i> | P | P |
| | <i>Minetteia</i> | P | A |
| Lonchaidae | | | |
| | <i>Lonchaea</i> | P | A |
| Micropezidae | | | |
| | <i>Metopochetus</i> | P | P |
| Milichidae | | | |
| | <i>Leptometopa</i> | A | P |
| | <i>Milichiella</i> | P | A |
| Muscidae | | | |
| | <i>Rostrata</i> | P | P |
| | <i>Vetustissima</i> | P | P |
| Neriidae | | | |
| | <i>Angusticollus</i> | P | P |
| Phoridae | | | |
| | <i>Gymnophora</i> | A | P |
| Pyschodidae | | | |
| | <i>Albipunctata</i> | P | P |
| Sarcophagidae | | | |
| | <i>Hardyi</i> | P | P |
| Sepsidae | | | |
| | <i>Sepsis</i> | P | A |
| Sphaeroceridae | | | |
| | <i>Copromyza</i> | P | P |
| Stratomyiidae | | | |
| | <i>Actina</i> | P | P |
| | <i>Berkshiria</i> | P | A |
| | <i>Pachygaster</i> | P | P |
| Syrphidae | | | |
| | <i>Mellinum</i> | A | P |
| Tachinidae | | | |
| | <i>Marmoritus</i> | P | P |



Table 1. Continued...

| FAMILY | SPECIES | POPULATION OF SPECIES PER VEGETATION | |
|-----------------|------------------|--------------------------------------|------------------------|
| | | Mixed forest | Coffee under pine tree |
| Tephritidae | <i>Ventralis</i> | P | A |
| | <i>Dorsalis</i> | P | A |
| TOTAL (species) | 50 | 44 | 38 |

Note: P- present A- absent

Distribution of Diptera on the Different Vegetations

Table 1 shows the distribution of Diptera on the mixed forest and Coffee under pine tree vegetations. Diptera were widely distributed at the mixed forest than in coffee under pine tree with 44 and 38 species, respectively.

Diptera were widely distributed at the mixed forest vegetation because of the presence of different plants that serves as their host and it can support the foods of insects, while in coffee under pine tree that has limited plants presents. Important note regarding species distribution was mentioned by Clark, et al. (1967) who emphasized that in nature, insect's species exist and evolve as components of communities of plant and animals in particular habits. Some insect species, including many predators, exist as member of a number of a community. All insects have a limited distribution range; and characteristically, insect numbers fluctuate to a greater or lesser extent both in time and in space.



Table 2. Families of Diptera which has the most abundant in species at the BSU Nature Park from May to September

| FAMILY | SPECIES | POPULATION OF SPECIES PER VEGETATION | |
|---------------|---------------------|--------------------------------------|------------------------|
| | | Mixed forest | Coffee under pine tree |
| Agromyzidae | <i>Cerodontha</i> | 8 | 6 |
| | Unidentified | 12 | 16 |
| Anisopodidae | <i>Anisopus</i> | 6 | - |
| | <i>Sylvicola</i> | 2 | 1 |
| Anthomyiidae | <i>Chrisosia</i> | 5 | 4 |
| | <i>Hydrophoria</i> | 2 | - |
| | <i>Pegomya</i> | 1 | 2 |
| Asilidae | <i>Cryptopogon</i> | 6 | - |
| | <i>Doliphus</i> | 1 | 2 |
| Calliphoridae | <i>Lucilia</i> | 12 | 10 |
| | <i>Cnomyopsis</i> | 8 | 5 |
| | <i>Phaenicia</i> | 7 | 3 |
| | <i>Phormia</i> | 6 | 3 |
| Canacidae | <i>Albiceps</i> | 2 | - |
| | <i>Meridionalis</i> | 16 | 5 |
| Cecidomyiidae | Unidentified | 10 | 6 |
| | <i>Pseudodinia</i> | 11 | 5 |
| Clusiidae | <i>Clusiodes</i> | 1 | 1 |
| | <i>Aedes</i> | 10 | 3 |
| Culicidae | <i>Anopheles</i> | 5 | 3 |
| | <i>Culiseta</i> | 4 | 6 |
| | <i>Cingulipes</i> | 3 | 1 |
| Drosophilidae | <i>Drosophila</i> | 66 | 52 |
| | <i>Amiota</i> | 13 | 5 |
| | Unidentified | 4 | 2 |



Table 2. Continued...

| FAMILY | SPECIES | POPULATION OF SPECIES PER VEGETATION | |
|-----------------|----------------------|--------------------------------------|------------------------|
| | | Mixed forest | Coffee under pine tree |
| Empididae | <i>Axelempis</i> | 1 | - |
| Gasterophilidae | <i>Intestinalis</i> | - | 1 |
| Heleomyzidae | <i>Pseucloleria</i> | 1 | 1 |
| | <i>Suillia</i> | - | 2 |
| Lauxaniidae | <i>Striatepennis</i> | 4 | 1 |
| | <i>Minetteia</i> | 1 | - |
| Lonchaidae | <i>Lonchaea</i> | 4 | - |
| Micropezidae | <i>Metopochetus</i> | 1 | 1 |
| Milichidae | <i>Leptometopa</i> | - | 2 |
| | <i>Milichiella</i> | 1 | - |
| Muscidae | <i>Rostrata</i> | 4 | 5 |
| | <i>Vetustissima</i> | 5 | 3 |
| Neriidae | <i>Angusticollus</i> | 1 | 1 |
| Phoridae | <i>Gymnophora</i> | - | 1 |
| Pyschodidae | <i>Albipunctata</i> | 2 | 1 |
| Sarcophagidae | <i>Hardyi</i> | 2 | 1 |
| Sepsidae | <i>Sepsis</i> | 3 | - |
| Sphaeroceridae | <i>Copromyza</i> | 5 | 3 |
| Stratomyiidae | <i>Actina</i> | 2 | 1 |
| | <i>Berkshiria</i> | 3 | - |
| | <i>Pachygaster</i> | 1 | 1 |
| Syrphidae | <i>Mellinum</i> | - | 1 |
| Tachinidae | <i>Marmoritus</i> | 2 | 3 |



Table 1. Continued...

| FAMILY | SPECIES | POPULATION OF SPECIES PER VEGETATION | |
|-----------------|------------------|--------------------------------------|------------------------|
| | | Mixed forest | Coffee under pine tree |
| Tephritidae | <i>Ventralis</i> | 1 | - |
| | <i>Dorsalis</i> | 1 | - |
| TOTAL (species) | 50 | 44 | 38 |

Families of Diptera which has the most abundant species in the vegetations at the BSU Nature Park

Family *Calliphoridae* has the most abundant in species collected in both vegetations with four species each. Under mixed forest, three species of family *Anthomyiidae*, *Culicidae*, *Drosophilidae*, and *Stratomyiidae* were collected and then the family *Agromyzidae*, *Anisopodidae*, *Cecidomyiidae*, *Muscidae* and *Tachinidae* has two species each. While on the other hand, family *Cilicidae* has three species collected and two species of family *Anthomyiidae*, *Agromyzidae*, *Cecidomyiidae*, *Muscidae*, *Stratomyiidae* and *Helcomyzidae* at coffee under pine tree.

Meanwhile, Baucas (2007) mentioned that one of the top highest families at the park were the order Diptera with 24 families collected and family *Drosophilidae* had the highest family with a population of 16.



SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

The study was conducted mainly to identify the Diptera inhabiting different Vegetations at BSU Nature Park; to record the distribution of Diptera; and to determine which among the families has the most abundant in species at the park. It was done by collecting through yellow plastic plate trap, carrion trap, fruit trap and natural insect trap, for the month of May to December 2008. Individual species collected was identified according to their families and species.

There were 50 species of Diptera collected belonging to 31 families. The 31 families were the *Agromyzidae*, *Anisopodidae*, *Anthomyiidae*, *Asilidae*, *Bibionidae*, *Calliphoridae*, *Canacidae*, *Cecidomyiidae*, *chamaemyiidae*, *Clusiidae*, *Culicidae*, *Dolichophilidae*, *Drosophilidae*, *Empididae*, *Gastrerophilidae*, *Helcomyzidae*, *Lauxaniidae*, *Lonchaidae*, *Micropezidae*, *Milichiidae*, *Muscidae*, *Neriidae*, *Phoridae*, *Psychodidae*, *Sacrophagidae*, *Sepsidae*, *Sphaeroceridae*, *Stratomyiidae*, *Syrphidae*, *Tachinidae* and *Tephritidae*.

Forty-four species of Diptera were widely distributed at mixed forest while 38 species at coffee under pine tree.

Like wise, family *Calliphoridae* has the most abundant number of species collected from the different vegetations.

Conclusion

It is therefore concluded that some species are widely distributed through out the area which some are solely confined in one vegetation, which clearly implies that



arthropods prefers a place to live in or the kind of habitat determines the species that can live on it.

Recommendation

It is therefore recommended that more study on this insect should be done to determine their significance to animals and plants.



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