Insects Diversity of Kundapura Taluk, Udupi, Karnataka, India

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Abstract: We quantified diversity of insects at Kundapura from February 2017 to March 2018. Field observations were made once in ten days for a year. Identified the species based on their colour of wings, markings, body shape, habit, wing shape, and structure of legs. During one year survey at three different sites such as cropland, plantation and forest, we recorded 69 species of 23 families and 8 orders. In three study areas, higher species richness was recorded at plantation with more number of species in order Lepidoptera indicating availability and access to food plants. In Cropland contains Order Lepidoptera only. The present study reveals that the plantation provides suitable environmental conditions for insects.

Keywords: Lepidoptera, Cropland, Plantation, Forest, Insects

1. Introduction

Insects are the world's most diverse group of animals on Earth, in terms of both taxonomic diversity and ecological function. Insects represent the vast majority of species in terrestrial and freshwater ecosystem. They have adopted for almost every conceivable type of environment from the equator to the arctic and from sea level to the snowfield of highest mountains, on land, in air and water and almost everywhere [14].

Insects diversity accounts for a large proportion of all biodiversity on the planet- over half of the estimated 1.5 million organism species are classified as insects [15]. The great number of insect species and individuals were created by a number of factors including their long geological history, the capability of flight, their small size that allows survival in many various habitats, their ability to store sperm for delayed fertilization, and their general adaptive abilities to the environment. Insects have remarkable fertility and reproductive abilities, which have usually vast numbers of individuals in nature. The class insect will constitute the dominant group of animal kingdom representing 80-92% of the entire animal kingdom. Insects play an important role in ecosystems herbivores, terrestrial as pollinators, decomposers, predators and parasites [22].

The presence of insects at a particular habitat depends on a wide range of factors, the availability of food and climatic conditions suitable for egg laying and suitable flowers for feeding of adults govern the distribution of insects [2]. Animals particularly insects are considered to pollinate nearly 70% of trees in lowland tropical rain forest [5,10]. In India nearly 59,353 species of insects belonging to 619 families constituting nearly 6.83% of the world insect fauna have been reported. Butterflies are one of the most important assemblages of insects that act as biodiversity indicators as well as nature's gardeners. Owing to habitat destruction for developmental activities in urban environment and unscientific management of natural resources, much of our native butterflies are fast disappearing and at present, their survival is under threat [1].

2. Materials and Methods

Study area: To accomplish the present study following three study sites were selected based upon the vegetation patternin and around Kundapura.

Site 1: Mullikatte Site 2: Hosadu Site 3: Movadi



Figure 1: Geographical location of study area

| Table 1: Study sites | | | | |
|----------------------|------------|------------|--|--|
| Study sites | Latitude | Longitude | | |
| Site-1. Mullikatte | 13°41'21"N | 74°40'18"E | | |
| Site-2.Hosadu | 13°41'30"N | 74°40'31"E | | |
| Site-3. Movadi | 13°41'55"N | 74°38'14"E | | |

Site1: Mullikatteis a village located a distance of 10 kms from Kundapura in which the cropland was selected for observing insect diversity. Vegetation type of the cropland is *Orizasativa* (paddy).

Site 2: Hosaduis a village located a distance of13 kms from Kundapurain which the plantation was selected for observing insect diversity.Vegetation type of the plantation is *Cocosnucifera* (Coconut), *Anacardiumoccidentale* (Cashew plant), *Mangiferaindica* (Mango tree).

Site 3: Movadiis a village located a distance of 13 kms from Kundapura in which theforest was selected for observing

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insect diversity. Vegetation type of the forest is Anacardiumoccidentale(Cashew plant), Terminalia paniculata (Hunalu), Mangiferaindica (Mango), Acacia arabica (acacia), Vitexnegundo (Nukkesoppu), Ixoracoccinea (Jungle geranium), Artocarpus hirsute (Hebbelasu), Aporosalindleyana (Salle).

Data Collection

Field work was conducted from February 2017 to March 2018. Species were observed by visual method. Field survey with the fixed paths while collecting data of the species and capturing the photos at three distinct habitats, forest, plantation and cropland in Kundapura. Field observations were made once in ten days for a year. Identified the species based on their colour of wings, markings, body shape, habit, wing shape, and structure of legs. Captured the photos of insects by using a Samsung J 7 prime smart phone and identified the species by referring books.

3. Results and Discussion

During one year survey at three different sites were mentioned, 69 species belonging to 23 different families of eight orders were recorded (Table -2). Of these individuals of Lepidoptera order were found to be dominant with 56 species followed by Odonata with two species, Blattodea with two species, Coleoptera with three species, Diptera with one species, Hemiptera with one species, Hymenoptera with three species and Mantodea with one species. 30 hymenopterans with 30 generaand 28 species spread over nine families were recorded in the University of Agricultural Sciences, Dharwad[16].140 species of butterflies were recorded in Kavvayi river basin Kerala[7].

We have recorded 69 species with orders are as follows. Lepidoptera is the most abundant order of the Western Ghats, it's an order of class insects that includes moths and butterflies, 56 moth and butterfly species of this order were recorded from this area during the study period. 94 species of butterflies were recorded in Manikkunnumalaforest of Western Ghats, Wayanad, Kerala[12]. 318 species of moths belonging to 19 families were recorded in the Silent Valley National Park, India[8].59 species of butterflies belonging to 48 genera and 5 families were recorded in Trishna Wildlife Sanctuary[13].

Odonata is an order of carnivorous insects, encompassing the dragonflies and the damselflies. Two species of dragonflies and damselflies were recorded. 48 species of odonates which includes 31 species of Anisoptera (dragonflies) and 17 species of Zygoptera (damselflies)were recorded in Chinnar Wildlife Sanctuary, Sourthern Western Ghats of India[6]. Blattodea is an order of insect that contains the cockroaches and termites. We have recorded twoBlattodea species. Coleoptera is an order of insects. Beetles are identified under these groups. We have recorded three beetle species. 18 Species of beetles belonging to 7 families were recordedin coffee, pepper and coconut plantation of chikkamagaluru[3]. True flies are insects of the order dipteral. It is a large order containing an estimated 10, 00,000 species. But only one species has been recorded in our study area.

Hemiptera is an order of insects. It contains nearly 50,000 to 80,000 species in the world. We have recorded only one species. Hymenoptera is a one more large order of insects. Over 1,50,000 living species has been recorded in all over the world [18].Three species are found in our study area. Montodea is an order of insects. That contains over 2400 species in about 430 genera in 15 families. The largest family is the mantidae. Only one species has been recorded. A complete checklist of insect species is given in Table 2.

 Table 2: Order wise distribution of insects species observed from the study site along with their status (C= Common, NR=

 Not Rare, LC= Locally Common, R= Rare, NC= Not Common and UC= Uncommon).

| Order | Family | Common Name | Scientific Name | Status |
|-------------|--|--|------------------------------|--------|
| Lepidoptera | Geometridae | Geometrinae Moth | Aporandriaspecularia | R |
| | | Problepsis Vulgaris | Problepsis vulgaris | С |
| | | Blue Tiger Moth | Dysphaniapercota | С |
| | Erebidae | EudocimaHomaena (Female) | Eudocimahomaena | R |
| | | Owlet MothSpiramaretortaTussock MothOrgyiarecens | | С |
| | | | | С |
| | | Little virgin tiger moth | Grammiavirguncula | С |
| | | Black Headed Wasp Moth | Eressaangustipenna | R |
| | Eupterotidae | Monkey Moth | Eupterotelineosa | UC |
| | Uraniidae | Under winged moth | Microniaaculeata | С |
| | Cramridae Crambid Moth Herpetogramm | | Herpetogrammalicarsisalis | LC |
| | | Hydrilla Leaf Cutter Moth Parapoynxdiminutalis | | С |
| | Pieridae | Psyche | Leptosianina Fabricius | С |
| | | Three Spot Grass Yellow | EuremablandaBoisduval | С |
| | | Common Emigrant | CatopsiliapomonaFabricius | С |
| | | Motteled Emigrant | CatopsiliapyrantheLinnaeus | С |
| | | Common Jezebel | Delias eucharis Drury | С |
| | | Common Wanderer | Pareroniavaleria Cramer | С |
| | | Common Grass Yellow | <i>Euremahecabe</i> Linnaeus | R |
| Nymphalidae | | Common Crow | Euploea core Cramer | С |
| | | Tawny Coster | Acraea violaeFabricius | С |
| | Common Evening Brown MelanitisledaLinnaeus | | Melanitisleda Linnaeus | С |
| | | Grey Pansy | JunoniaatlitesLinnaeus | LC |
| | | Great Egg Fly | HypolimnasbolinaLinnaeus | C |

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| | | Rustic | <i>Cuphaerymanthis</i> Drury | С |
|-------------|----------------|----------------------------|------------------------------------|----|
| | | Common Baron | <i>Euthaliaaconthea</i> Cramer | С |
| | | Long Branded Bushbrown | <i>Mycalesisvisala</i> Moore | С |
| | | Nigger | Orsotriaenamedus Fabricius | С |
| | | Tamil Oak Blue | ArhopalabazaloidesHewitson | LC |
| | | Common Palm Fly | ElymniashypermnestraLinnaeus | С |
| | | Common Lascar | PantoporiahordoniaStoll | С |
| | | Peacock Pansy | JunoniaalmanaLinnaeus | С |
| | | Chocolate Pansy | JunoniaiphitaCramer | С |
| | | Plain Tiger | DanauschrysippusLinnaeus | С |
| | | Dark Evening Brown | MelanitisphedimaCramer | NR |
| | Lycinidae | Red Pierrot | TalicadanyseusGuerin-Meneville | LC |
| | 2 | Red Spot | ZesiuschrysomallusHubner | NR |
| | | Gram Blue | <i>Euchrysopscnejus</i> Fabricius | С |
| | | Common Pierrot | <i>Castaliusrosimon</i> Fabricius | С |
| | | Commom Cerulean | <i>Jamidesceleno</i> Cramer | С |
| | Papilionoidae | Common Rose | AtrophaneuraaristolochiaeFabricius | С |
| | 1 | Blue Mormon | Papiliopolymnestor | С |
| | | Common Blue Bottle | <i>Graphiumsarpedon</i> Linnaeus | С |
| | | Common Jay | GraphiumdosonC & R Felder | LC |
| | | Common Mormon | PapiliopolytesLinnaeus | С |
| | | Common Mime | ChilasaclytiaLinnaeus | С |
| | | Bush Hopper | AmpittiadioscoridesFabricius | LC |
| | Hespiridae | Rice Swift Skipper | BorbocinnaraWallace | С |
| | - | Small Branded Swift | Pelopidas mathias | С |
| | | Indian skipper | Spialiagalba | С |
| | | Grass Demon | <i>Udaspesfolus</i> Cramer | С |
| | Libellulidae | Pied Paddy Skimmer | Neurothemistullia | NR |
| | | Fulvous Forest Skimmer | Neurothemisfulvia | С |
| | | Green Marsh Hawk | Orthetrumsabina | NC |
| | | Spine Tufted Skimmer | Orthetrumchrysis | NC |
| | | Ground Skimmer | Diplacodestrivialis | LC |
| Odonata | Calopterygidae | Clear Winged Forest Glory | Vestalisgracilis | NR |
| | Coenagrionidae | Blue Fronted Dancer | Argiaapicalis | NC |
| Hemiptera | Fulgoroidea | Lantern bug | Kalidasalanata | R |
| Hymenoptera | Vespidae | Potter Wasp | Eumenes species | С |
| | Sphecidae | The Blue Mud Dauber | Chalybioncalifornicum | С |
| | Formicidae | Red Ant | Oecophyllasmaragdina | LC |
| Mantodea | Mantidae | Praying Mantis | Mantis | R |
| Coleoptera | Scarabaeoidea | Asiatic Rhinoceros Beetle | Oryctes rhinoceros | С |
| _ | | Shining Leaf Chafer Beetle | Chrysophorachrysochlora | R |
| Γ | Cerambycidae | Long Horn Beetle | Cerambycidae species | UC |
| Diptera | Muscidae | House Fly | Musca domestica | LC |
| | Blattidae | Cockroaches | | С |
| Blattodea | Termitidae | Termites | | С |

In the present study, the highest numbers of observed insects species belonged to order Lepidoptera (81.16%), Similar observationswere made by [17], followed by Hymenoptera (4.35%), Coleoptera (4.35%), Odonata (2.90%),Blattodea (2.90%), and the least number of species were observed under orders Diptera (1.45%), Hemiptera (1.45%), and Mantodea (1.45%) (Table- 3, fig- 2).

| Table 3: | Order-wise | distribution | of insect | species |
|----------|------------|--------------|-----------|---------|
| | | | | |

| Sl.No | Order | No. of species | Percentage of species |
|-------|-------------|----------------|-----------------------|
| 1 | Blattodea | 2 | 2.90% |
| 2 | Coleoptera | 3 | 4.35% |
| 3 | Diptera | 1 | 1.45% |
| 4 | Hemiptera | 1 | 1.45% |
| 5 | Hymenoptera | 3 | 4.35% |
| 6 | Lepidoptera | 56 | 81.16% |
| 7 | Mantodea | 1 | 1.45% |
| 8 | Odonata | 2 | 2.90% |



Figure 2: Distribution of species of insects in respective orders

Seasonality: Spring is the prime time for insects to strive and to increase their populations. Some insects are common for only a few months and some are common for throughout the year because they are very sensitive to the changes in the

Volume 8 Issue 4, April 2019 www.ijsr.net Licensed Under Creative Commons Attribution CC BY habitat and climate conditions. The highest number of specieswere recorded in monsoon there are 56 species, which is decreased to 30 species in post- monsoon and in pre- monsoon only 20 species.

 Table 4: Number of species and individuals recorded in
 different seasons

| different seasons | | | | | |
|-------------------|--------------|-------------|---------|---------------|------------|
| C No | C | No. of | No. of | Percentage of | Percentage |
| 5.INO. | Season | individuals | species | individuals | of species |
| 1. | Monsoon | 580 | 56 | 73.14% | 81.16% |
| 2. | Post-monsoon | 104 | 30 | 13.11% | 43.48% |
| 3. | Pre-monsoon | 109 | 20 | 13.75% | 28.99% |



Figure 3: Number of insects' species and individuals recorded in different seasons

Climate is the major drawback for species for the behavioral changes. In monsoon time insects are more active and in pre monsoon their activity will get reduce. During the study we have recorded more number of insects' species in monsoon season and less number of species in pre monsoon season. Because in monsoon season temperature and moisture content is very favorable for insects hence they are more active in monsoon. The order Lepidoptera was recorded in the highest numbers (Table 5) and the numbers are decreases in pre- monsoon season. Because of the climatic factors such as high and low temperatures; humidity and rainfall affect insect survival. Effects occur directly and indirectly, usually by acting on other organisms such as the host plant or predators. The relative abundance of the butterflies varied with the site, month, and family significantly [20].Butterfly diversity varies with season. They are abundant for only a few months and rare or absent during other months of the year [11].

 Table 5: Distribution of Insects species at different seasons

| Sl.No. | Order | Monsoon | Post-monsoon | Pre-monsoon |
|--------|-------------|---------|--------------|-------------|
| 1 | Blattodea | 2 | 2 | 2 |
| 2 | Coleoptera | 2 | 1 | 0 |
| 3 | Diptera | 1 | 1 | 0 |
| 4 | Hemiptera | 1 | 0 | 0 |
| 5 | Hymenoptera | 3 | 1 | 1 |
| 6 | Lepidoptera | 45 | 23 | 12 |
| 7 | Mantodea | 1 | 0 | 0 |
| 8 | Odonata | 1 | 2 | 5 |



seasons.

Abundance of Insects: Abundance of insects surviving to adulthood, and their activity once emerged, are both related to climate. Warm, dry weather generally encourages faster development of the early stages leading to lower mortality and lower predation. However there are some potential problems if condition become too dry, or if food supplies become desiccated, so it is hard to make generalisations. Total of 793 individuals of insects were recorded during the study period. While 396 individuals belonging to 54 species were recorded from Plantation, 17 species were recorded from Cropland and 16 species were recorded from Forest. Moths and butterflies of order Lepidoptera was recorded as the most abundant species and plantation site was supported to the maximum number of butterfly and moth species.

 Table 6: Number of species and individuals recorded in different habitats

| S1. | Habitat | No. of | Total number | Percentage of |
|-----|------------|---------|----------------|---------------|
| No. | monut | species | of individuals | individuals |
| 1 | Plantation | 54 | 396 | 49.93% |
| 2 | Forest | 16 | 321 | 40.47% |
| 3 | Cropland | 17 | 76 | 9.58% |



Figure 5: Number of species and individuals recorded in different habitats

In the present study, 793 individuals were recorded belonging to 69species of 8 orders. In three study areas, higher species richness was recorded at plantation site with more number of species in order Lepidoptera indicating availability and access to food plants. In Cropland site contains Order Lepidoptera only.Similar observation made by[19].

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 Table 7: Distribution of Insects species of different order at different habitat

| Sl.No. | Order | Plantation | Forest | Cropland | | |
|--------|-------------|------------|--------|----------|--|--|
| 1 | Blattodea | 1 | 1 | 1 | | |
| 2 | Coleoptera | 3 | 0 | 0 | | |
| 3 | Diptera | 1 | 0 | 0 | | |
| 4 | Hemiptera | 1 | 0 | 0 | | |
| 5 | Hymenoptera | 3 | 1 | 0 | | |
| 6 | Lepidoptera | 39 | 12 | 17 | | |
| 7 | Mantodea | 1 | 0 | 0 | | |
| 8 | Odonata | 5 | 3 | 0 | | |



Figure 6: Distribution of Insects species of different order at different habitat.

4. Conclusion

The present study reveals that the plantation provides suitable environmental conditions for insects. Hence more number of species was recorded in the plantation. Similar observations were made by [4, 14].

We have recorded more number of butterflies and moths. They are coming under order Lepidoptera. In the present study, highest numbers of observed insects species belonged to order Lepidoptera (81.16%), Similar observation made by [17], followed by Hymenoptera (4.35%), Coleoptera (4.35%), Odonata (2.90%), Blattodea (2.90%), and the least number of species were observed under orders Diptera (1.45%), Hemiptera (1.45%), and Mantodea (1.45%). We have recorded more number of butterfly species, because availability of food source, optimum environmental conditions, and shelter.

Some insects are eco-friendly in nature; Butterflies serve as major pollinators of both wild and cultivated plants[21]and some insects are very effective for croplands for example Rhinoceros beetles and some other beetles. Many blood sucking insects are vectors of human diseases; intensive agriculture encourages the development of insect pests by concentrating food items on which insects can feed.Farmers using some pesticides to control the insects activity which kills the insects and gradually decreases the number of insects. Hence, conservation of insects is necessary.

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