



Full Length Research Paper

Preliminary Assessment of Population, Species variation and Habitat Preference of Some Insects in Kuvempu University Campus India

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Abstract

This present paper deals with preliminary assessment of population, species variation and habitat preference of some insects carried out in Jnana Sahyadri, the main campus of Kuvempu university located at Shankaraghatta conducted during 2015 to 2016. Total 95 variety of species belonging to 15 order was recorded in study area which shows good diversity of insects and species variation by direct method and random quadrat sampling method. The present investigation shows highest species variation was founded in order Orthoptera followed by Hymenoptera and least in an order silverfish, mayflies and rock crawler, lacewings and booklice. This species variation is due to food availability, climatic condition and suitable habitat. But due to human interference, construction and disturbing habitat of insects may affect diversity of insect in this area.

Key words: Insects, Habitat, Species, Campus.

Introduction

Biological diversity means the variability among the living organisms from all sources including terrestrial, marine, and other aquatic ecosystems (Harper and Hawksworth, 1994). This includes diversity within species, between species, and of ecosystems. Biological diversity refers to the entire body of organisms, their ecological complexity within the environment, and all the ecological processes in relation to these systems (Primack, 1993; Liu, 1999). Approximately 30 million species are found worldwide, of which about 1.4 million have been briefly described; of these, about 750,000 are insects. Insects now comprise > 75% of all described animal species and exhibit not only a rich variety of form, color, and shape, but also a range of ecological adaptations unexcelled by any other group. The insects are known to be the most successful and diverse animals on earth. They have adapted for almost every conceivable type of environment. The insects are considerably estimated to comprise more than 75 percent of the known species of the animals. Approximately 0.9 million species of insects have been described throughout the world and 59353 species of insects pertaining to 27 orders are known in India (Varshney, 1998). Although new findings of the faunal explorations indicate that this number is a little proportion of the total existing species. The insect fauna of India is vast. In an old estimate, Lefroy and Howlett (1909) in the monumental book 'Indian Insect Life' reported 25,700 Indian species.

Roonwal (1989) estimated that insects constitute two-thirds of the total fauna in India and comprise nearly 1,00,000 species, of which about half remain yet to be studied. Recent estimate, Alfred et al. (1998) estimated 59,353 species of insects from India belonging to 619 families. Indian insects belong to 27 orders of which Coleoptera is most dominant with about 15,500 species. Butterflies and Moths with about 15,000 species is another important group. These are followed by Hymenoptera (10,000 spp.), Diptera (6093 spp.) and Hemiptera (6500 spp.) (Varshney, 1998). The review of literature available on the insect species of Western Ghats is reviewed by Mathew et al. (2002) recorded 860 species of insects belonging to 13 orders from Western Ghats. Nandini V. Belamkar (2012) reported that a total of 11,318 insects from 6 orders, 26 families and 54 species were recorded in agriculture fields of Hadgil Harutti village, Gulbarga, Karnataka. Jayakumar et al. (2007) recommended points of conservation of insect's diversity in India. Suryaprakash (2007) has given some action plans for conservation of butterflies in Delhi. Gupta (2003) accounted 633 species in 60 genera of bees in India. Maicykuty and Usha (2002) described nineteen species of Hemiptera from Western Ghats of India. Insects are closely associated with our lives and affect the welfare of humanity in diverse ways. At the same time, large numbers of insect species, including those not known to science, continue to become extinct or extirpated from local habitats worldwide. Insect consist of a succession of segments, more or less hundred by the deposition of chitin. These segments are arranged in 3 groups, head, thorax & abdomen.

In the six footed insects such as the bee, moth, beetle, dragonfly Four segment unite to form the head thorax consist of three, segments & abdomen is composed of either ten or eleven segments body is divided in to 3 region whence the name insect. Insects play critical roles in ecosystem function. They cycle nutrients, pollinate plants, disperse seeds, maintain soil structure and fertility, control populations of other organisms, provide a major food source for other taxa (Majer 1987) and are

parasites or disease vectors for many other organisms, including humans. Many insects have considerable capacity for long distance dispersal, enabling them to find and colonize isolated resources as these appear. Other insects are flightless, and hence vulnerable to environmental change or habitat fragmentation. Because of their small size, short life spans, and high reproductive rates, the abundances of many species can change by several orders of magnitude on a seasonal or annual time scale, minimizing time lags between environmental changes and population adjustment to new conditions. Such changes are easily detectable and make insects more useful as indicators of environmental changes than are larger or longer-lived organisms that respond more slowly. In turn, insect responses to environmental change can affect ecosystem structure and function dramatically. Insects are highly responsive to environmental changes, including those resulting from anthropogenic activity to agriculture fields. The diversity of insect species represents an equivalent variety of adaptations to variable environmental conditions. The present study is an attempt made to determine some insect diversity in Jnana Sahyadri, the main campus of Kuvempu University located at Shankaraghatta.

Materials and methods

Jnana Sahyadri, the main campus of Kuvempu University is located at Shankaraghatta which is only 2kms from the magnificent Bhadra Reservoir across the river Bhadra, one of the important life lines of the area. The campus sprawls over an area of 326.21 acres in that around 56.48% (184.25 acres) of land is forest area (undisturbed area) and the remaining 43.51% (141.96 acres) of land is used for construction & vegetation cover of university buildings blending naturally with the landscape

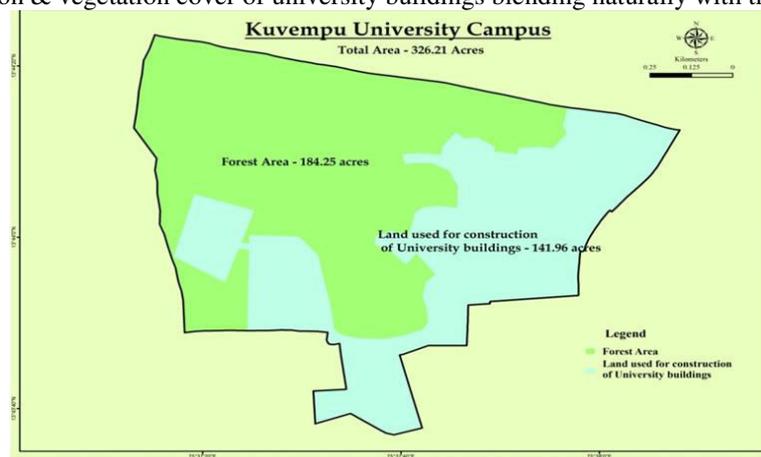


Fig 1. Study area

As Kuvempu University is situated in the lap of lush forest green, lying next to Bhadra forest area it is very rich in flora, fauna, insect, micro organism etc. Thus it's been a very good research place for wildlife studies which would help in enhancing the knowledge of wildlife. It's been found that there are rich diversity insects in Kuvempu University. Thus, this research is undertaken to know diversity, distribution & species richness of some insects inside Kuvempu University. Field work was conducted during 2015 to 2016. During the field work some material like Camera, Data Sheet, Measurement tape, & the complete illustrated guide book World Encyclopedia of Insects by Martin Walters were used. A total of 12 quadrates were plotted in Kuvempu University campus.

To know the diversity of some insects inside the study area, following methodology were adopted,

1. Direct method by taking photograph, counting individual species, collecting dead species and look and see method
2. Random quadrat sampling

Direct method

The study is by taking suitable photographs and collecting dead species for the identification of insects. To know the population of insect counting individual species and look and see method was adopted.

Random quadrat sampling method

A quadrat is a plot used in ecology and geography to isolate a standard unit of area for study of the distribution of an item over a large area. While originally rectangular, modern quadrats can be rectangular, circular, irregular, etc. The quadrat is suitable for sampling plants, Insects slow-moving animals such as millipedes, and some aquatic organisms.

The study area that is Kuvempu university campus was divided into three types of landscape i.e. constructed area, vegetation cover area and forest cover area. On the basis of types of landscape 12 target evaluations is selected and divided into four equal sections (quadrants). A 5x5 m² quadrat is randomly placed in each of the four quadrants. It is important to understand that the evaluation area is consciously selected to allow for repeatability, but that the quadrat sampling is random. Random sampling means that every area within the evaluation area has an equal chance of being measured and that one quadrat placement does not determine or influence the next quadrat placement. Randomness eliminates bias and ensures that each subset is independent.

Selected sites are as shown in map



Quadrates 1- Botanical Garden (Vegetation cover area); Quadrates 2- Distance Education Walking Garden (Vegetation cover area); Quadrates 3- Shankar math Temple (Forest Area); Quadrates 4- Children Play Ground (Vegetation cover area); Quadrates 5- Near to Organic Kitchen Park (Vegetation cover area); Quadrates 6- Butterflies region of Forest (Forest area); Quadrates 7- Near to Boys Hostel (Construction area); Quadrates 8 - Near to Hilly Region (Inside Forest); Quadrates 9 - Centre of Forest (Forest area); Quadrates 10- Near to Staff quarters (Construction area); Quadrates 11- Near to Guest House (Construction area); Quadrates 12- In Front of Girls Hostel (Construction area); **Statistical Analysis:** Population, Density, Abundance and frequency was calculated

Results and Discussion

The Kuvempu University Campus is one of the good places to study population and distribution pattern of insects because it is situated near Bhadra wildlife sanctuary which is the part of western ghat biodiversity zone. The statistical calculations were done to enumerate the insect population (Table-1) (Fig-1-4), distribution pattern, habitat preference (Table-2) (Fig-5) and species variation (Table-3) (Fig-6) in Kuvempu university campus, Shankaraghatta. Total 95 variety of species belonging to 15 orders was founded in 12 quadrates that were laid in study area which shows good diversity of some insects and specie variation. The diagnostic features of some insect orders are:

Silverfish (Thysanura): 2-22 mm long with flat elongated shiny silver bodies. Their antennae are long and they have two cerci and a tail-like telson at their rear. There are 370 species in four families. Most species are Nocturnal omnivores, scavenging under bark, in leaf litter. Males secrete silk that they suspend sperm droplets on for the female to take up. The eggs hatch into nymphs. Silverfish are found in varied environments throughout the world. They feed on algae, lichen and plant debris.

Mayflies (Ephemeroptera): They are short lived winged insects. They are small to medium-sized, soft-bodied insects with two pair of wings. All of which are closed vertically above the body. They have short antennae, large compound eyes and three light sensors, and at the rear end have two long cerci and a long tail filament. Their common names include shad fly, day fly, soldier fly and fish fly. The adults do not feed but the larvae feed on diatoms, algae and detritus, or are carnivorous. The order is split into two suborders with approximately 2,500 species in 23 families. Mayfly nymphs live in an aquatic habitat, which may be slow or fast running rivers, ditches, ponds, streams or lakes. Some species breed in water bodies with a gravelly bottom, while others prefer muddy substrate. These insects have a worldwide distribution, but are found particularly in temperate regions where they require clean unpolluted and well oxygenated water to complete their life cycle.

Dragonflies (Odonata): They are large, colorful, long-bodied insects with amazing flying abilities. They have two pairs of wings that are independent and capable of changing their angle, wing beat allowing dragonflies backward if necessary. Their thorax is packed with flight muscles and at rest the wings lie straight outside. There are five families with 3000 living species. They have large heads and compound eyes that have near 360 degree stereoscopic vision. They are commonly found near fresh water but are in no way restricted to it; as strong fliers, they can travel many miles to forest and some species even migrate over the sea.

Termites (Isoptera): They have soft bodies, biting mouth parts, short cerci and simple antennae with 9-30 segments. Sometimes called white ants due to their coloration. They are social insects; they live in colonies with reproductive, workers and soldiers of both sexes. They are mainly tropical and subtropical insects that feed on wood, fresh leaves, leaf litter or soil. They are grouped, according to their feeding or habitat preferences. They build nests, in fallen wood or above or below ground, in order to shelter to colonies. Their mounds are constructed from soil excavated in the course of digging underground tunnels, or from soil and sand collected on the surface, mixed with saliva and faeces.

Mantids (Mantodea): They are elongate, medium to large sized insects, growing up to 25 cm. Many are winged with 2 forewings and 2 hind wings. The head is triangular with large forward facing compound eyes that have binocular vision. Found mainly in warm regions of the world. They are predators feeding mainly on insects and spiders. There are 2000 species. The male

is generally smaller than female, in some species may be eaten by the female after during mating. The female may lay 6 to 22 egg cases, with 30 to 300 eggs in each, through her life time. Mantids live among tree foliage, flowers or grasses where they are expert ambush predators. They are often the same colour as their surrounding, and many have body out growths mimicking flower petals, leaves or twigs to help disguise them.

Rock Crawler (Grylloblattodea): They are wing less insects, related to the stick insects. They live in mountains in Western North America and Eastern Asia.

Stick and Leaf insects (Phasmatodea): There are 3 families in the order.

- i. *Stick insect*: Stick insects are elongate 10-30cm, slender and cylindrical with variable body shape. They have long legs, short, leathery forewings and large membranous hind wings, thread-like antennae, small compound eyes and biting mouthparts. Sometimes known as ghost stick or walking stick. The stick insect mimics the color of its background, which effectively camouflage it from predator.
- ii. *Leaf insect*: Leaf insects are tending to be broad, flat and leaf shaped. The leaf insects are mimicking leaves, often including the appearance of mildew, insect feeding damage and leaf veins. When seen they are hard to mistake for any other insect.
- iii. *Habitats of Leaf and Stick insect*: These are all herbivorous slow moving insects, living and feeding within foliage and distributed mainly in tropical and subtropical regions. They are found in a variety of habitats including wet and dry forests and grassland. During the day they tend to hide on the forest floor, but at night, they come out to feed.

Grasshopper and Crickets (Orthoptera):

- i. *Grasshopper*: Body size ranges from 5-11.5 cm with wingspan up to 22 cm and they possess compound eyes. This sub order consists of about 34 families. The majorities are plant eater, but a few are omnivorous.
- ii. *Cricket*: Crickets are distinguished from grasshoppers by their long antennae and ovipositor, and the fact that they have their hearing organ on their front legs. females show maternal care. They are mainly nocturnal insects with a lifespan of over one year. Many crickets make loud rasping and repetitive calls to attract mate.

Habitat of Cricket and Grasshoppers: In the tropics, species are also found in the tree canopy or living among lichens and mosses, but the main families are well represented around the world in all habitats that support plants. These include deserts, bogs, marshes, grassland and woodland. Generally, they are ground dwelling insects that feed mainly on grass during the day, but many grasshoppers can fly well.

Booklice (Psocoptera): This order includes booklice and bark lice, which are active, fast running, small 1-10mm, soft bodied insects whose coloration matches their surroundings. They have protruding compound eyes, thin antennae and simple, chewing mouth- parts. The wings, if present, are two fore and two hind, with the forewings slightly larger. There are about 3000 species distributed worldwide. These insects feed on plant material, algae, lichens or fungi. Booklice and bark-lice form gregarious groups under bark, leaf litter or wood dust. They are considered beneficial to the tree on which they live.

Bugs (Hemiptera): All Hemiptera possess specialized mouthparts modified in to a proboscis which can appear like beak. It typically forms a slender, piercing tube used for stabbing the host, either plant or animal, and sucking liquids. The majority of bugs are also characterized by the structure of their wings, which are hardened near the base but membranous at the ends, hence their order name which literally means half wings in Greek. In herbivorous bugs the saliva injected into the host's tissue causes local necrosis in plants, whereas in predatory species, the saliva is highly toxic and can paralyse relatively large prey. bugs are a diverse group of insects which are very often live in association with humans and occur in a wide variety of habitats. Several species, such as the water boatmen are aquatic. Another group is truly marine and some have been found on the surface of the ocean. All aquatic species are predatory but the majority of bugs are plant feeders.

Lacewings (Neuroptera): They are of moderate size with the largest species having forewings length of 34mm. As the name suggests, their wings have a delicate lace like appearance. They have auditory organ, which allows them to detect bat ultrasounds, as well as by their ability to communicate through vibration transmitted by moving the legs against the abdomen. There are about 5000 species of lacewings. The female lacewing lays about 300 eggs, commonly on the stalks. Most larvae are brown with darker spots and markings dried remains of their prey for camouflage. Lacewings tend to live in forests but can be found in most of habitats where aphids and their prey exist.

Beetles (Coleoptera): The size of beetle varies from 0.25-15cm. Beetles have two pair of wings, but the first pair has been enlarged and thickened in to a pair of hard sheaths, which cover and protect the more delicate hind wings and dorsal surface of the abdomen and also offers good protection to the wings. The mouthparts are always of a biting type. They appear as a large pincers on the front of some beetles. They are used to grasp, cut or crush prey or plant food. Beetles with more than 300,000 species and

166 families, constitute the largest order of insects. The majority of adult beetles are terrestrial herbivores, but several entire families and portions of others are predatory, fungivores or parasites. Though some beetles feed on nectar and pollen. Beetles exploit a variety of habitats throughout the world from rainforest canopies and lakes to mountains and the driest desert. They can also found in deep caves and underground watercourses. Some of beetles are found around decaying organic matter.

Table No. – 1(Showing Population, Density, Frequency and Abundance)

No	Order	Total No of Different Varieties of spp.	Total No of Quadrates												Total No of spp.	P %	D	F	A
			Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12					
1	Silverfish(Thysanura)	1	Ab	Ab	Ab	Ab	Ab	Ab	Ab	Ab	Ab	Ab	Ab	1	1	0.32	0.08	0.08	1
2	Mayflies(Ephemeroptera)	1	Ab	Ab	1	1	Ab	Ab	Ab	Ab	Ab	Ab	Ab	Ab	2	0.65	0.16	0.16	1
3	Dragonflies(Odonata)	2	2	Ab	3	1	Ab	Ab	Ab	Ab	Ab	Ab	Ab	2	8	2.61	0.66	0.33	2
4	Termites(Isoptera)	4	Ab	Ab	1	Ab	Ab	4	3	Ab	2	Ab	5	Ab	12	3.92	1	0.41	2.4
5	Mantids(Mantodea)	2	Ab	Ab	1	Ab	Ab	Ab	Ab	1	Ab	Ab	Ab	Ab	2	0.65	0.16	0.16	1
6	Rock Crawlers Grylloblattodea)	1	Ab	Ab	Ab	1	Ab	Ab	Ab	Ab	Ab	Ab	Ab	Ab	1	0.32	0.08	0.08	1
7	Stick and Leaf Insect (Phasmatodea)	4	4	Ab	2	Ab	2	1	1	Ab	Ab	Ab	Ab	3	13	4.24	1.08	0.5	2.16
8	Cricket and Grasshoppers (Orthoptera)	26	10	8	1	2	5	2	3	1	2	3	1	1	39	12.7	3.25	1	3.25
9	Booklice (Psocoptera)	1	Ab	Ab	Ab	Ab	Ab	Ab	Ab	Ab	Ab	Ab	Ab	1	1	0.32	0.08	0.08	1
10	Bugs (Hermiptera)	6	2	Ab	Ab	Ab	Ab	Ab	3	2	1	2	3	1	14	4.57	1.16	0.58	2
11	Lacewings (Neuroptera)	1	Ab	Ab	Ab	Ab	Ab	Ab	Ab	Ab	Ab	Ab	Ab	1	1	0.32	0.08	0.08	1
12	Beetles (Coleoptera)	15	1	10	Ab	Ab	Ab	1	6	1	5	10	1	Ab	30	9.80	2.5	0.66	3.75
13	Flies (Diptera)	2	1	1	Ab	Ab	Ab	2	1	Ab	Ab	1	1	Ab	7	2.28	0.58	0.5	1.16
14	Butterflies and Moths (Lepidoptera)	13	5	6	2	Ab	Ab	8	1	1	2	Ab	1	2	28	9.15	2.33	0.75	3.11
15	Bees, Wasp, Ants and Sawflies (Hymenoptera)	17	3	2	7	5	1	2	1	1	1	10	13	12	157	50.3	13.08	1	13.1

(P= Population; F=Frequency; D=Density and A=Abundance)

Table 2. Comparison of DATA according to landscape to know habitat preference of some insects in Kuvempu University.

No.	Order	Construction Area %	Forest Area%	Vegetation Cover Area%	Highest Preference Area
1	Silverfish (Thysanura)	0.32	Ab	Ab	C.A.
2	Mayflies(Ephemeroptera)	Ab	0.32	0.32	F.A. and V.C.
3	Dragonflies (Odonata)	0.98	0.98	0.65	C.A. and F.A.
4	Termites (Isoptera)	Ab	2.28	2.61	F.A.
5	Mantids (Mantodea)	Ab	0.65	Ab	F.A.
6	Rock Crawlers (Grylloblattodea)	Ab	Ab	0.32	V.C.
7	Stick and Leaf Insect (Phasmatodea)	1.30	0.98	1.96	V.C.
8	Cricket and Grasshoppers (Orthoptera)	2.61	1.96	8.16	V.C.
9	Booklice (Psocoptera)	0.32	Ab	Ab	C.A.
10	Bugs (Hermiptera)	2.94	0.98	0.65	C.A.
11	Lacewings (Neuroptera)	Ab	Ab	0.32	V.C.
12	Beetles (Coleoptera)	5.55	2.28	3.59	C.A.
13	Flies (Diptera)	0.98	0.65	0.65	C.A.
14	Butterflies and Moths (Lepidoptera)	1.30	4.24	3.59	F.A.
15	Bees, Wasp, Ants and Sawflies (Hymenoptera)	11.76	3.59	3.59	C.A.

Where, C.A. = Construction Area; F.A. =Forest Area; V.C. = Vegetation Cover Area

Table 3. Species Variation of some insects in Kuvempu University.

No	Order	Total No of Different Varieties of spp.	Percentage %
1	Silverfish (Thysanura)	1	1.05
2	Mayflies(Ephemeroptera)	1	1.05
3	Dragonflies (Odonata)	2	2.10
4	Termites (Isoptera)	4	4.21
5	Mantids (Mantodea)	2	2.10
6	Rock Crawlers Grylloblattodea)	1	1.05
7	Stick and Leaf Insect (Phasmatodea)	4	4.21
8	Cricket and Grasshoppers (Orthoptera)	26	27.36
9	Booklice (Psocoptera)	1	1.05
10	Bugs (Hemiptera)	6	6.31
11	Lacewings (Neuroptera)	1	1.05
12	Beetles (Coleoptera)	14	14.73
13	Flies (Diptera)	2	2.10
14	Butterflies and Moths (Lepidoptera)	13	13.68
15	Bees, Wasp, Ants and Sawflies (Hymenoptera)	17	17.89
	Total	95	-

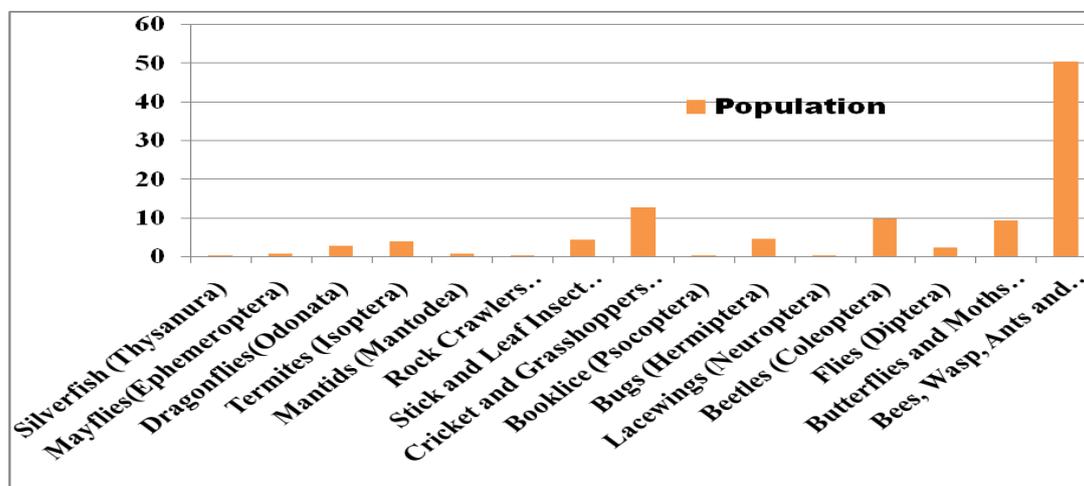


Fig 2. Representing Population of some insects in Kuvempu University

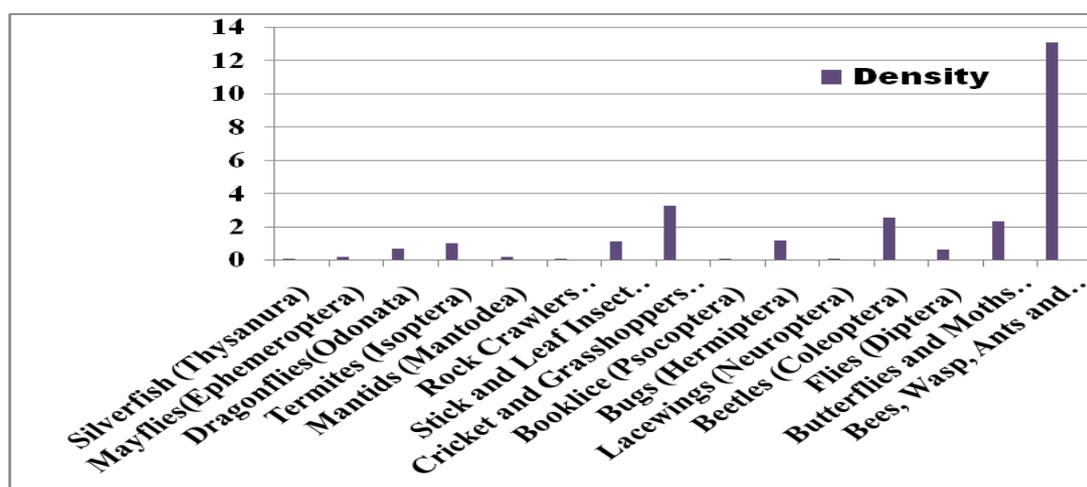


Fig 3. Representing Density of some insects in Kuvempu University

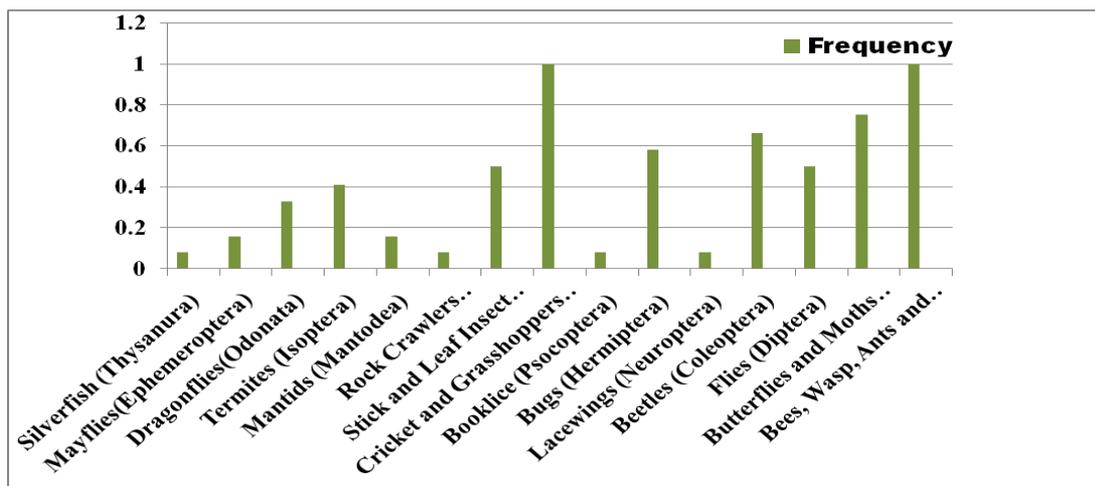


Fig 4. Representing Frequency of some insects in Kuvempu University

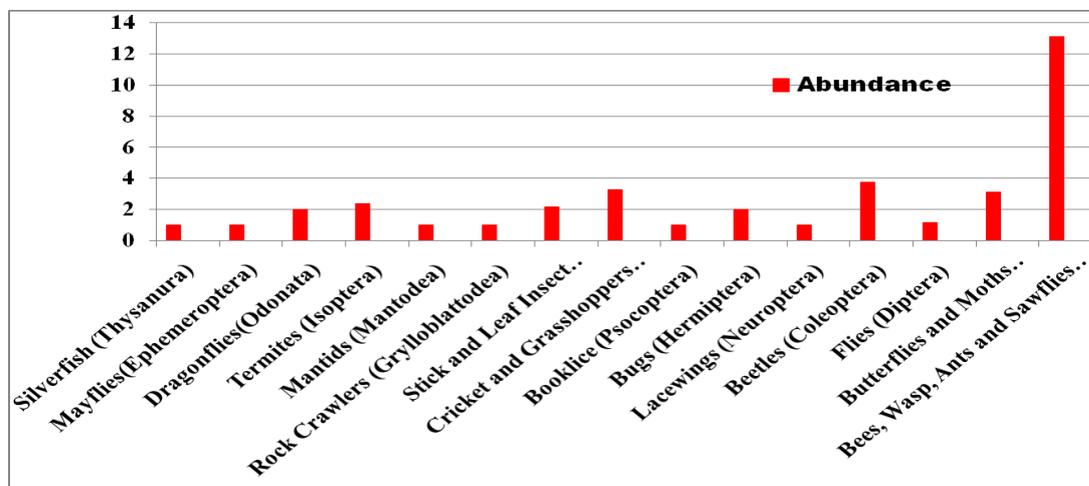


Fig 5. Representing Abundance of some insects in Kuvempu University

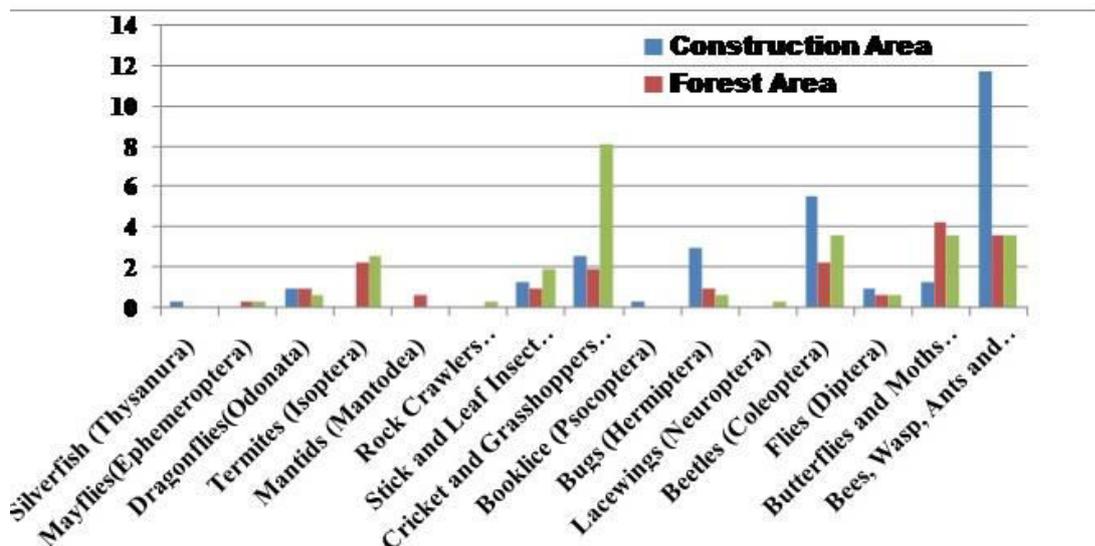


Fig 6. Representing Habitat Preference of some insects in Kuvempu University

Flies (Diptera): They are mostly fairly small, with a single pair of functional wings. The second pair of wings is reduced. This feature distinguished them from other insects also called flies. This is a large order with an estimated 85,000- 100,000 species. This is a diverse order with a wide range of ecological roles from herbivores and predators including the robber flies, to internal

parasites whose larvae develop inside a living host. Many are external parasites for e.g. mosquitoes which feed on blood. Most of the species feed on decaying organic matter, pollen or nectar. Dipterans have colonized most habitats and are widely distributed throughout the world very few species are restricted to the one type of habitat. The majority of species live in the tropics. Many flies attracted to rubbish and other waste.

Butterflies and Moths (Lepidoptera): The majority of the members of the order are moderate-sized, averaging about 30mm in wingspan. The shape of antennae differs between butterflies and moths. Butterflies have thread like antennae with the tips thickened into knobs. Moths have very diverse types of antennae, varying from filamentous and feathered to toothed or comb like, depending on the species. Lepidoptera are mainly herbivorous insects. Some of species do not feed at all and live on food reserves accumulated during their larval stage, their mouthpart having atrophied. Most of adults, feed on nectar, honeydew or exudates from fruit. The larvae of most species are also herbivores, feeding on a wide range of plants, from root to leaves. Butterflies and moths have colonized most habitats, from the arctic to the tropical jungles. Specially adapted to feed from flowers, butterflies are associated with rich meadows, woodland and forest clearings, and other sites where there are vegetation and flowers.

Bees, Wasp, Ants and Sawflies (Hymenoptera): Hymenopterans are characterized by their membranous wings. They usually have two pairs of wings. Members of the certain species, notably ants, only have wings at specific stage of their lifecycle. Hymenopterans have a very mobile head with well-developed mandibles adapted for chewing, as well as for attacking or defending themselves. Hymenoptera is the third largest order of insects, with more than 280,000 species. It includes the wasps, bees, ants and sawflies. It is a diverse group well known for the advanced social organization of some of its members. Many ant species nest underground. An ants nest is made up of many different chambers in forests they recycle huge amounts of material. They play major role in maintaining the stability of immediate ecosystem in which they live. Ants are common in both temperate and tropical parts of the world

The present investigation shows highest population of order Hymenoptera, approximately 50.3% with density 13.08 followed by Order Orthoptera with 12.7% of population and 3.25 density and least in Silverfish, Rock Crawler, Booklice, Lace wing etc. with population and density 0.32% and frequency approximately 0.08. The highest frequency occurs in Order Hymenoptera and Orthoptera i.e. 1. The highest abundance occurs in Order Hymenoptera i.e. 13.1 followed by Order Coleoptera is about 3.75 and least in a Silverfish, Mayflies, Booklice, Lacewings, Mantids and Rock Crawler (Table-1) (Fig-1-4). The insects are widely distributed in different landscape of the study area (Table-2) (Fig-5) i.e. Construction area, Forest area and Vegetation Cover area which shows habitats of each order insect species. According to my survey the highest number of species present in construction area is of order Hymenoptera and least is of order Epenoptera, Termites, Mantids, Rock Crawlers etc., in forest area is of order Lepidoptera and least is of Silverfish, Booklice etc., in vegetation cover area is of order Orthoptera and least is order Silverfish, Mantids etc. which shows highest preference of habitat. For e.g. Mantids live among tree foliage, flowers or grasses so it prefers forest area as their habitat where as beetles are found around decaying organic matter so it prefers construction area as their habitat.

Total 95 variety of species of 15 order was founded in study area which shows good diversity of insects and species variation (Table-3) (Fig-6). The present investigation shows highest species variation was founded in an order Orthoptera followed by order Hymenoptera and least in an order Silverfish, Mayflies and Rock crawler, Lacewings and booklice. These species variation is due to food availability, climatic condition, and suitable habitat. We compare our study with a preliminary study on abundance and diversity of Insect conducted by Nadini V. Belamkar et.al (2012). They reported a total of 11,318 insects from 6 orders, 26 families and 54 species were recorded in Gulbarga District, Karnataka, India. Our result shows 95 species of 15 different orders were founded in only in 326.21 acres area of Kuvempu university campus. Thus gives an idea, that our study area is rich in insect diversity.

Conclusion

Insects play critical roles in ecosystem function. They cycle nutrients, pollinate plants, disperse seeds and maintain soil structure and fertility, control populations of other organisms, provide a major food source for other taxa. A sharp decline of diversity of insects may occur due to natural calamities like flood, drought earth quakes and forest fires. As man begin to use superior intelligence and understanding nature, he became progressively centered and in this process, started disrespecting and destroying nature which affects diversity of insects. Another major threat to population and diversity of insect is due to killing as pest or for obtaining silk, killing due to fear and other human useful purposes. The present study reveals a documentation of 95 species belong to 15 orders in a small area. This reveals that Kuvempu university campus located near Bhadra wildlife sanctuary and part of western ghat biodiversity hotspot is rich in a diversity of insects, but due to human interference and disturbing habitat of insects may affect diversity of insect in this area. There is need to conserve habitat of insects and there is need to aware the people about the importance of insects.

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