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Insect diversity in Sarah tucker college campus, Tirunelveli, Tamil Nadu

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Abstract
Among nature's most amazing creations, insects currently make up about 90% of the animal kingdom and are the most common species on earth. Depending on the species, they play an important role in a flourishing agricultural sector by contributing to the overall health of an ecosystem in various ways. A total of 92 insect species belongs to 9 orders and 24 families were identified in the study area Sarah Tucker College campus, Tirunelveli. The present study was revealed that the order Lepidoptera found to dominant with 58species followed by Hymenoptera with 13species, Orthoptera with 7species, Odonata 6, Coleoptera 3, Blatella with 2 species, Scorpiones and Dermaptera, Dictyoptera with 1 species. The current investigation focuses on the variety of insects found on the Sarah Tucker College campus, Tirunelveli, Tamil Nadu, South India

Keywords: Insects, agricultural sector, ecosystem, lepidoptera, diversity

Introduction
Insects are the most successful and diversified collection of multicellular organisms on earth. Insects can have a positive impact on ecosystems through prey-predator interaction, soil enrichment, and bio-indicative behaviours; therefore, maintaining biodiversity on agricultural land is vital from both a conservational and commercial point of view. In an ecosystem, this biodiversity provides a range of ecological services that complement one another and combine to create a stable, sustainable ecosystem. [1]. They play anessential role in key ecological processes as pollination, pest control, decomposition, and the preservation of wildlife species [2]. The most key pollinators are bees, beetles, butterflies, and flies [3]. Insects of all kinds, including bees, wasps, and sporadically ants (Hymenoptera), beetles (Coleoptera), moths, butterflies (Lepidoptera), flies (Diptera), and bugs (Hemiptera), pollinate economically significant crops and play a crucial role in the food chains of predatory insects, birds, reptiles, and spiders [4]. Since insects serve as a major source of food for other creatures in the community and maintain the ecosystem, their abundance is vital for biological control. [5]. Due to the lack of information about the insect groups, this study made an attempt to evaluate insect diversity in the study area Tirunelveli. This will further assist the calculation of species and their abundance loss, finally contributing to the conservation of insect fauna.

Materials and Methods
The present work was carried out in Sarah Tucker College campus (Elev; 250 ft N: 8 42.67' E:077 198') fromJanuary 2022 to July2022.The College campus spreads over an extensive 41acres of land. Vegetation of theCollege holds a best place for different fauna. The insects were collected using a variety of techniques, including handpicking and netting. Sweeping nets were used to gather and photograph several bug species. Naphthalene was used as a repellant to avoid secondary infection of the conserved specimens after the insects were properly gathered, killed, preserved, and kept in insect storage boxes. Research articles, journals, and reliable literature were used to identify insects [6, 7, 8, 9]. Insect identification was aided by information that was available on Indian insects and by an entomologist from the agricultural college.

Data analysis
A count of the number of distinct species (species richness) in an area would appear to provide a clear picture of the diversity in a community's biodiversity. (i) Species richness: Total number of insect species recorded in a particular area. (ii) Relative abundance: It is the number of insects of a particular species as a percentage of the total insect population of a given area. It is given by: Pi= Ni/N x 100 (iii) Species diversity: Shannon's index of diversity was calculated, which is a measure of diversity. H'=Σ pi In pi Where: H = the Shannon diversity index, Pi = fraction of the entire population made up of species i; S = number of species encountered; Σ = sum from species 1 to species S.

Results
In the present study, a total of 92 species of insects belonging to9 orders and 24 familieswere identified from the study area..Identified insects recorded from the study areawere given in Table 1.

Table 1: Identified insects in the study area

S. No		Common Name	Name of the species
Family:			Order: Lepidoptera
1	Erebidae	Castor semi-looper	*Achacajanata*
2		Common Owlet Moth	*Spiramahelicina*
3		Cotton bollworm	*Helicoverpaarmigera*
4		Common fruit-piercing moth	*Eudocimaphalonia*

5		Dot-underwing moth	*Eudocimamaterna*
6		Aganaisficus	*Asotaficus*
7		Tobacco cutworm or cotton leafworm	*Spodopteralitura*
8		Indian owlet-moth	*Speiredoniaretorta*
9		Asian gypsy moth caterpillar	*Lymantriadisparasiatica*
10		Sandalwood defoliator	Amatapassalis
11	Sphingidae	Yam hawk moth	*Thretranessus*
12		Convolvulus hawk-moth	*Agrius convolvuli*
13		Pale striated hawkmoth	*Hippotionboerhavia*
14		lesser death's head hawkmoth or bee robber	*Acherontiastyx*
15		Oleander hawk-moth	*Daphnis nerii*
16		Sundowner moth	*Sphingomorphachlorea*
17		Crepuscular hawkmoth	*Nephelehespera*
18	Nymphalidae	Tawny Coster	*Acraeaviolae*
19		Common evening brown	*Melanitisleda*
20		Red dish brush brown	*Mycalesis oculus*
21		Dingy Bush-brown	*Mycalesisperseus*
22		Peacock pansy	*Junoniaalmana*
23		Choclate pansy	*Junoniaiphita*
24		Common Four ring	*Ypthimahiibneri*
25		Common Three ring	*Ypthimaasterope*
26		Common Indian crow	*Euploea core*
27		Common Salier	*Neptishylas*
28		Blue tiger	*Tirumalalimniace*
29		Dark Blue tiger	*Tirumalaseptentrionis*
30		Plains tiger	*Danauschrysippus*
31		Common tiger	*Danausgenutia*
32		Monarch butterfly	Danausplexiopus
33		Yellow pansy	*Precishierta*
34		Lemon pansy	*Junonialemonias*
35		Great Egg fly	*Hypolimnasbolina*
36		Smooth Eyed Bush brown	*Orsotriaenamedus*
37		Forest giant owl	Caligoeurilochus
38	Crambidae	Egg plant fruit borer	*Leucinodesorbonalis*
39		Beet webworm moth	*Spoladearecurvalis*
40	Lycaenidae	Dark pierrot	*Castaliusananda*
41		African Babul Blue	*Azanusjesous*
42	Hesperidae	Chest nut bob	*Iambrixsalsala*
43		Plains cupid	*Chiladescontracta*
44	Pieridae	Common grass Yellow	*Euremahecabe*
45		Common Albatross	*Appiasalbina*
46		Imported cabbage worm	*Pierisrapae*
4 7		Indian Cabbage White	*Pieriscanidia*
48		Common emigrant	*Catopsiliapomona*
49		Common gull	*Ceporanerissa*
50		Common wanderer or Malayan wanderer	*Parenoniavaleria*
51		Brimstone	*Gonepteryx*
52		Grass yellow	*Euremahecabe*
53	Papilionidae	Common blue bottle	*Graphiumsarpedon*
54		Crimson Rose	*Pachliopta hector*
55		The common Mormon	*Papiliopolytes*
56		Lime swallowtail	*Papiliodemoleus*
57		Blue Mormon	*Papliopolymnester*
58	Geometridae	Sub angled wave moth	*Scopulanigropunctata*
	Family:		Order: Hymenoptera
59	Apidae	Giant honey bee	*Apisdorsata*
60		Western honey bee	*Apismellifera*
61		Dwarf honey bee	*Apisflorea*
62		Indian bee	*Apisindica*
63		Black bumble bee	*Bombusmelanopygus*
64	Formicidae	Formicine ant	*Camponotuscompressus*
65		Black ant	*Monomorium minimum*
66		Black garden ant	*Lasiusniger*
67		Common red ant	*Myrmicarubra*
68		Red fire ant	*Solenopsisgeminata*
69	Sphecidae	Burrowing wasp	*Spheciusspeciosus*
70	Vespidae	Potter wasp	*Eumenespetiolata*
71		Oriental hornet	*Vespa orientalis*

	Family		Order: Blatella
72	Ectobiidae	German cockroach	*Oothecablatella*
73		German cockroach	*Blatellagermanica*
	Family		Order: Dermaptera
74	Lampyridae	Neon insect	Crazy neon bugs
	Family		Order: Orthoptera
75	Acrididae	Common field grasshopper	*Chorthippusbrunnes*
76		Javanese grasshopper	*Valanganigricornis*
77		Brown-spotted locust	*Cyrtacanthacristatarica*
78		Carolina grasshopper	*Dissosteria*
79		Garden Locust	*Acanthacriusruficornis*
80	Gryllidae	Crickets	*Grylloidea*
81	Tettigoniidae	broadwinged katydid	*Microcentrumrombifolium*
	Family		*Order: Scopiones*
82	Buthidae	Arizona bark scorpion	*Centruoidessculpturatus*
	Family		Order: Odonata
83	Platycnemididae	The blue bush dart.	*Coperavittata*
84	Libellulidae	Black marsh trotter	*Tramealimbata*
85		Globe Wanderer	*Pantalaflavescens,*
86		Chalky percher	*Diplacodestrivialis,*
87		Green marsh hawk	*Orthetrumsabina,*
88		Scarlet Skimmer	*Crocothemisservilia*
	Family		Order: Dictyoptera
89	Mantidae	Praying mantid	*Mantis religiosa*
	Family		Order: Coleoptera
90	Scarabaeidae	White grub	*Holotrichiapicea*
91		June Beetle	---
92	Cerambycidae	Two Long horned Borer	----

The status of available insect species in each order is given in Figure 1. The order Lepidoptera was found to be the most dominant, being represented by 63% of the total identified insect species, followed by Hymenoptera, Orthoptera, with 8%, Odonata, with 7% of species, and Coleoptera, with 3%. The Blatella order had 2%. However, the orders Scorpiones, Dermaptera and Dictyoptera were least represented, with 1% of species each. Monthly variations in the occurrence of insects and their diversity are explained in Figure 2 and Table 2.

In the present study, the maximum species diversity was recorded in the month of February (3.79), followed by 3.74 in the month of January and the minimum species diversity (2.71) in the month of June.

Distribution of insect species belonging to different families in each order was depicted in Figure 3. Out of the 24 families of insects recorded during the present study, 9 families belonged to the order Lepidoptera with 58 species, 4 families belonged to the order Hymenoptera with 13 species, 1 family belonged to the order Dermaptera with 1 species, 2 families belonged to the order Coleoptera with 3 species, 1 family belonged to the order Dictyoptera with 1 species, 2 families belonged to the order Odonata with 6 species, 1 family belonged to the order Blatella with 2 species, 3 families belonged to the order Orthoptera with 7 species and 1 family belonged to the order Scorpiones with 1 species respectively.

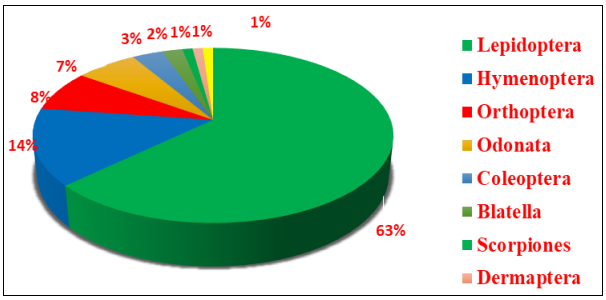

Fig 1: Status of available Insect species in each order

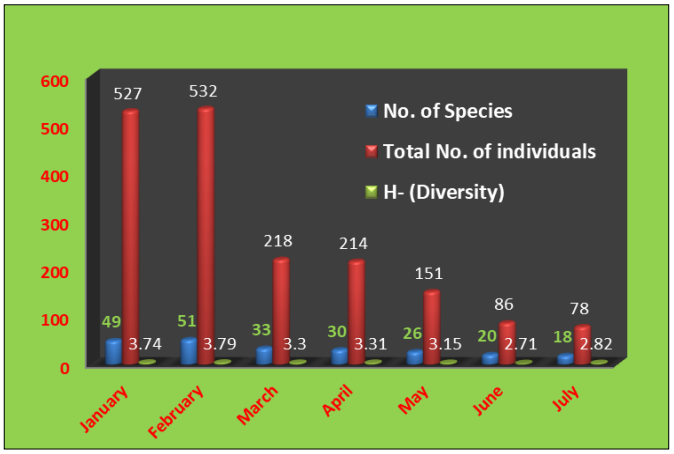

Fig 2: Diversity of identified Insects in Study area

Table 2: Month-Wise Variation of Insects Diversity during the study area

Month	No. of Species	Total No. of individuals	Diversity	Dominance	Evenness
January	49	527	3.74	0.026	0.86
February	51	532	3.79	0.025	0.87
March	33	218	3.3	0.042	0.82
April	30	214	3.31	0.038	0.91
May	26	151	3.15	0.045	0.9
June	20	86	2.71	0.08	0.75
July	18	78	2.82	0.063	0.93

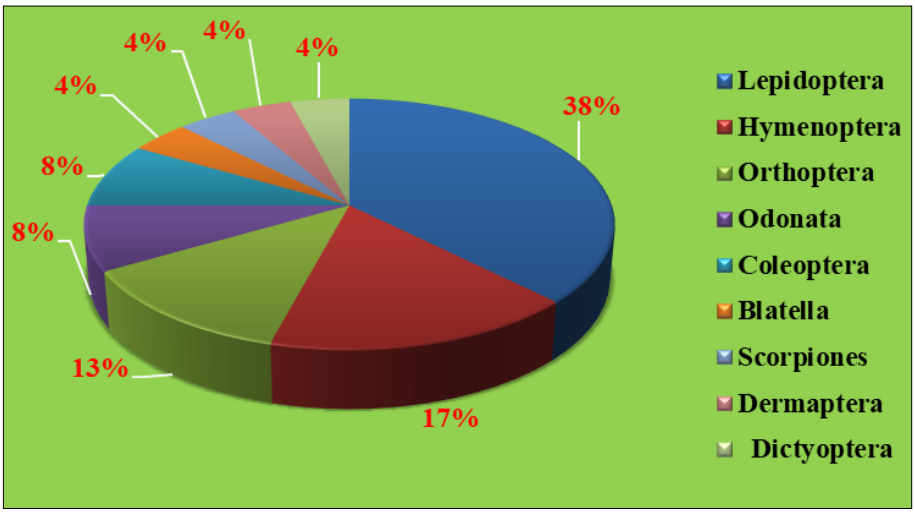

Fig 3: Distribution of Insects belonging to different families in each order

Discussion

Insects are one of the most important components of the biosphere. Insects have been hugely successful in terms of both species richness and abundance, and insects and terrestrial arthropods are seen as the largest contributors to species richness.[11]. In the world 1,80,000 species of currently recognised animal species are lepidopterans, which include both butterflies and moths [10]. The present study was revealed that the order Lepidoptera found to dominant with 58 species followed by Hymenoptera with 13species. Out of the 24 families of total insects recorded, 9 families belonged to order lepidoptera with 58 species. Lepidopteran insects are diverse in nature and act as crop pests and adult pollinators both as adults and as larvae. Moths require specific habitats and types of plants, therefore increasing the variety of plant species should increase the number of moth species that can be sustained.[12]. The distribution of butterflies is exclusively dependent upon the availability of their food plants.[13] The majority of the college campus is covered in prickly plants such *Achrassapota, Moringaoleifera, Murrayakoenigii, citrus reticulata, Musa paradisica, Terminaliacatappa, Carrica papaya, Psidiumguajava, Ficusbengalensis,* and *Phyllanthusemblica.* Given that insects are effective pollinators, there is a direct correlation between insect richness and flora diversity. The availability of all lepidopteran insects varies throughout the year, with the fruiting season seeing the biggest peak. Furthermore, the high density of these insects is associated to the rise in temperature and fall in humidity. [14]

In the present study more insects were identified in the month of February and January and minimum were recorded in the month of June. Previously Viji Margaret *et al.*, (2023) reported that Lepidopteran species from different families were found in 32 different species in January, 25 species in February, and 22 species in March [5]. The study found that the orders Lepidoptera and Hymenoptera had high species richness and that their corresponding Shannon-Wiener index (H) values were 3.79 and 3.74. This could be attributed to the comfortable temperature and convenient access to the natural resources necessary for their survival. The research region offers a suitable environment for Lepidopteran and Hymenopteran pollinators, according to the substantial species diversity that was discovered throughout the survey. Hymenopterans are crucial components of ecosystems since they not only account for a sizeable amount of animal biomass but also serve as ecosystem engineers. Wasps are crucial to the survival of the fig family of plants, which are significant members of the tropical rainforest. [15]

Insect abundance is essential for biological management because it preserves the stability of the ecosystem and provides a large source of food for other organisms in the community. The stability of agricultural landscapes also depends on insect abundance.There is still some uncertainty over the precise status of a number of insect species. Before beginning a conservation strategy, one must first thoroughly analyze the life cycles of the species and the factors affecting their survival.

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