International Journal of Entomology Research
www.entomologyjournals.com
ISSN: 2455-4758
Received: 05-04-2024, Accepted: 28-04-2024, Published: 22-05-2024
Volume 9, Issue 5, 2024, Page No. 41-43

Study of entomofauna associated with the snow view apple orchard of Ramgarh Nainital district, Uttarakhand, India

Neha Bora[1], Himanshu Pande[2*], Divya Pangtey[3], Isha Chandra[3]
[1] Department of Zoology, D.S.B. Campus, Kumaun University, Nainital, Uttarakhand, India
[2]Assistant Professor, Department of Zoology, D.S.B. Campus, Kumaun University, Nainital, Uttarakhand, India
[3] Research Scholar, Department of Zoology, D.S.B. Campus, Kumaun University, Nainital, Uttarakhand, India

Abstract
Insects are the most diverse and important group of animals, belonging to the class Insecta, because of the huge diversity of insects, the phylum Arthropoda is considered as largest phylum in all. The insect diversity is important, because of their great contributions in nature, so primarily our study aims to reveal the data of the insects present in an orchard and to study their taxonomical identification and exploration of their diversity. The collection of the insect samples was done in the Apple orchard of Ramgarh (Nainital), by sweep netting and hand-picking methods, we used various published pieces of literature and books for identification purposes, basically total of 16 insect species from the 13 families and 6 orders are reported from the orchard, the maximum number of individuals were reported from the Order Coleoptera and also the dominant species was the *Coccinella septmepunctata*, the second dominant order is Hemiptera, which have a maximum number of families among all the orders. By identifying the insect species, their ecological importance and behavioural study of an insect becomes easy to observe, so in this paper we just tried to identify and study the diversity, may this could be helpful for future researchers. The total insect orders observed in orchards were the Coleopterans, Lepidopterans, Hemipterans, Orthopterans, Dipterans and Hymenopterans.

Keywords: Apple orchard, Insect, Diversity, Nainital

Introduction
Insects are individuals that exist in every habitat on earth. They are well known for their huge diversity among all the members of the animal kingdom. Insects are the most diverse and important group of animals and come under the largest class "Insecta" of the phylum Arthropoda. There are 1.4 million species of insects described according to the scientific literature data, which is 80% of life exists on earth [1]. Insect provides great ecological services by various methods, they are pollinators, decomposers and biological control agents, various species of insects and their food products are so valuable, that about 1,500 edible insect species are consumed by 3000 ethnic groups in 113 countries [6]. Insect deserves the attention and interest of people around them, even if they cause damage or are beneficial to us and to the ecosystem as well as, our attention towards them would be a small contribution toward ecosystem services. A number of insect species provide widely used medical or industrial products [9]. Some are considered pests because of damage to the crops, but within this, they are also predators, ecological indicators, bio accumulators, and today used variously in field of science and society [4]. A single species has a significant role in nature, and a lot is yet to be known, the present study aims to observe the insect species present in the orchard, their collection and identification, to estimate their diversity and abundance. The study was conducted from October to December 2022. The collected insect sample was identified on the basis of different morphological characteristics as coleopterans are identified by their sheath-like wings or (elytra), similarly, bugs are identified by their Hemelytra or by the scutellum, the other members of Hemiptera-like leafhoppers are identified by the presence of their antennae located below the eyes, Lepidoptera are identified by their large scaly wings, these types of further keys and literature helped to find out the species of insects.

Method and material
Study area: The research was carried out at the Apple orchard in Nainital district, Uttarakhand, India latitude 29°25'45", longitude 79°35'45" (Figure 1). 2286m above sea level, this site has orchards of apple. The study was conducted from October- December 2022 during the winter season. The area is in a high altitudinal range and surrounded by thick coniferous forests [7].

Fig 1: Google map of the Study site

Sampling

Insects were collected by hand picking and sweep sampling method, Coleopteran and hemipterans by hand picking method and some flying insects like Dipterans, and Hymenopterans with the help of sweep net. The collected specimen's taxonomic investigations or identification was done on the basis of their primary morphological characters or taxonomic keys and with the help of some published literature [2] [3] [5]. Also, after the identification, the collected insect specimens were released back into their natural habitat.

Species diversity Index:

The species diversity was calculated by "Shannon Wiener Index".

$$H = -\sum_{i=1}^{s} \text{pi ln pi}$$

Where pi = portion of the entire population comprised of species, S = total no. of Species, i = proportion of species and In = the natural logarithm.

Table 1: Relative abundance and Shannon-Wiener Index Diversity (H') in the area.

S.No.	Insect orders	Family	Species name	No. of individuals	Relative abundance P_i	$P_i \ln P_i$
1.	Coleoptera	Coccinellidae	*Coccinella septempunctata*	20	0.114285714	-0.247891851
2.	Coleoptera	Coccinellidae	*Coccinella transversalis*	12	0.068571429	-0.183763154
3.	Coleoptera	Chrysomelidae	*Altica himensis*	9	0.051428571	-0.152617443
4.	Coleoptera	Chrysomelidae	*Galeruca rudis*	7	0.04	-0.128755033
5.	Diptera	Asilidae	*Neoitamus sp.*	7	0.04	-0.128755033
6.	Diptera	Lauxaniidae	*Minettia longipennis*	16	0.091428571	-0.218715177
7.	Hemiptera	Miridae	*Stenodema sp.*	5	0.028571429	-0.101581373
8.	Hemiptera	Cicadellidae	*Evacanthus sp.*	9	0.051428571	-0.152617443
9.	Hemiptera	Cicadellidae	*Balclutha sp.*	12	0.068571429	-0.183763154
10.	Hemiptera	Delphacidae	*Sogatella furcifera*	9	0.051428571	-0.152617443
11.	Hemiptera	Coreidae	*Homoeocerus sp.*	8	0.045714286	-0.141044317
12.	Orthoptera	Tettigonidae	*Conocephalus fuscus*	18	0.102857143	-0.233939748
13.	Orthoptera	Tetrigidae	*Tetrix ceperoi*	15	0.085714286	-0.210577352
14.	Hymenoptera	Apidae	*Apis mellifera*	15	0.085714286	-0.210577352
15.	Lepidoptera	Lycaenids	*Lycaena sp.*	8	0.045714286	-0.141044317
16.	Lepidoptera	Erebidae	*Spilosoma sp.*	5	0.028	-0.101581373
Number of Individuals (N)					175	
Richness (S)					16	
Shannon-Wiener Index of Diversity (H')					2.689841564 ~ 2.7	

Results and discussion

16 insect species belonging to 13 families of 6 orders were reported during the study period. The most dominant insect order was Coleoptera (27%) followed by Hemiptera, Orthoptera, Diptera, Hymenoptera and Lepidoptera (Figure 2) (Some of the photo plates of the collected insect species are shown in Figure 3). We observed that the (Coleoptera) was the most diverse order of insects among all, and the number of individuals in the Coccinellidae family was high. The Coccinellidae family was the most abundant during the winter season, all the insect we observed there was associated with the small shrubs, grasses and weed plants in the orchard, some weed host plants were *Hercleum sphondylium*, *Anaphalis margar*, *Impatiens glandulifera* (Himalayan balsam), *Galinsoga. sp.* etc.

According to the Shannon Wiener index calculations, which are shown in Table 1 The species diversity index shows that *Coccinela septumpunctata* has the highest number of individuals among all the species, further this species was also reported maximum in number by [8] so the H value of *Coccinella septempunctata* is also maximum (-0.247891851) and the lowest value is -0.101581373 (H index value of *spilosoma sp.)* While the total value for Shannon calculated is 2.689841564.

The second dominant order is Hemiptera which are well known for their herbivorous diet. Miridae, Cicadellidae, Delphacidae, and Coreidae families were reported. From the Hymenoptera only the family of honey bee Apidae was reported, the Hymenopterans are a well-known group of social insects, pollinators and predators, but their diversity was very less, The Diptera (fly) reported with two families Asilidae (predators) and Lauxaniidae (detritivores) and orthoptera with Tettigonidae and Tetrigidae families also known as long-horned grasshoppers and pigmy grasshopper. Highest number of insects observed during the October month. The maximum number of species belongs to the order Coleoptera and Hemiptera. All the reported insect species were active during the daytime. During the investigation period, very few insect pollinators were reported as there were fewer floras, the diversity of insects was not so high during the winter season because the temperature, humidity, latitude and altitude affect the population and diversity of a species, at the high altitude the density and abundance of the insects decreases which is also reported by [7].

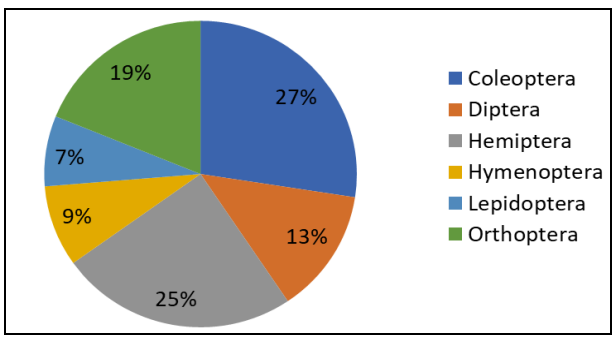

Fig 2: Pie chart showing no. of individuals belonging to different orders.

Fig 3: Some of the insects collected from the study site.

Conclusion

The present study aims to identify, explore and estimate the insect diversity in the Snow View Apple orchard, Uttarakhand. The study revealed that *Coccinella septempunctata* was the most dominant species of the family Coccinellidae belonging to Order Coleoptera. The insects of this family are important predators, they act as a biocontrol agent for the various insect pests present in the orchard. another predator species *Neoitamus* (family-Asilidae) from the Order Diptera also reported as pollinators Apis mellifera and Lycaena sp. were present in the orchard, while the other species were the occasional visitors, *Altica himensis* species were observed in the orchard feeding upon the plant species named as Himalayan balsam, could be a helpful and simple way to manage weed growth. This biodiversity study of entomofauna is focused on the variations at the species level of insects. Entomofauna studies need attention for the purpose of conservation of insects, estimation of their population and understanding the importance of each and every species of an insect can make a huge difference in our environment

References

1. Bindulekha DS, Amalnath S. A preliminary study on the biodiversity of insects collected from a college campus: Thiruvananthapuram district, Southern Kerala. Int J Sci Res,2016:1631-4.
2. Biswas D, Thakur NA, Gogoi J, Nakambam S. Study on the biodiversity of insects in Apple in mid hills of Meghalaya. J Entomol Zool Stud,2020:8(3):8.
3. Chandra K. Insect fauna of states and union territories in India. ENVIS Bull Wildl Prot Areas,2011:14(1):189-218.
4. Foottit RG, Adler PH, editors. Insect biodiversity: science and society. John Wiley & Sons, 2009.
5. Huang SH, Cheng CH, Chen CN, Wu WJ, Otuka A. Estimating the immigration source of rice planthoppers, Nilaparvata lugens (Stål) and Sogatella furcifera (Horváth) (Homoptera: Delphacidae), in Taiwan. Appl Entomol Zool,2010:45(3):521-31.
6. Hazarika AK, Kalita U, Khanna S, Kalita T, Choudhury S. Diversity of edible insects in a Natural World Heritage Site of India: entomophagy attitudes and implications for food security in the region. PeerJ,2020:1-20.
7. Joshi NC, Joshi PC, Kumar S, Nath P, Singh VK, Mansotra D. Entomofaunal diversity in fruit orchards along the altitudinal gradients of district Nainital, Uttarakhand (India). Int J Fauna Biol Stud,2016:3(2).
8. Pervez A, Yadav M, Khan M. Diversity of predaceous coccinellid beetles (Coleoptera: Coccinellidae) in Uttarakhand, North India. Soc Himalayan Action Res Dev,2020:(15):7-20.
9. Schowalter TD, Noriega JA, Tscharntke T. Insect effects on ecosystem services—Introduction. Basic Appl Ecol,2018:26:1-7.