



ORIGINAL RESEARCH PAPER

Zoology

STUDY OF BIODIVERSITY OF INSECTS AS AN IMPORTANT FACTOR FOR BALANCE THE ECOSYSTEM WITH SPECIAL REFERENCE TO BHIMASHANKAR WILDLIFE SANCTUARY

KEY WORDS: Western Ghats, biodiversity, endemic, hot spots, sacred groove.

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ABSTRACT

The Western Ghats are well known Global hot spot of biodiversity. Insects are incredible ancient group of creatures that have dominated all other terrestrial animals. They play an important role to balance life within ecosystem. The Bhimashankar wildlife Sanctuary is one of few protected area in the Northern Western Ghats, Pune, Maharashtra, India. It has sacred grooves which are best sacred grooves in Northern Western Ghats. Due to unique biogeography of region it supports immense amount of biodiversity. It is the habitat of endemic Giant Squirrel *Ratufa indica* ssp. *Elphinstonii* and many other faunal species such as Leopard, Golden Jackal, Mouse Deer and about 20% of mammals reported. It has also been identified as an Important Bird Area by Bird life International as it harbors globally threatened species like, Greater spotted eagle, Nilgiri wood pigeon, Malabar parakeet and White blacked vulture. It also contains rich diversity of insects of many orders. Out of 330 species of butterflies recorded from Western Ghats, 213 in Maharashtra, of which 65 found in this Sanctuary.

INTRODUCTION:

Biodiversity can be described as the richness and diversity of all life on earth. Biodiversity is not just about the individual species, but also about the diversity of ecosystems, species and genes, and the relationship between them. Insects are the world's most diverse group of animals, making up more than 58 per cent of the known global biodiversity (Footitt and Adler, 2009) which make them one of the major ecological and evolutionary radiations on Earth (Condamine et al., 2016). They evolved into a hyper-diverse fauna (Grimaldi and Engel, 2005) and inhabit all habitat types and play major roles in the function and stability of terrestrial and aquatic ecosystems (Footitt and Adler, 2009) because of great diversity of life forms and developmental strategies (Grimaldi and Engel, 2005). Insect biodiversity in India is characterized by high level of endemism at the generic level as well as the species level. The current study conducted in Bhimashankar Wildlife Sanctuary which is the part of Northern Western Ghats (Sahyadri Mountain Ranges) to know the diversity of insects an important factor to balance the ecosystem.

MATERIAL AND METHODS:

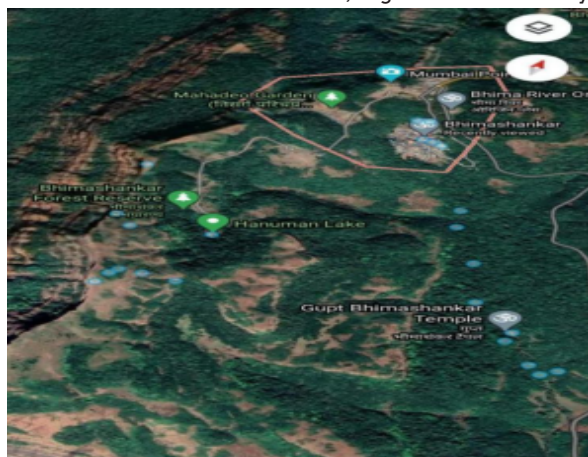
Collection of Insects:

Diversity of Insects belongs to different orders were recorded opportunistically during June 2020 to Jan 2021. Species were recorded during visit to study sites. An 8×40 (magnification × lens diameter) binocular was used to observe Insects. The findings presented here are based on random survey and observations were made from morning 9am to evening 5.30pm (At the time of dusk). The insects were collected by netting, hand picking and trapping. The insect preservation was avoided. Insects were identified using field guide to Insects (D.J Borrer, R.E White - 1970; M. Picker - 2012). The recorded species were listed according to the classification by J.O Westwood - 1838 and M.S Mani - 1974.

Study area:

The BWS is spread over four forest ranges in two districts —Pune (Khed and Ghodegaon ranges) and Thane (Karjat and Alibaug ranges). It covers an area of 130.78km² from eight villages in Pune District and reserve forest along the west slopes of the crest-line in Thane District between 19.0226361–19.2305555 N & 73.4827777– 73.6308333 E. The elevation ranges between 340m on the west side and 1,208m above mean sea level at the Nagphani (Hindi: Snake's Hood)

point. Two important rivers of the state, Bhima and Ghod, which are tributaries of river Krishna, originate in the sanctuary.



RESULTS

To study the biodiversity of insects of Bhimashankar Wildlife Sanctuary, Pune, Maharashtra, India carried out during June 2020 to Jan 2021 during the period observed large number of insects. Diversity of insects shows variation according to the habitat. In this study, a total number of 268 species of insects collected belongs to 9 orders. They are from the order of Coleoptera (beetles), Dermaptera (earwigs), Diptera (flies), Hemiptera (plant-bug), Hymenoptera (wasps, bees and ants), Lepidoptera (moth and butterfly), Mantodea (mantis), Odonata (dragonfly and damselfly), Orthoptera (grasshoppers and crickets). The total number of insects recorded and the percentage of insect's orders were presented in Table 1 below.

Table 1: Total number of insects and the percentage of Insect's order in the Study area

Sr. No.	Insect Order	Total (Approx.)	Percentage
1	Coleoptera	36	13.43%
2	Dermaptera	03	1.11%
3	Diptera	40	14.92%
4	Hemiptera	35	13.05%
5	Hymenoptera	27	10.07%
6	Lepidoptera	48	17.91%
7	Mantodae	19	7.08%

8	Odonata	29	10.82%
9	Orthoptera	31	11.56%
Overall insects recorded		268	100%

Table 2: Relative abundance and Shannon-Wiener Index Diversity (H') in the study area

Sr. No.	Insect Order	n	Relative abundance (Pi)	ln "Pi"	Pi*ln (Pi)
1	Coleoptera	36	0.134	-2.00	-0.268
2	Dermaptera	03	0.011	-4.50	-0.049
3	Diptera	40	0.149	-1.90	-0.283
4	Hemiptera	35	0.130	-2.04	-0.265
5	Hymenoptera	27	0.100	-2.30	-0.23
6	Lepidoptera	48	0.179	-1.72	-0.307
7	Mantodae	19	0.070	-2.65	-0.185
8	Odonata	29	0.108	-2.22	-0.239
9	Orthoptera	31	0.115	-2.16	-0.248
No. of Individuals (N)		268			
Species richness		09			
Shannon-Wiener Index of Diversity (H')		2.074			

The diversity index was calculated by using the Shannon – Wiener diversity index (1949).

Diversity index, $H' = -\sum Pi \ln Pi$ Where $Pi = n / N$

n = number of individuals of one sample

N = total number of all individuals in the sample ln = logarithm to base e

Based on the results, Lepidoptera, with highest diversity index of $H' = 0.307$ were the most diverse and abundant order among collected insects. Diptera were ranked as second and third after Coleoptera, respectively. The overall insect biodiversity indices of Shannon-Weiner index were 2.074. The Relative abundance and Shannon-Weiner index diversity were illustrated in Table 2.

DISCUSSION

Great insect diversity is indeed an intrinsic part of the Earth's ecosystem. However, the insect fauna of India is vast. It's worth mentioning that the absolute numbers provided are an underestimate of the total diversity as many microhabitats were not sampled. Our results showed that were the Lepidoptera (17.91%) most dominant insects in Bhimashankar wildlife sanctuary, followed by Diptera (14.92%), Coleoptera (13.43%) and Orthoptera (11.56%).

Lepidoptera are commonly known as 'butterflies' and 'moths'. The various publications on Butterflies and Moths of India have been published by Wynter-Blyth (1957), Marshall and De Niceville (1882), Mathew and Rahamathulla, 1993, Tiple et al. 2006, Tiple et al. 2007, Tiple, 2012. Butterflies & moths important pollinators like bees. They also acts as bioindicators of ecosystem.

The Coleoptera (beetles) are the largest single order of insects, they total a staggering 360 000 named species with 125 different families. Many beetles are regarded as major pests of agricultural plants and stored products. They attack all parts of living plants as well as processed fibers, grains, and wood products. Scavengers and wood boring beetles are useful as decomposers and recyclers of organic nutrients. Predatory species, such as lady beetles, are important biological control agents of aphids and scale insects.

The Hemiptera is the largest group of insects, they are hemimetabolic insects (where the young look like wingless adults). There are at least 80,000 named species globally. Hemipterans are important as they are Dipterans are one of the major success's of the insect world, and the 145,000

species (about 160 families) are reported. Dipterans (flies) have been of incredible importance to mankind all over the world, this is because many of the primary diseases of humanity are transmitted by flies. The Diptera are a very significant group in the decomposition and degradation of plant and animal matter. They are plays an important role in the breakdown and release of nutrients back into the soil. Odonates are primarily aquatic insects and their life history is closely linked to specific aquatic habitats. This habitat specificity makes them a good indicator of wetland health. India with its unique geography and diverse bioclimatic regions, support a rich Odonate fauna. Adult Odonates feed on mosquitoes, blackflies and other blood-sucking flies and act as an important biocontrol agent of these harmful insects. In addition to the direct role of predators in ecosystem, their value as indicators of quality of the biotope is now being increasingly recognized.

Hymenoptera is one of the most diverse orders of insects, including over 115,000 described species representing 84 families. Hymenoptera are not only diverse in terms of structure, size, and numbers of species, but also in their habits and life histories. Some are phytophagous (plantfeeding), while others are herbivorous, predatory, or even parasitic. Many Hymenoptera lead a solitary lifestyle, while some of the bees, ants, and wasps show some of the highest degrees of social organization of any animals.

The other orders that were sighted in the Sanctuary included the Mantodae, Orthoptera and Dermaptera are also ecologically important as indicator species. Several groups of insects are known to exhibit and live in social groups. This arrangement is beneficial to the faunal forms as they can create a better impact on the environment. The most well known social insect is the Honey bee that has a high economic importance. The honey bee can also indicate the productivity of the ecosystem. During the study, insects living in colonies representing three orders including Hymenoptera, dipteran and Hemiptera were observed.

CONCLUSION:

The biodiversity (diversity index, species abundance) of insect fauna is mainly due to the rich vegetation in this area as vegetation plays an important role for the existence of insect fauna in a community as it provides the main source of food etc. for insects.

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