

Insects species composition in man-made ecosystems at Dhanuvachapuram, Kerala

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Abstract

A baseline study on was conducted for insect species composition in a Man-made ecosystem. The study indicated that the level of diversity was low. Fragmentation and absence of thick vegetative cover appeared to be a reason for the such a low level of diversity. A more detailed study is desirable in this regard to plan measures for improving the insect habitat.

Keywords: insect diversity, fragmentation, man-made habitate

Introduction

Insects comprise more than half of the world's known animal species (May, 2010). Their diversity and composition are largely reliant on vegetation. Disparity in the habitat is likely to have an impact on their distribution and relative abundance. Insects also serve as a tool for monitoring environmental changes (Sudheendra kumar & Mathew, 1999) [16]. In general, insects are predominantly suited for monitoring landscape change because of their abundance, species richness, ubiquitous occurrence, and importance in the functioning of natural ecosystems (Uniyal & Mattur, 1998) [18].

Of the 30 or so orders of insects, four dominate in terms of numbers of described species; with an estimated 600,000–795,000 species including Coleoptera, Diptera, Hymenoptera, and Lepidoptera (May, 2010). Despite a lot of work has been done worldwide to assess the diversity of arthropods, less than 20% of tropical insects have been described by entomologists yet (Godfray *et al.*, 1999) [7]. Changes in land usage like an intensification of agriculture, habitat fragmentation and invasion of alien species have as well led to the decline of species such as butterflies (Thomson, 2001) [17], bees (Calabuig, 2000; Cane & Tepedino, 2001) [3, 4], and bumble bees (Kwak & Bergman, 1996). No documentation has been done on this area previously and the present study was carried out to record the insect composition.

Materials and methods

Dhanuvachapuram, 25 km south of Thiruvananthapuram, the capital of Kerala state in India is located at 8.4°N 77.08°E at an average elevation of 26 m above sea level. The topography is uneven which constitutes rocky substratum and dry hard soil with less vegetation. The geology is typical of the Kerala soil - the red laterite with very less humus content. The area receives the southwest and northeast monsoons, the southwest monsoon being more vigorous.

The study area was divided into sample plots by an imaginary line transect. Insects other than Lepidoptera (unpublished data) were randomly collected at a time interval of 3 to 4 days every month in the daytime by handpicking and beating vegetation. The collection was carried in the grass, shrubs, flowers, leaf galls, bare ground, tree bases, and tree trunks. The insects were photographed

and identified using standard manuals (Leffry and Howllet, 1978, Mathew 2004, ZSI Manual 1986.) [9, 10]. The identification could be made only at the level of recognizable taxonomic units (RTUs), order and family level.

The diversity index across the site of a habitat was calculated by using the Shannon –Wiener diversity index (1949).

Diversity index, $H' = - \sum P_i \ln P_i$ Where $P_i = n / N$
 $n =$ number of individuals of one sample
 $N =$ total number of all individuals in the sample
 $\ln =$ logarithm to base e.

Results and discussion

A total of 2558 specimens were collected from the study sites and identified 8 orders and 24 families (Recognizable taxonomic units). The percentage abundance of different orders is given in Figure 1 and the species richness of families documented is given in Figure 2. Shannon diversity index = 2.52 and Evenness = 0.794

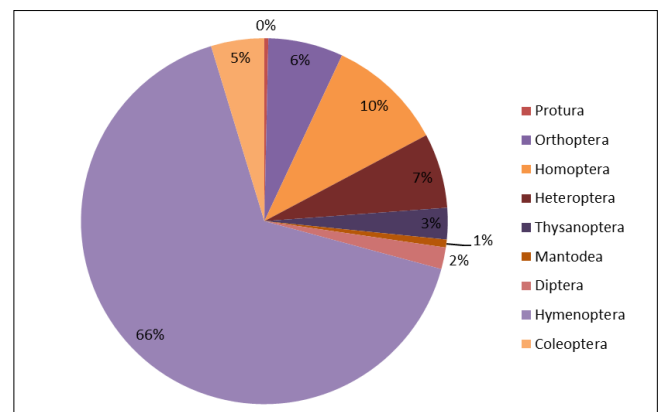


Fig 1: The percentage distribution of different insect orders

Out of the eight orders identified Hymenoptera was the most prominent one. This order was represented by three families namely Formicidae, Vespidae and Apocidea. The family Formicidae comprised the highest numbers of insects with five subfamilies Dorylinae, Dolichoderinae, Formicinae, Myrmicinae, Ponerinae. A total of twelve species were identified from this order. They were *Aenictus sp*, *Tapinoma sp*, *Anoplolepis sp*, *Camponotus sp*, *Oecophylla sp*,

Solenopsis sp, *Paratrechina sp*, *Crematogaster sp*, *Monomorium sp*, *Pheidole sp*, *Myrmecaria sp*, *Pachycondyla sp*. The other families Vespidae and Apocidea was represented by a few members.

In species diversity and species abundance, Order Hemiptera comprising two suborder Homoptera and Heteroptera came next to Hymenoptera. The suborder

Homoptera was enriched with four families Membracidae, Aleyrodidae, Aphidae, Psedococcidae. The Heteropterans include Reduviidae, Pyrrhocoridae and some unidentified bugs. In the case of species abundance, the Order Hemiptera was followed by Order Diptera with Family Tipulidae, Culicidae, Drosophilidae, Muscidae.

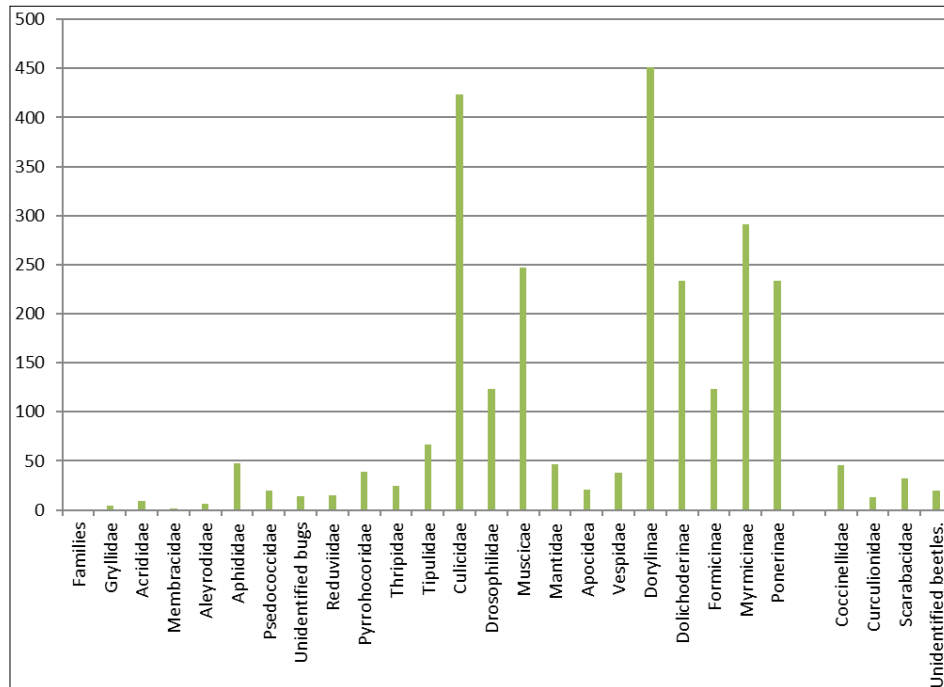


Fig 2: Species richness of insect families documented.

Families Gryllidae and Acrididae were noticed from Order Orthoptera. Order Coleoptera was signified by Coccinellidae, Curculionidae, Scarabacidae and some unidentified beetles. Members from Order Thysanoptera (Family Thripidae) and Order Mantodea (Family Mantidae) were also documented in the present study. Members of order Protura were also present but only in a few numbers. The Order Lepidoptera was not considered in the present study as it was documented separately (unpublished data).

The existing information of invertebrates suggests that the most abundant species among insects may be Hymenoptera (mostly represented by Formicidae), Diptera, Coleoptera, Hemiptera (mostly Homoptera) and Lepidoptera (Basset, 2001) [2]. The present work is also concomitant with this finding. In a similar study in city forests in the Andaman and Nicobar Islands, Lepidoptera, Odonata and Hymenoptera were found to be the predominant orders (Shah & Mitra, 2014) [14]. Chima *et al.* (2013) [5] also showed a similar pattern of the highest number of individuals from Hymenoptera and Coleoptera in a residential area.

The overall abundance and species richness of insect fauna was found to be quite poor in the present study as compared to studies conducted in other parts of Kerala. Most similar works in Kerala have been conducted in conserved forest areas (Sudheendra kumar, & Mathew, 1999; Mathew. *et al* 2004,2007) [16, 11]. Insect species are abundant in protected forests because of their shield from human-induced activities. Since of the diverse nature of plant species in protected forests, insects are more attracted to plant species for the forging purpose which could result in richness and

abundance (FAO, 2001) [6]. In addition, large patches provide usually higher heterogeneity and thereby support different communities (Ricklefs & Lovette, 1999) [13]. Habitat fragmentation cuts are smaller and more remote fragments are expected to retain fewer species than larger, less isolated patches (Chima *et al.*, 2013) [5]. Ecosystem loss and separation are noticed as the main causes of the current biodiversity problems (Sih *et al.*, 2000) [15]. The vegetation of the college campus has been seriously fragmented and modified through the construction of buildings and pathways. A study by Ade Duntan *et al.* (2013) [1] showed that the higher the tree species diversity and abundance, the higher the diversity and abundance of insect species. A more detailed study is needed in this regard to plan measures to improve the insect habitat.

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