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Faunal diversity of insects in the foothills of Velliangiri hills (Part of Western Ghats), Coimbatore district, Tamil Nadu

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Abstract
Over a million different kinds of insects have so far been described and named, and many more certainly remain to be discovered. The insects are air breathing terrestrial arthropods which are mainly characterized by three pairs of legs; body divisible in to three parts, head, thorax and abdomen. Accurate identification of a pest or disease vector is of ultimate importance because the scientific name of an organism is significant to all known information about its morphology, its behavior and life history and its damage to human welfare. The aim of the present study was to study the diversity of insects in the foot hills of Velliangiri, Coimbatore, Part of Western Ghats in Tamil Nadu. The collection methods adapted in three ecosystems were more or less similar. The collecting techniques includes, hand picking, sweeping net, beating tray, light trap, aspirators, pitfall trap and bait traps. The insects were collected from morning 8.00 AM to 1.00 PM using other than light trap. Insects collected alive were killed and processed before mounting. A total of 96 species of insects from 77 genera and 39 families were collected from the foot hills of Velliangiri, Coimbatore District, Tamil Nadu. Collected specimens were identified and deposited in Southern Regional Centre, Zoological Survey of India, Chennai.

Keywords: insect biodiversity, faunal diversity, entomo fauna, velliangiri hills

1. Introduction
About 55% of all the known species in science are occupied by insects (Tabashnik *et al*., 1992) [1]. They are the primary pollinators of flowering plants; they are important consumers and recyclers of decaying organic matter and they are the integral components in the food webs of vertebrates and other invertebrates. As a result, entomology is a crucial field as the society faces tremendous challenges to enhance environmental quality and crop production, reduce pesticide usage, control food costs and increase trade in the global community. Pests bring about severe economic losses every year, attacking crops and ornamental plants, causing damage to our food and clothing and vectoring diseases that affect cultivated plants, our pets and livestock and ourselves. Their behavior can be most easily observed in their natural environments. Insects contain a vast array of chemical compounds, some of which can be collected, extracted, or synthesized for our use. Hypotheses concerning the many forms of mimicry and sexual selection have been derived from observations of insect behaviour, which continue to be investigated by entomologists. Lastly, the sheer numbers of insects means that their impact upon the environment, and hence our lives, is highly significant. Insects occupy a chief role in macroscopic biodiversity and for this reason alone, we should try to understand them better.

2. Materials and methods
2.1 Study area
The study was conducted at the foot hills of Velliangiri hills which includes three different types of ecosystems: namely, an agro ecosystem, a forest ecosystem and a riverine ecosystem. It is a part of the Nilgiri Biosphere Reserve, situated at the Western Ghats border of Coimbatore district, Tamil Nadu.

2.2 Study period
The study was carried out in the three ecosystems, for the period of 12 months between January 2013 to December 2013.

2.3 Collection methodology
The collection methodology in all the three ecosystems were more or less similar. The collecting techniques includes, hand picking, sweeping net, beating tray, light trap, aspirators, pitfall trap and bait traps. Insect collection was carried out from morning 8.00 AM to 1.00 PM except by using the light trap. Collecting nets come in three basic forms: Aerial, sweeping and aquatic. The aerial net is suited for collecting butterflies and other flying insects. Both the bag and the handle are relatively light weight. The sweeping net is similar to the aerial net but it is more stronger and has a more durable bag as they are used in thick vegetations.
Aquatic nets are used for gathering insects from water and are usually made of metal screening or heavy scrim with canvas band affixed to a metal rim. The insect collecting net is the basic tool of an insect collector. The net should be light and the handle may be made from an aluminium pipe, a broom handle or a sturdy dowel stick. The length may vary between 50 – 120 cms. A metal opening or hoop, no less than 30 cm in diameter can be made from heavy steel wire of about 5 mm in diameter. The net bag should be about 90 cm deep, tapered at the bottom and made from nylon mosquito netting which does not disintegrate or tear easily. Around the hoop, the net should be reinforced with strong binding material. The ends should be

left open so that the metal ring can be passed through the binding. One way to attach the ring to the handle is to use hose clamps.

The insect net can be used to collect individual specimens when they are in flight or at rest on flowers and shrubs. Once an insect is caught in the net, the handle is given a quick twist to fold the bag and prevent escape. The insect is then transferred into a suitable container or a killing jar. Generally collection can be done by sweeping the net back and forth through foliage and grasses. Sweeping results in the collection of a mixture of insects that maybe removed by hand, forceps or an aspirator. Alternatively, the net can be shaken so that the contents drop down to the bottom and then inverted into a killing bottle. Insects can then be stored later. This technique may result in the excessive collection of unwanted specimens.

Light trap was used to collect insects normally attracted towards light. The trap consisted of a metal funnel of one meter diameter with a light source of 220 W mercury vapour lamp. At the bottom of the funnel, the killing jar saturated with the killing agent ethyl acetate and labelled 'POISON' was placed. The light trap was set at a height of 4.8m from the ground level in the middle of agro ecosystem; 6m from the ground level in the first plot of forest ecosystem and 4.8m from the ground level in a point of riverine ecosystem. It was run once in every two months between 18.00 and 06.00 hours (Edwin 1997) [2]. The light attracted insects were collected in the killing jar. The trap catches were sorted out, numbered, preserved properly and stored in the laboratory.

2.4 Bark

The bark inhabiting insects were collected from all available loose barks by a moistened white cloth and by brushing them into a wide mouthed collecting jar (Stefferud, 1976) [3] The large sized bark beetles were collected with the aid of a pair of forceps.

2.5 Boulder bed

Insects inhabiting concealed micro habitats like underneath of stones were carefully collected by a moistened cloth. Other insects of the micro habitat such as Carabid and Tenebrinoid beetles were collected by a pair of forceps. The boulders tilted were carefully replaced in their original position to minimize the disturbance of micro habitats.

2.6 Preservation and pinning

Insects collected alive were killed and processed before mounting. The beetles, bugs, wasps and grasshoppers were killed in 70% ethyl alcohol, dehydrated in absolute alcohol for 8 to 12 hours, degreased in xylene for about the same length of time, dried and mounted dry on pins (Stefferud, 1976 and George *et al*., 1986) [3, 4]. Small and soft bodied insects such as ants, termites, leaf hoppers and lacewings were killed and preserved in 80% ethyl alcohol. Medium and large sized Lepidoptera, Odonata and other insects with large wings were killed in ethyl acetate vapour and then placed in envelopes or folded triangles until their wings become stretched hard and mounted on pins. Whiteflies were killed in 70% alcohol and mounted on slides. Normally insects were pinned vertically through the body leaving enough space at the top of the pin to facilitate handling during identification or comparison studies. The methods of pinning followed were based on guidelines drawn by Stefferud (1976) [3]. Beetles were pinned through the right elytron near the base; large bugs through the scutellum to the right of the middle line; grasshoppers through the back of the thorax; bees and wasps through the thorax between the bases of the forewings and moths, butterflies and dragon flies through the middle line of the thorax at the thickest point. The small insects which could not be pinned were mounted on card points. Temporary labels giving essential information on collection were attached to the specimens during preparation and mounting. Mounted insects were stored in pest- proof storage cabinets. A ball of naphthalene, covered in a small net bag was pinned firmly at a corner of the storage box to protect the specimens from storage pests.

3. Results and discussion

A total of 96 species of insects from 77 genera and 39 families were collected from the foot hills of Velliangiri, Coimbatore District, Tamil Nadu. Collected specimens were identified and deposited in Southern Regional Centre, Zoological Survey of India, Chennai. The collected species are listed in Table 1.

Table 1: Diversity of Insects at the Foothills of Velliangiri Hills, Coimbatore

Order	Families	Genus and Species	Total Number of Species Recorded
Orthoptera	Acrididae and Scleropteridae	*Dnopherula luteipes* *Dnopherula socius* *Leva cruciata* *Leva indica* *Ochrilidia longiceps* *Phonogaster cariniventris* *Acrida lugubris* *Ceracris nigricornis* *Pteronemobius indicus*	9
Blattodea	Blaberidae Blattellidae Blattidae	*Calalampra characterosa* *Stictolampra plicata* *Phlebonotus pallens* *Opisthoplatia orientalis* *Thorax porcellana* *Princisola pulchra* *Rhabdoblatta lineaticollis* *Panesthia birmanica* *Panesthia monstruosa* *Blattella germanica*	13

		Blattella padmanabhani *Malaccina pallidula* *Periplaneta americana*	
Hemiptera	Belostomatidae Nepidae Pyrrhocoridae Pentatomidae Euscelidae Membracidae	*Diplonychus rusticus* *Lethocerus indicus* *Laccotrephes griseus* *Laccotrephes ruber* *Ranatra elongata* *Dysdercus cingulatus* *Antilochus coqueberti* *Nezara viridula* *Calidea dregii* *Nephotettix virescens* *Oxyrhachis rufescens* *Oxyrhachis taranda* *Leptocentrus taurus*	13
Coleoptera	Cicindelidae Carabidae Dytiscidae Elateridae Scarabaeidae Curculionidae Coccinellidae	*Cicindela sexpunctata* *Cicindela sumatrensis* *Oxylobus dekkanus* ***Anthia sexguttata*** *Dytiscus verticalis* *Melanotus hirticornis* *Oryctes rhinoceros* *Onthophagus bonasus* *Lacnosterna serrata* ***Sitophilus** oryzae* *Coccinella septempunctata*	11
Lepidoptera	Pyraustidae Pyralidae Asotidae Noctuidae Papilionidae Satyridae Nyrnphalidae Pieridae Lycaenidae	*Tryporyza incertulas* *Hymenia recurvalis* *Eudioptes indicus* *Scirpophaga incertulas* *Asota caricae* *Achaea janata* *Papilio demoleus* *Papilio polytes polytes* *Papilio polytes stichius* *Tros hector* *Danaidae Danais chrysippus* *Mycalesis perseus* *Precis lemonias* *Precis almana* *Hypolimnas bolina* *Byblia ilithyia* *Ergolis merione* *Atella phalantha* *Catopsilia pyranthe* *Terias blanda* *Lampides boeticus* *Azanus ubaldus* *Jamides celeno*	23
Hymenoptera	Formicidae Vespidae Apidae Xylocopidae	*Camponotus compressus* *Camponotus rufoglaucus* *Camponotus sericeus* *Camponotus irritans* *Oecophylla smaragdina* *Solenopsis geminata* *Vespa affinis affinis* *Apis indica* *Apis mellifera* *Xylocopa bryorum*	10
Isoptera	Termitidae	*Macrotermus estherae* *Microtermus obesi* *Odontotermes obesus*	3
Diptera	Culicidae Muscidae Cecidomyiidae Oestridae	*Aedes aegypti* *Culex quinquefasciatus* *Musca domestica* *Orseolia oryzae* *Oestrus ovis*	5

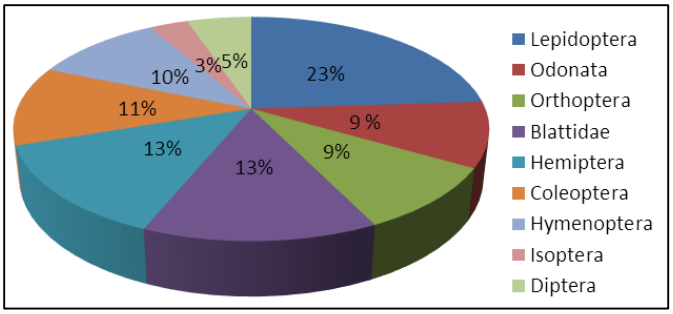

Fig 1: A pie chart showing the entomo fauna of Velliangiri foothills

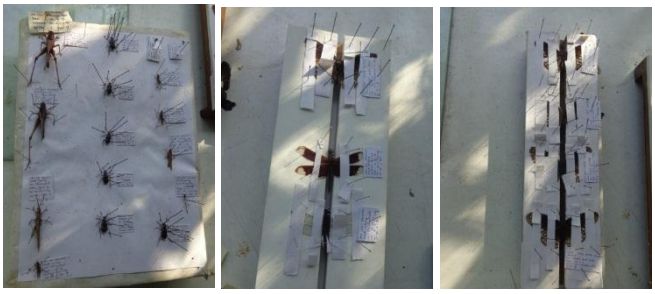

Fig 2: Insect Pinning

4. Acknowledgment

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