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Diversity of orthoptera in Vaniyamkulam village of Ottappalam, Palakkad district, Kerala

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Abstract
Order Orthoptera constitute a major quantity of total insect biodiversity and play a major role in trophic chains. Diversity and abundance of orthopterans were studied and analysed in two different habitats of Vaniyamkulam village of Ottappalam thaluk, Palakkad, Kerala. The study was conducted during March 2015 to February 2016.For the study grasshoppers were collected, preserved and identified. The collection method include handpicking and sweeping. The grasshoppers were preserved by pinning. The identification was done with the help of experts. A total of 35 species belonging to 5 families were recorded. The population of grasshoppers belongs to family Acrididae (26 species) was found to be predominant followed by that of Gryllidae (3 species), Pyrgomorphidae (2 species), Tettigonidae (2 species) and Gryllotalpidae. Monthly abundance of the orthopterans show the order: March>April>May>February>November>October>January>September>August>June>December>July. Temperature and humidity influences the abundance of grasshoppers in the study area.

Keywords: orthoptera, acrididae, pyrgomorphidae, gryllidae, tettigonidae, gryllotalpidae

1. Introduction
The Orthoptera order of insects include the grasshoppers, crickets, katydids, locusts, etc. The name is derived from Greek “ortho” meaning “straight” and “ptera” meaning “winged”. The order orthoptera divides in to two suborders Ensifera and Caelifera. Ensifera contain family Grylloidea, Hagloidea, Tettigoniidae, Gryllotalpidae. Suborder Caelifera contain family Acrididae, Pyrgomorphidae, Tetrigidae etc. Grasshoppers are widely distributed in all ecological systems with significant economic importance due to their destructive role to almost all type of green vegetation. Among insects, the order Orthoptera is one of the largest having over 20,000 species worldwide with about 10% of the total world species (1,750 species) recorded from India. Acridoidea is a superfamily of grasshoppers including locusts in the order Orthoptera. They are commonly known as the short- horned grasshopper and placed in the suborder Caelifera. Species that change colour and behaviour at high population densities are called locusts. Grasshoppers have antennae that are almost always shorter than the body, and short ovipositors. Locusts are several species of short- horned grasshoppers of the family Acrididae that sometimes form very large groups (swarms); these can be highly destructive and migrate in a more or less coordinated way. Thus, these grasshoppers have solitary and gregarious (swarm) phases. Locust swarms can cause massive damage to crops.

Grass hopper are hemimetabolous insects which hatch from an egg in to a 'nymph' or 'hopper' which undergoes five moults, becoming more similar to the adult insect at each developmental stage. At high population densities and under certain environmental conditions, some grasshopper species can change colour and behaviour and form swarms. Under these circumstances they are known as locusts. They inturn have been used to some extent as food by man in certain parts of the world. Grasshoppers usually have one generation annually. However, some species such as American grasshopper 'Schistocerca americana, may be two brooded. As a rule the winter is passed in the eggstage but certain species such as Schistocerca damnifica and S.americana may over winter as adults or nymphal stage (chortophaga viridifasciata). With few exception eggs of grasshoppers are deposited in the ground. In general the females lay 100 or more eggs which hatch in spring. Order orthoptera include family acrididae, Tettigonidae Pyrgomorphidae etc. Orthoptera probably arose during the middle of the carboniferous period. Most living members of this order are terrestrial herbivores. It is one of the largest and most important group of plant feeding insects.

Orthopterans are chewing insects with soft wing cases and pliable, membraneous rear wings. They have compound eyes. Usually medium or large sized insects; winged, brachypterous or apterous, mouth parts mandibulate. prothorax large, hind legs usually enlarged and somewhat widely separated,tarsi 3 or 4 segmented, rarely with 5 or fewer than 3 segments. Forewings forming more or less thickened tegmina with submarginal costal vein. Wing pads of nymph undergo reversal during development. Female generally with well-developed ovipositor not concealed by 7th or 8th abdominal sterna. Male external genitalia symmetrical, concealed at rest by enlarged 9th abdominal sternum which may or may not bear a pair of styles. Cerci usually short and almost invariably unsegmented. Specialised auditory and stridulatory organs frequently developed and shows gradual metamorphosis.

Orthoptera is generally regarded as a dominant group in terrestrial habitats. These insects feed on all type of plants and often causes serious economic damage. Swarms of grasshoppers regularly appear, destroy crops over wide land areas. Mole crickets are major pests in lawns. Several species of field crickets are reared commercially as fish bait. The redlegged grasshopper *Melanoplus femurrubrum* is not only a crop pest but also the intermediate host for a tapeworm *choano taenia infandibuluam* that infests poultry.

Maturity is reached during summer. Grasshoppers are found in greatest abundance and are most destructive in prairie lands with an annual rainfall af less than 25 inches. Hirdesh Kumar

and Mohammed Kamil Usmani made taxonomic studies on Acrididae from Rajasthan (2015). 37 species of locusts and grasshoppers representing 25 genera and 11 subfamilies belonging to the family Acrididae are reported from different localities of Rajasthan. A comprehensive report of Acridid fauna of this region is given for the first time. Mohammed Kamil usmani & Mohammed Rashid Nayeem (2012) made studies on taxonomy and distribution of Acridoidea of Bihar, India. 37 species of locusts and grasshoppers representing 26 genera, 4 tribes and 12 subfamilies belonging to the families Pyrgomorphidae, Catantopidae and Acrididae are reported from different localities of Bihar. They distinguishing characters and bio-ecological data are provided along with keys to tribes and subfamilies.

Palakkad is one of the fourteen districts of Kerala. Its geographical position, historical background, rural nature, educational status, tourist attractions and above all the developmental activities are wide and varied. The district, situated almost in the centre of the state has no coastal line. The district open the state to the rest of country throug the palakkad gap. This 32 to 42 Km wide natural gap in the 960 km long Westernghat. It perhaps the most influential factor for the unique characteristics of the district, such as the climate.Vaniyamkulam village of ottappalam lies in 10'46'20.15"N and 76'22'10.26"E with an altitude of 39.46m.The climate is generally mid hot and humid average temperature ranges from 28-36'C.A study on the diversity of Orthoptera will not only help to assess the diversity of the area but also will help to carry out further studies to conserve the biodiversity over there. No work has been reported so far on orthopteran, faunal diversity from Vaniyamkulam region.

Materials and Methods

Diversity and abundance of orthopterans were studied and analysed in two different habitats of vaniyamkulam village of ottappalam thaluk, Palakkad, Kerala. The study was conducted during March 2015 to February 2016. For the study grasshoppers were collected, preserved and identified. The collection method include handpicking and sweeping during morning 9am-11am. The grasshoppers were preserved by pinning.A 13 megapixel camera is used to take photographs. The identification was done with experts and by comparing with pictures and descriptions.

Result and Discussion

During the sampling, a total of 35 species of grasshoppers were recorded. The species belongs to 5 families of Orthoptera. The population of grasshoppers belong to family Acrididae (26 species in 11 subfamilies) was found to be predominant followed by that of Gryllidae (3species), Pyrgomorphidae (2species), Tettigonidae (2species with in 2 subfamilies), and Gryllotalpidae (1 species).Among the collected families of orthoptera 25 species reported from site 1 and 16 species from site 2.Many species are common to both the sites but subfamily Eyprepocnemidinae, calliptaminae, tropidopolinae are completely absent in site 1 and present in site 2.Altogether 5 families were reported from the two sites they are Acrididae, Pyrgomorphidae, Tettigonidae, Gryllidae and Gryllotalpidae. From site 1 total of 1094 individuals and from the site 2 total of 761 individuals are recorded. Total of 1855 orthopterans were collected. The recorded species were shown in the table (Table 1).

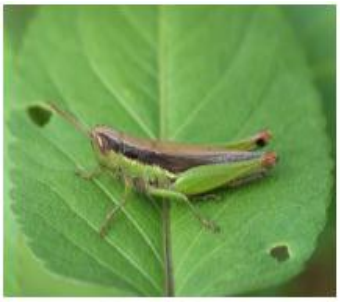
Parameters like temperature and humidity was recorded during the study period March (2015)-February (2016). The highest number of orthopterans collected at high temperature such as March, April and May. During falling seasons such as June, July and December etc. the number of population of grasshoppers decreases, it is due to the fact that rain and snow destroys the egg and nymph, resulting high rate of mortality and reduces the number of individuals. They shows high growth rate in high temperature. An optimum humidity also necessary for their growth in this study maximum number of individuals are present at a humidity value of 80.

Table 1: Orthopteran species reported from the study area

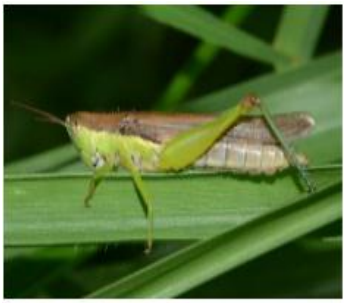
S. No.	Family Acrididae	Grasshoppers, locusts
	A) SF. Oxynae	
1		*Oxya hylahyla*
2		*Oxya fuscovittata*
3		*Oxya hylaintricata*
4		*Oxya velox*
5		*Oxya japonicajaponica*
	B) Sf. Hemiacridinae	
6		*Hieroglyphus banian*
7		*Spathosternum parsiniferum*
	C) Sf. Eyprepocnemidinae	
8		*Eyprepocnemis alacris*
	D) Sf. Calliptaminae	
9		*Acorypha glaucopsis*
	E) Sf. Ramaleinae	
10		*Teratodes monticollis*
	F) Sf. Acridinae	
11		*Acrida exaltata*
12		*Acrida gigantean*
13		*Phaeoba infumata*
14		*Aiolopus simulatrix*
15		*Chloebora grossa*
16		*Acrotylus insubricus*
17		*Oedaleus senegalensis*
	G) Sf. Gomophocerinae	
18		*Leva indica*
19		*Pseudopomala brachyptera*
20		*Syrbula admirabilis*
	H) Sf. Catentopinae	
21		*Diabolocatentops pinguis*
22		*Diabolocatentops innotabilis*
23		*Catentops pinguisinnotabilis*
	I) Sf. Tropidopolinae	
24		*Tristia pulvinata*
	J) Sf. Cyrtacanthacridinae	
25		*Cyrtacanthacris tataricatatarica*
	K) Sf. Oedipodinae	
26		*Oedaleus abruptus*
	Family: Pyrgomorphidae	
27		*Atractomorpha psittacina*
28		*Attractomorpha crenulata*
	Family: Tettigoniidae	Bush cricket
29	Sf. Conocephalinae	*Conocephalus maculates*
30		*Euconocephalus insertus*
31	Sf. Listroscellidinae	*Hexacentris major*
	Family: Gryllidae	*True cricket*
32		*Gymnogryllus minor*
33		*Teleogryllus occipitalis*
34		*Brynkir bimaculatus*
	Family: Gryllotalpidae	
35		*Gryllotalpa africana*

Family Acrididae

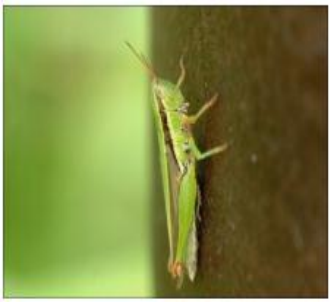
Oxya fuscovittata



Oxya hylahyla

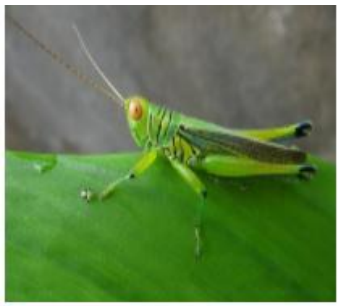


Oxya hylantricata



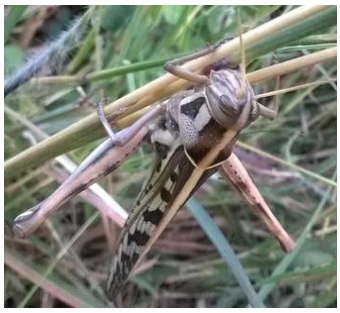
Oxya Velox

Oxya Japonicajaponica

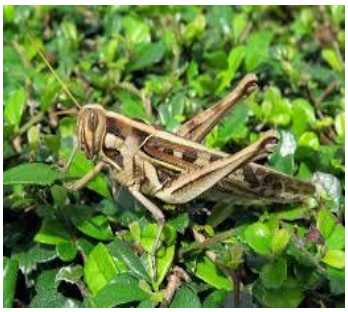


Hieroglyphus banian

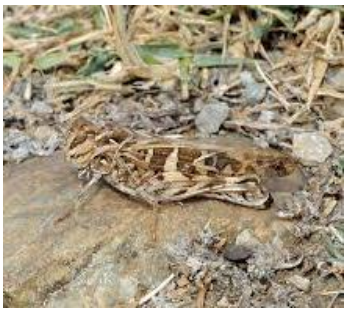
Spathosternum parsiniferum



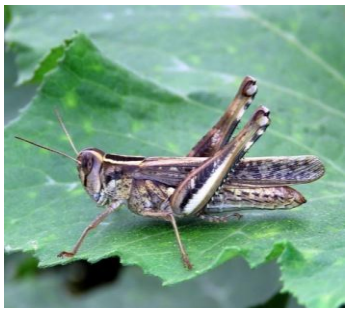
Tristia pulvinata



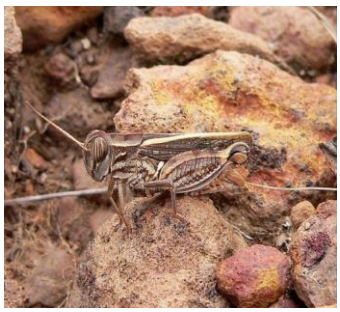
Cyrtacanthacris tatarica tatarica



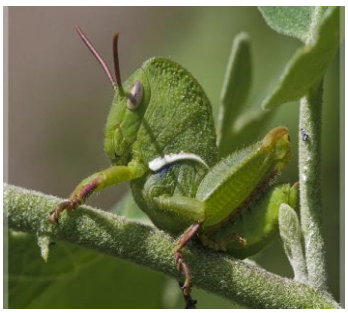
Oedaleus abruptus



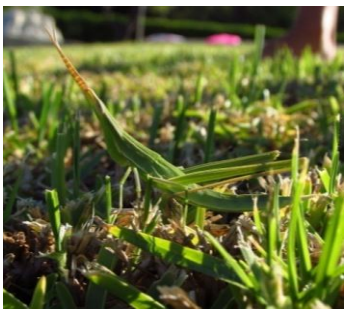
Eyprepocnemis alacris



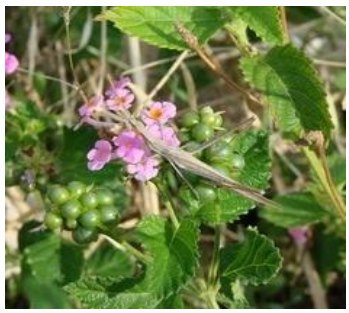
Acorypha glaucopsis



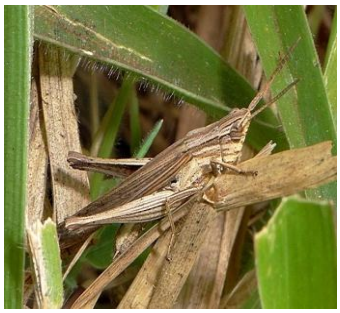
Teratodes monticollis



Acrida exaltata



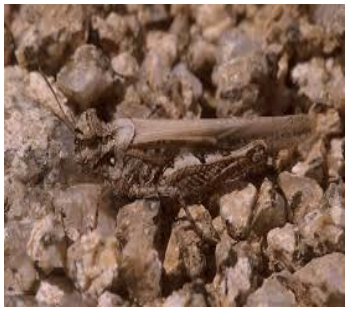
Acrida gigantean



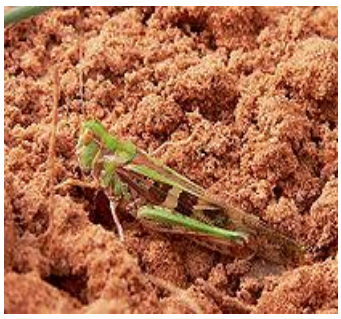
Phaeoba infumata

Aiolopus simulatrix

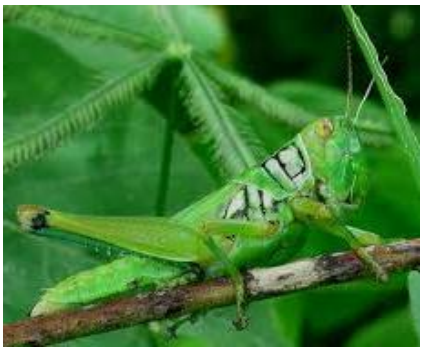
Chloebora grossa



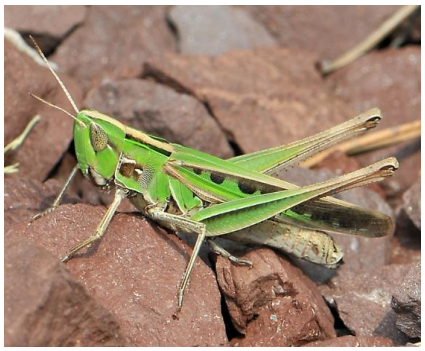
Acrotylus insubricus



Oedaleus senegalensis

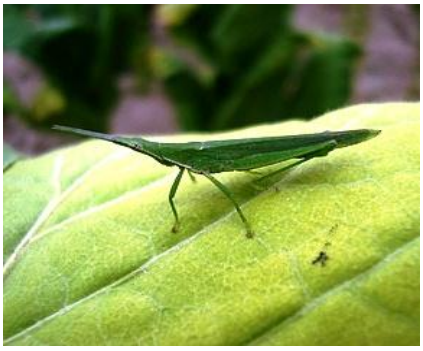


Leva indica

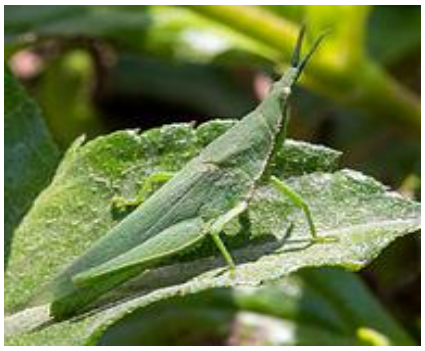


Syrbula admirabilis

Pyrgomorphidae

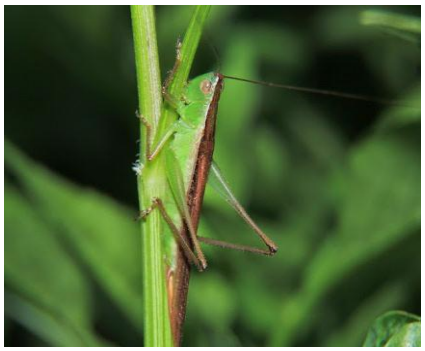


Atractomorpha

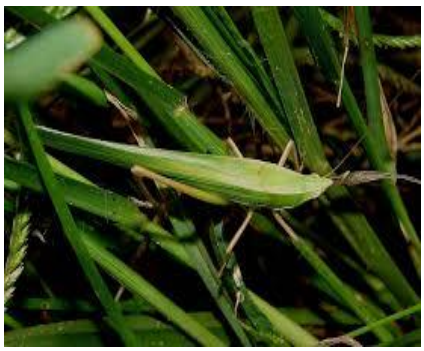


Attractomorpha crenulata

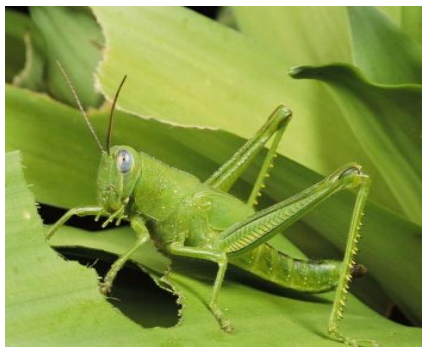
Tettigonidae



Conocephalus maculates

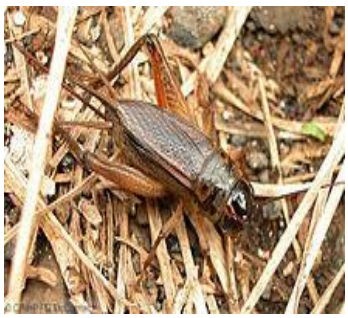


Euconocephalus insertus

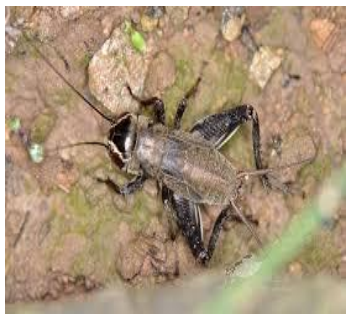


Hexacentris major

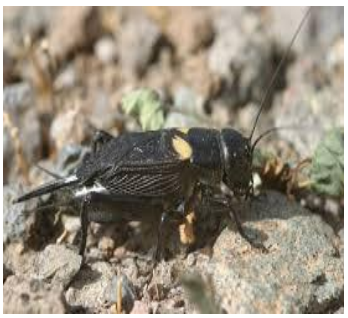
Family Gryllidae



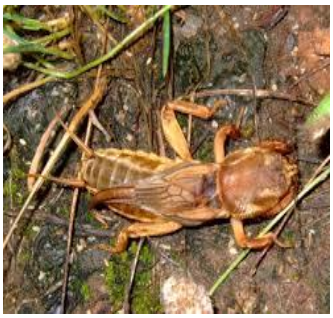
Gymnogryllus minor



Teleogryllus occipitalis



Brynkir bimaculatus



Gryllotalpa Africana

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