

A Study on Distribution of Acridoidea (Orthoptera) of Patna District, Bihar (India)

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Abstract

A thorough study of species shows that 12 types of grasshoppers fall into 3 families: Acridoidae, Catantopidae, and Pyrgomorphidae. These families have 7, 3, and 2 species, respectively. The survey places with rich plants and different weather conditions – like rainfall, humidity, and temperature. Researchers did an extensive survey. They checked many crops and habitats to gather grasshoppers from various agricultural spots. These insects were observed in their natural habitat. The research work was conducted in Patna district, in and around with agricultural sites, river side with fertile land, rural belt with forest and vegetation. The work is significant for taxonomists as well as for applied entomologists and will provide a benchmark for other inter disciplinary sections. The researchers focused on gathering specimens directly from the plants they live on. The survey covered many seasons to get a bigger picture of grasshopper population in key farming areas across Patna district. They spent time observing the distribution of these insects. The research also looked at their diversity, which is vast. Importantly, they noted the range of plants these grasshoppers live on and how often they appear as pests. This was all part of the survey goals – to better understand their geographical spread and impact on agriculture. It has covered places with rich flora, different ecological conditions, rainfall, humidity, and temperature. The computation work was a key part of the study. They used a computer to prepare the data matrix. Results included tables and histograms showing distribution and frequency of occurrence. These also showed dominance of different genera in the family.

Keywords: Acridoidae, Patna, distribution, grasshoppers, diversity, families, flora.

INTRODUCTION

The members of the family Acrididae and order Orthoptera comprise of locusts and grasshoppers. Both insects are spread over worldwide. A locust refers to large acridids and small species are called grasshoppers. These insects are often found in two phases: one solitary and the other gregarious. A solitary-phase nymph has camouflage nature, and do not live in groups during this phase [1]. A gregarious-phase nymph has black and yellow or orange coloration in a fixed pattern, and it prefers existing in large groups. In solitary-phase, it comprises shorter wings, longer legs than gregarious phase. It is classified into two sub-orders viz. Califera or short horned grasshoppers and Ensifera or long horned grasshoppers. Former suborder is divided into four superfamilies viz. Acridoidea, Tridactyloidea,

Tetrigoidea and Eumastacoidea. The basic characters of Acridoidea are short antennae usually shorter than the body, short ovipositor and three segmented tarsi. They comprise an economically important group of Orthopterous pests infesting number of cultivated and non-cultivated agricultural crops [2, 3].

They are spread out throughout the world but they relocate best in tropical and sub-tropical belts. The overall distribution of locusts and grasshoppers reduces along increasing number of latitudes and

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their density of population increases towards the equator. They feed on various unrelated plant species as they are polyphagous in feeding habits [4]. The difference in habitat basically depends on various abiotic factors such as ecosystem, altitude, latitude and rainfall. These insects are considered as good biotic messenger of threatened habitats which lead to the conservation and preservation in potential areas. Grasshoppers are considered as primary consumers in grasslands world around [5]. They play a vital role in the transfer of energy in trophic levels. They are primary consumers in the food chain and act as prey to others which provides a balance to the ecosystem. These processes keep the population within control but defense mechanisms exhibited through them give a tight competition to those led by predators and parasites. These insects have shown increased migration towards natural vegetation such as crop fields and have proved themselves as major pests, e.g., *Phlaeoba infumata*, *Atractomorpha crenulata* and *Oxya fuscovittata*.

These insects will be observed in their natural habitat. The work is first of its kind in the given location of Patna district. Places in and around Patna District with agricultural sites, river side with fertile land, rural belt with forest and vegetation will be studied. The work is significant for taxonomists as well as for applied entomologists and will provide a benchmark for other interdisciplinary sections. Many of the economically important species of grasshoppers like *Hieroglyphus*, *Oxya*, *Atractomorpha*, *Pyrgomorpha*, *Spathosternum*, *Phlaeoba*, *Truxalis*, *Acrida* etc. have shown a direct effect on the agricultural areas like the one under consideration.

REVIEW OF LITERATURE

Initially, Latreille (1802) gave the family group name Acrididae, based on the genus *Acrida* Linnaeus (1758). The researchers Serville, Uvarov and Walker proposed the family group names Truxalidae and Oedipodidae respectively [6–8]. Meanwhile, Macleay suggested Acridina and Locustina as sections in Orthoptera in the Horae Entomologica. Later, Thomas named the family Acrididae and split it into three subfamilies: Acridiinae, Tettiginae, and Proscopiinae. He then classified Acridiinae into three tribes: Truxalini, Oedipodini and Acridini [9]. Saussure defined Oedipodii and Tryxalii as tribes of the family Oedipodidae [10]. Following this, Brunner classified groups like Acridiinae, Eumastacinae, Tryxalinae, Pyrgomorphinae, Pamphaginae, Catantopinae, Pneumorinae and Proscopiinae as subfamilies of the family Acrididae [11]. The researcher, Kirby supported these classifications later [12]. Lefroy divided the family Acrididae into nine subfamilies with names like Tettiginae, Pneumorinae, Mastacinae and others [13]. Lucas elevated the family Acrididae to sub-order status - known as Acridoidea. He further grouped these subfamilies to form new families like Tettigidae and Pneumoridae among others [14]. By Uvarov had proposed four subfamilies under the family Acrididae: Acridinae, Oedipodinae, Catantopinae and Pyrgomorphinae [15]. Later on, came a fifth subfamily: Pamphaginae. The researcher, Dirsh made significant contributions via his book ‘African Genera of Acridoidea’ [1]. He also published papers on Angola’s acridoids during 1966 and Congolese species by 1970. Harz focused on European taxa in 1975 while researchers Walker and Willemse worked regarding Crete’s Orthoptera soon after [16, 17]. Moving towards Uttar Pradesh (UP), thirty-three insect species were found within its western domain around year 2010 [18, 19]. Researchers also delved into Taxonomic aspects concerning Female genitalia among other regions [20, 21]. Twenty-six creatures arising from rice ecosystems specifically reaching UP were also studied [22–23]. Again circa late twenty-tens timeframe and recalibrating efforts alongside pulses/paddy fields forming Bihar-Jharkhand areas through consistent years, thereafter till final culmination mid-aughts decade endeavors incidentally bunching male genitalia aspects fully yet inclusive [24–28] summative affirmations, thereby, roughly rounded off somewhere neatly definitive conclusively decentralized formatting inclusively overall general thematic tightly indicative corpus structural formulated sensibly conclusive densely punctuated erratically stylistically variably rhythmical archaic deduced poignantly summarized.

Increasing density of grasshoppers led to damage crops due to pests. Various species of grasshoppers are considered as pests for croplands by the researcher Murray [29]. It was found that mainly four grasshoppers species responsible for 90% crop damage [30]. The researchers also reported the relation

of feeding to migratory phenotypes of Mongolian locust [31]. Researchers studied two new species of slant faced grasshopper from central India [32]. Few also studied on the abundance and diversity of grasshoppers and their ectoparasitic mites from Dakota [33]. Acrididae are diversified group among order Orthoptera [34]. The grasshoppers which belong to family Acrididae act as pests for agricultural crops [35]. Around 360 species of short horned grasshoppers have been reported so far [36]. Family Acrididae are more dominant with 25000 species worldwide [37].

MATERIALS AND PROCEDURES

Grasshoppers were gathered in the morning and evening hours of 2021 and 2022 from Patna fields using the sweep net method. After that, the gathered specimens were placed in flasks with paper covers and ethyl acetate-soaked cotton for death. Both dry and wet preservation techniques were used to preserve the gathered specimens. Webography and Orthoptera fauna of India [12] were used to aid in the identification process.

Table 1. List of grasshopper species in Patna.

S. No.	Family	Species
1	Acrididae	Acrida exaltata
		Acrida gigantea
		Phlaeoba infumata
		Phlaeoba panteli
		Trilophidia annulata
		Aiolopus simulatrix
		Chloeobora grossa
2	Catantopidae	Oxya hyla hyla
		Oxya velox
		Oxya japonica japonica
3	Pyrgomorphidae	Poekilocerus pictus
		Atractomorpha sinensis

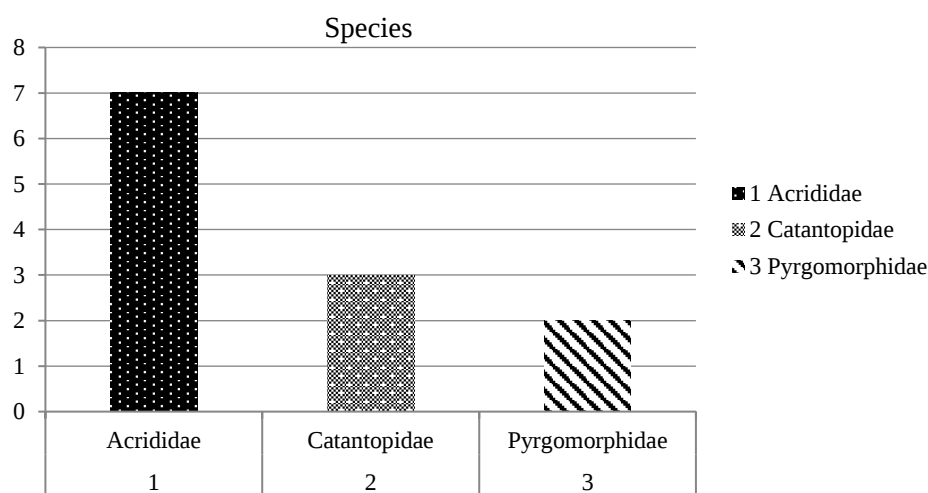


Figure 1. Histogram – no. of species with families.

Table 2. No. of species found with families.

S. No.	Family	Species
1	Acrididae	7
2	Catantopidae	3
3	Pyrgomorphidae	2

EXAMINE AREA

Patna, earlier known as Pataliputra, is an old city which is located on the Southern banks of holy river Ganga from the east, Punpun from the north and Sone from the south. It is a fertile piece of agricultural land mainly consisting of plain region, with no hills located at the eastern part of the Indo-Gangetic plain. The coordinates of Patna are 25.611°N latitude and 85.144°E longitude. Temperature ranges between 1.1°C to 46.6°C while average rainfall is recorded as about 120 cms, between June and September. The district is among one of the cold districts of Bihar. The land is rich in alluvial soil. This place also comprises of mango orchards and bamboo clumps. These areas will be explored within the concerned timeframe giving a spectacular view of distribution patterns of these insects depending on topography and host plant. The survey will provide good number of specimens which will serve as base for present critical study, the examination of grasshoppers in various types of habitats. The deep, rich green forest and semi-evergreen mixed forest dominate the surrounding area. This location is in the Indian state of Bihar's Patna district. The latitude and longitude of Patna are around 762 meters above sea level, with a temperature range of 14.75 to 16.75. Tables 1 and 2 and histogram (Figure 1) are showing distribution and frequency of occurrence of grasshoppers.

RESULTS AND CONCLUSIONS

During the survey, about 12 species of grasshoppers were found. The sample collected 255 total specimens. These were gathered from various habitats and fields. The detailed study showed that these 12 species belonged to three families: Acrididae, Catantopidae and Pyrgomorphidae (with 7, 3, and 2 species respectively). It has been an extensive survey of different crops and habitats. This was done to collect grasshoppers from various agricultural areas. Special effort was made to gather specimens from host plants. It has covered places with rich flora, different ecological conditions, rainfall, humidity, and temperature. The computation work was a key part of the study. The researchers used a computer to prepare the data matrix. Results included tables and histograms showing distribution and frequency of occurrence. These also showed dominance of different genera in the family. Surveys were done in various seasons in important agricultural areas across Patna district and researchers noted down observations on geographical distribution, diversity, host range, and pest incidence.

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