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Economically important dipteran species biodiversity in South Tripura district of Tripura

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ABSTRACT

The present two years experimental survey was carried out for assessment of distribution pattern and diversity of different dipteran insects species in the South Tripura district of Tripura during 2015-16 and 2016-17. The various dipteran insects were collected from different localities of South Tripura district *viz*., Manumukh, Birchandra Manu, West pillak and Bedantra para. The selected areas for collection were varied from farmland to forest areas with an average elevation of 26 meters. During the study a total of 40 numbers of surveys were made and study reveals that the area under the survey has dipteran insects belonging to 18 families, 28 genera, and 55 species and among the collected 55 numbers of species the ecological roles span are ranges from vertebrate blood feeding to detritivory species.

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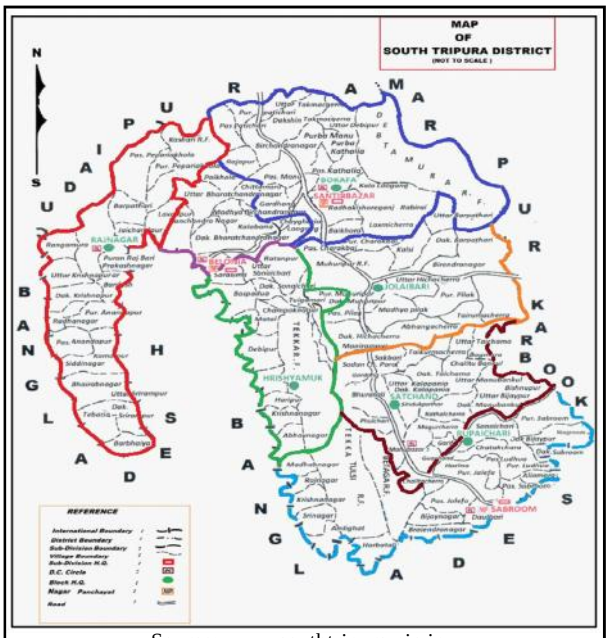
INTRODUCTION

The order Diptera is one of the anatomically varied, most species-rich and ecologically important groups of insect and occupying 10–15 per cent of known species of animal. As per the recent estimate, there are 1,53,000 Diptera species have been described (Thompson, 2005), however, the actual number of extant fly species is many times over that number. The living dipteran species is classified into about 10,000 genera, 159 families, 22–32 super families, 8–10 infra-orders and 2 suborders (Thompson, 2005). The dipteran flies span a wide range of biological specialisations (Merritt *et al*., 2003) and among the four megadiverse insect orders, are probably the most ecologically diverse group (Kitching *et al*., 2005). The total extant species of Diptera (6,225 nos.) belongs to 1,141 genera under 87 families with 110 endemic genera have been documented from India (ZSI Report, 2006).

The insect under order Diptera has a significant contribution in maintaining the plant diversity through their participation in pollination of crops/plants. Different

cross pollinated crops like apples, cacao, carrots, cashew, cassava, cauliflower, leek, mango, mustard, onions, strawberries and tea, dipteran pollinators play a significant rule (Mitra and Banerjee, 2007). Due to the predatory and parasitic nature of a large number of Dipteran insect species help in regulating harmful insect pest populations. Flies are usually the first insects to arrive at vertebrate carrion, which make especially the Calliphoridae and species of Fanniidae, Muscidae, Phoridae, Piophilidae, Sarcophagidae, and Stratiomyidae potential forensic indicators in cases involving dead bodies.

The area of the South Tripura district is 1514.32 Sq. Km. with a population of 4,53,079 (as per 2011 census) having 1200.38 sq.km total forest area. Although there is significance of insect fauna biodiversity studies, but no effort has been made so far to study and document the common insect-fauna of the district. This present survey work was formulated with the objective to assess the diversity of economically important Dipteran insects and their distribution pattern in the South Tripura district.



Source: www.southtripura.nic.in

Fig. A: Map of South Tripura district

MATERIAL AND METHODS

Location, constitution and area:

South Tripura district is located at 23.3°N and 91.6°E. It has an average elevation of 26 Meters. South Tripura district is surrounded by Bangladesh in the South and West, Udaipur and Amarpur in the North and Karbook in the East.

Climatic conditions of Jorhat:

The average summer and winter temperature: 34°C and 15°C, respectively. The District is a high rainfall zone with the incidence of very high concentration of rainfall (upto 450 mm per day) in the monsoon season, which lasts from April to August with average annual rainfall 2024.4 mm (50 years average). Intermittent rainfall is received round the year, but the pattern of rainfall throughout the year is not homogenous. In case of vegetation structure of South Tripura is concerned, the district comprises of wide types of agricultural land to forest areas with undulating topography.

Methods adopted for the study:

Collection:

Collections of various insects were made from different locations of South Tripura district *viz*., Manumukh, Birchandra Manu, West pillak and Bedantra para. The areas chosen for the collection of dipteran insect comprises agricultural land and forest areas with an average elevation of 26 meters. Details of season wise surveys undertaken in different area are presented in Table 2. A total of 40 surveys were carried out. The insect collections were made in the early hours of the day because dipterans are usually active at early hours of the day.

Methods broadly adopted for the collection:

Hand picking:

Barks from tree were collected by hand picking for insects like leaf-miner.

Insect collecting net:

Insect collecting net was used to collect active flier dipteran insects. Insects trapped in the insect collecting net were first killed by the vapour of killing agent to facilitate collection.

Light trap:

Positively phototaxis dipteran were collected from near various light sources.

Equipment:

Killing bottle:

Killing bottles were used to kill and preserve insect without affecting its colour. Chloroform ($CHCl_3$) was used as the killing agent. The liquid was poured over a layer of cotton and one or two filter papers or blotting papers were used to soak the cotton and also to prevent the specimen from coming in direct contact with cotton. Insects were handled carefully while they were put inside the bottle or taken out to prevent any morphological damage.

Collection vials:

Small specimens were killed and preserved for further studies. Such specimens were kept in small plastic or glass vials.

Preservation for taxonomic study:

Pinning of insects:

Hard bodied dipteran were pinned directly by piercing entomological pin through the body and care was taken to choose the correct size and number of pin to avoid damage to the internal part. Usually 0-3 size pins were used, although longer pins of 37-39 mm. in length were used for large bodied insects.

Location of pinning:

The standard method *viz.*, through right of middle line of thorax of pinning dipteran insects was followed.

Spreading:

It is a process to arrange the wings for taxonomic study, with the help of spreading board which consists of two flat parallel pieces of soft wood with an inner groove lined by cork. A properly relaxed specimen, with a pin thrust vertically, was inserted inside the groove so that the wing bases remained at level with the edge of top part. Two narrow paper strips were used to hold and spread the wings, and after adjustment of the wings at a desirable position the collected specimen was pinned using an entomological pin.

Mounting:

Small delicate specimens were pinned with a minute, fine pin on a piece of pith, through other end of which a longer pin is inserted. The collection date and other details on a paper label were attached to this long pin. The mounted specimens were kept in insect cabinet. Naphthalene balls and Para dichlorobenzene were used in cabinet for safe preservation against any pest or fungal attack.

Taxonomic keys for identification:

The purpose of a taxonomic key is to facilitate identification of a specimen. The goal was achieved by presenting subsequent appropriate diagnostic characters in a series of alternative choices with dichotomous characters (Mayr, 1976). Two type of keys were used for the identification purpose : Dichotomous Key and Pictorial Key.

Statistical analysis:

Collected data was analysed using PASW statistics 18 and per cent distribution of different species in the survey area was calculated by the following formula:

$$\text{Per cent distribution } Z \frac{\text{Number of species}}{\text{Total number of species collected}} \times 100$$

RESULTS AND DISCUSSION

The present study, a total of 55 numbers of dipteran insects species under 28 genera covering 18 families (Table 1) were tabulated and documented. The field observations and specimens collected, dipteran insects were divided into three broad categories *viz*., abundant, occasional and rare. Out of the 55 species colocted in South Tripura district, thirty two were abundant, fifteen occasional and eight species of flies were rare and showed in the Table 2 and Fig. 1.

The state Tripura can be considered as a virgin area as far as biodiversity studies of insect fauna. Biodiversity of most of the areas of this state remained unexplored even today. Diptera, being a group of agriculturally as well as economically important insects of this region, demands biodiversity studies for understanding it's pattern of biodiversity as formerly considered by Mayer *et al*. (2000) that North East is a dipteran mega diversity hot spot. The present study is also in accordance with Sharmah *et al*. (2014) who reported dipteran biodiversity from Jorhat district of Assam.

Thus detailed biodiversity information is indispensable not only to conservation but also to environment assessment. The high species diversity (relative to the area of the South Tripura district) and the presence of many rare species indicate that the study area is a real paradise for dipteran. This study supports

Table 1 : Diversity of dipteran insects in South Tripura district of Tripura

Sr. No.	Family	Genera	Common name
1.	Tipulidae	*Trichotipula*	Crane flies
		Nephrotoma	
2.	Simuliidae	*Simulium*	Black flies
3.	Cecidomyiidae	*Celticecis*	Gall midges
4.	Bibionidae	*Plecia*	March flies
5.	Sarcophagidae	*Sarcophaga*	Flesh fly
6.	Tephritidae	*Bactrocera*	Common fruit flies
7.	Syrphidae	*Epistrophe, Eristalis, Palpada, Eupeodes*	Hoverflies
8.	Calliphoridae	*Calliphora, Lucilia, Chrysomya*	Blow flies
9.	Culicidae	*Anopheles, Aedes, Culex, Chrysops*	Mosquitoes
10.	Muscidae	*Musca, Coenosia*	House flies
11.	Drosophilidae	*Drosophila*	Small fruit flies
12.	Stratiomyidae	*Stratiomys*	Soldier flies
13.	Tabanidae	*Tabanus*	Horse flies
14.	Dolichopodidae	*Condylostylus*	Long-legged flies
15.	Tachinidae	*Winthemia*	Tachinid flies
16.	Agromyzidae	*Agromyza*	Rice leaf-miner
17.	Glossinidae	*Glossina*	Tsetse Flies
18.	Pediciidae	*Pedicia*	Marsh Crane Fly

Table 2 : Distribution pattern of dipteran insects in South Tripura district

Sr. No.	Family	Species distribution in the district			Sr. No.	Family	Species distribution in the district		
		Abundant	Occasional	Rare (few in numbers)			Abundant	Occasional	Rare (few in numbers)
1.	Tipulidae	√		√	10.	Muscidae	√	√	
2.	Simuliidae	√	√		11.	Drosophilidae	√		
3.	Cecidomyiidae	√	√		12.	Stratiomyidae	√	√	√
4.	Bibionidae	√			13.	Tabanidae	√		
5.	Sarcophagidae	√	√		14.	Dolichopodidae	√	√	
6.	Tephritidae	√		√	15.	Tachinidae	√	√	
7.	Syrphidae	√	√	√	16.	Agromyzidae	√	√	
8.	Calliphoridae	√	√		17.	Glossinidae	√	√	
9.	Culicidae	√	√	√	18.	Pediciidae	√	√	√

the case for the wider use of Diptera in biodiversity analyses, complementing extensive earlier analyses which have used, predominantly, large coleopteran assemblages. The results indicate the potential power of family-level analyses at small geographical area and contribute to the ongoing debate on 'taxonomic sufficiency'.

Conclusion:

It can be concluded that the district South Tripura is mega hot spot of economically important Dipteran biodiversity. The presence of diverse dipteran species has a significant role in agriculture either by pollination of crop or as natural enemy of noxious insect pests due to predatory habit of some of dipteran species. So, present study may have a great value in boosting up the agricultural productivity as well as dipteran species richness in the district.

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