

Present Status of Meniscus midges (Insecta: Diptera: Dixidae) in India

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Abstract

A total of 11 species belonging to the single genus *Dixa* Meigen of the family Dixidae of the order Diptera are reported from India, which is 5.58% of the total world fauna of Dixidae. Among these, only a lone species is distributed in Arid, Semi-Arid & Hot Desert Region and nine are restricted their distribution only in Himalayan Region. This present article provides information on the current status, distributional pattern and gaps in knowledge of the family Dixidae from India.

Abbreviation used: HR: The Himalayan Region; ASHD: Arid, Semi-Arid & Hot desert region; NSL: No specific Locality; TL: Type locality, RI: Restricted in India

Key words : Culicoidea, *Dixa*, Bio-geographic zones.

INTRODUCTION

Dixidae (or meniscus midges) are small to middle sized (wing length 26 mm) nematoceros Diptera that are placed in the superfamily Culicoidea^[1]. They are commonly known as meniscus midges for their special larval behaviour, which is closely related to mosquitoes with which they were treated earlier. The long legs of the members of this family are often confused with mosquitoes. But absent of scales on the body and wings help to differentiate it from Culicidae. Members of this family are found in every bioregion excluding Pacific islands and the sub Antarctic islands of Antarctica. Dixidae is a small family with it's about 197 global species belonging to 09 genera^[2] and only 11 species under a lone genus *Dixa* Meigen are represented from India (table.1).

HISTORY OF TAXONOMIC RESEARCH

The subfamilial classification of the Dixidae distinguishes only a small number of genera: *Dixa*, and *Dixella*, in the Palearctic, Oriental, and Oceanic Regions, Nothodixa, in Australia and New Zealand, and a few other genera in North America (Stone 1973)^[3]. Major contributions were made by Tonnoir (1924)^[4], Martini (1928)^[5], Elliott and Tallett (1977)^[6], Peach and Fowler (1986)^[7], Goldie-Smith (1987)^[8], Rozkošný (1990)^[9], Disney (1999)^[10], Papp (2007)^[11] throughout World and provided the significant information for study of these flies from different aspects. The genus *Dixa* and *Dixella* are frequent in the northern hemisphere with relations to Palearctic and Oriental regions (Catherine and Hoi Sen Yong, 2012)^[12].

Probably, Brunetti (1911)^[13] was the first man who described dixid flies from India. Indian Dixid fauna enriched by the outstanding contribution of Brunetti (1911)^[13], Senior-White (1924)^[14], Freeman (1948)^[15], Alexander (1959)^[16] and Edwards (1934)^[17]. According to Systema Dipterorum (2013)^[18] and Oriental Catalogue (1973)^[3] 11 species belonging to the genera *Dixa* are considered as Indian species.

DISTINGUISHING CHARACTERS

Flies belonging to this family are small to medium in size (3-5.5 mm), yellowish to brownish in colour. Antennae, wings, legs and abdomen long and slender. Eyes are separated in both sexes. Ocelli are absent. Antenna with 16 elongated segments. Palpi are of with four segments, proboscis is short, and mouth parts are non-biting. Thorax with brown and yellowish stripes on the pleurae. Scutum and Scutellum is prominent. The Greek word Dixos means bifurcate and refers to the two forked veins of the wing. Wings clear, characterised by an anal lobe and occasionally pigmented spots; vein R2+3 is strongly curved. Radial and cubital forks are another features of wing venation, rm cross vein is distinct, and discal cell absent. Short spurs are found in tibiae of fore and mid legs. The male genitalia is inverted by torsion of segments 58.

Examination of the genitalia is the only method for accurate identification of adults. Genera can be distinguished on the basis of the size of the terminal process on the coxite. In females the structure of the ninth segment is of considerable taxonomic value^[1].

HABIT AND HABITATS

Adults are privileged fliers and do not feed. They may be found close to the water body, where mating crowd of them are observed occasionally. The larvae of Dixidae develop at the edges of streams, pools or lakes. The larvae of meniscus midges reside in or slightly above where they take on a characteristic body posture, a reversed U shape, near the edge of the water or just above it, holding themselves up by objects projecting from the water surface^[19]. Pupation also takes place there. The species belonging to the genus *Dixa* prefers lotic, running waters.

The life cycle includes the egg, four larval instars, pupae and adults. Little is known of the life history, but laboratory cultures (172 days a generation)^[7] and field observations suggest two generations per year in the European species. The number of generations may increase with increasing temperature in the biotope towards the tropics. Eggs are typically laid in yellowish or greyish jelly disk-shaped masses at the water's edge on solid

substrata or organic material. Prior to laying, egg masses are held by the hind legs of the females and contain several dozen eggs^[1].

ECONOMIC IMPORTANCE

Dixid larvae are important ecologically as filter-gatherers of organic matter and prey items for predatory insects and fish. They live on microorganisms, as well as small particles of organic matters. Some species of Dixidae point out the particular values of wildlife and other important qualities of sites^[20]. They are not known as vector of any causative agent of human disease. But they are very susceptible to annoyance.

DISCUSSION

Present communication reveals different distributional zones of Meniscus midges in India. Indian fauna shares only 11 species belonging to only 01 genera that represents only 5.58% of total global species. Among these, the type-locality of 10 species are

within India. 08 species are restricted their distribution only in India and distributed only in five states. Of them, the dixid fauna of Uttarakhand and Punjab are with only 01 species which is only 9.09% of total Indian Dixid fauna. Maximum number of dixid flies were reported from Himachal Pradesh, Jammu & Kashmir and West Bengal (27.27%) (fig.1.).

Considering the bio geographic regions of India, 81.81% of total dixid flies are reported from Himalayan bio geographic region, while only 9.09% of flies are from Arid-Semiarid & hot desert. Even, those species which are reported from the state West Bengal, they are reported only from northern part (Darjeeling district) of the state. Remaining biogeographical zones have no records of occurrence of these meniscus flies.

CONCLUSION

In conclusion, it can be said that, the distribution of dixid flies

Table 1: Distribution of species in different states and biogeographic zones of India.
(Source: Brands, Systema Naturae, 2000^[21], Systema Dipteriorum, 2013)

Sl no.	Name of the species	Distribution in India	Biogeographic Zones	Distribution other than India
Family: Dixidae Subfamily: Dixinae Genus <i>Dixa</i> Meigen				
1	<i>Dixa amabilis</i> Alexander 1959 [T.L.-Uttar Pradesh: Teri Garhwal, Teri, 2500-5000 ft]	Uttarakhand: Teri Garhwal, Teri, 2500-5000 ft	H.R	RI
2	<i>Dixa barraudi</i> Freeman 1948 [T.L.-India. Punjab:Karnal]	Punjab: Karnal	ASHD	RI
3	<i>Dixa bifasciata</i> Brunetti 1911 [T.L.-India. Simla Distr., Phagu, 9000 ft]	Himachal Pradesh: Simla, Phagu, 9000 ft	H.R	RI
4	<i>Dixa bistrata</i> Brunetti 1911 [T.L.-India. West Bengal: Darjeeling]	West Bengal: Darjeeling	H.R	RI

5	<i>Dixa christophersi</i> Edwards 1934 [T.L.-India. Kashmir: Nara Nag, 7500 ft.]	Jammu & Kashmir: Nara Nag, 7500 ft.]	H.R	Tibet
6	<i>Dixa kashmirensis</i> Edwards 1934 [T.L.-India. Kashmir: Aran, 8000 ft.]	Jammu & Kashmir: Aran, 8000 ft.	H.R	RI
7	<i>Dixa maculipennis</i> Brunetti 1911 [T.L.-India. West Bengal, Darjeeling & Simla Distr., Matiana, 8000 ft.]	West Bengal: Darjeeling & Himachal Pradesh: Simla, Matiana, 8000 ft.	H.R	RI
8	<i>Dixa montana</i> Brunetti 1911 [T.L.-India. Simla Distr., Simla & Phagu]	Himachal Pradesh: Simla, Simla & Phagu	H.R	RI
9	<i>Dixa ochrilineata</i> Brunetti 1911 [T.L.-India. West Bengal: Darjeeling Distr., Kurseong]	West Bengal: Darjeeling, Kurseong	H.R	RI
10	<i>Dixa platystyla</i> Edwards 1934 [T.L.-India. Kashmir: Nara Nag, 7500 ft.]	Jammu & Kashmir: Nara Nag, 7500 ft.	H.R	RI
11	<i>Dixa zeylanica</i> Senior-White 1924 [T.L.-Sri Lanka. Matale, Suduganga]	NSL	NSL	Sri Lanka. Matale, Suduganga

[Biogeographic zones are classified as Alfred et al. (2001) [22]]

in India mostly concentrated in the high altitudinal areas of Himalayas. Only single species, *Dixa barraudi* Freeman was reported from the low altitudinal areas of Punjab and another species, *Dixa zeylanica* Senior-White was lacking of specific locality. Nothing has been recorded from the southern, central and western part of India. As a whole, the dixid fauna of the Indian

subcontinent is the big unknown and needs more study on morpho-taxonomy and biology.

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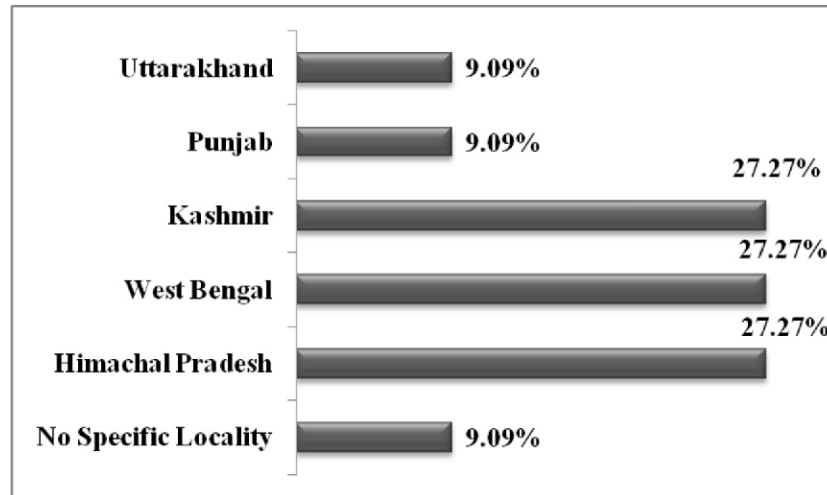


Fig 1: Distribution of dixid flies in different states of India (%)

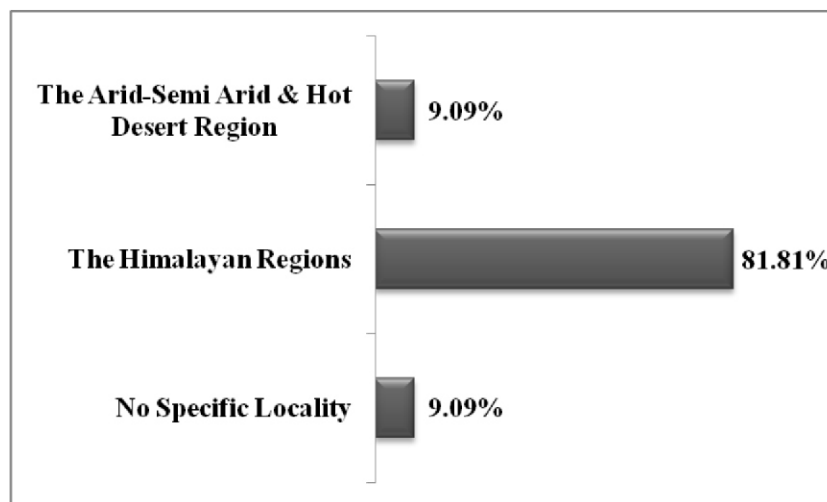


Fig 2: Distribution of dixid flies in Indian biogeographic regions (%)

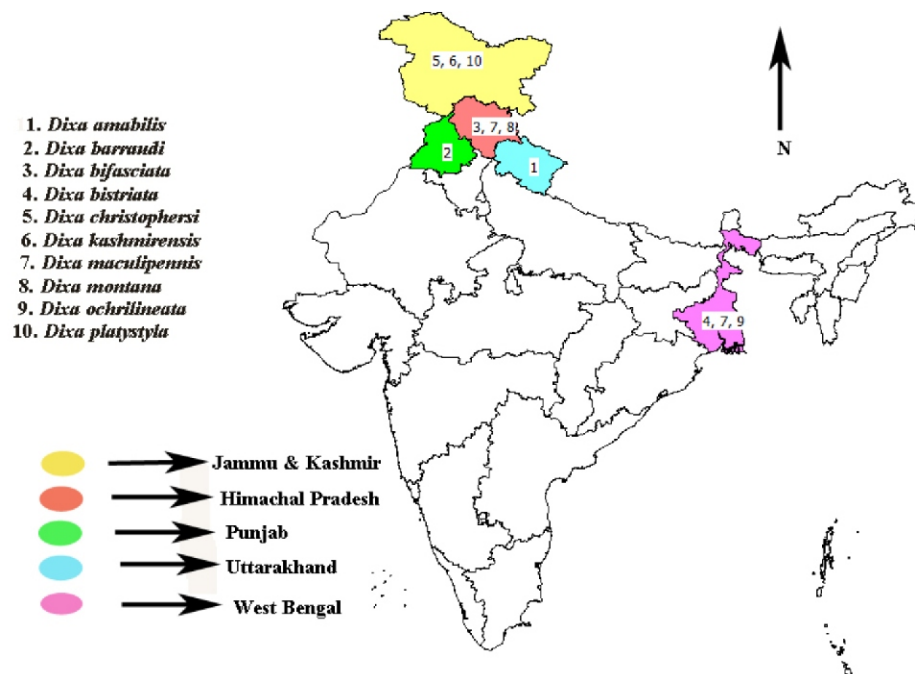


Fig 3: Distribution of Indian Dixid Flies in different states

[* Due to data deficient, *Dixa zeylanica* Senior-White is not included in map]

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