

### Review Article

## A CURRENT STATUS OF NORTH-EASTERN BLACK FLY BITES: A REVIEW

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### ABSTRACT

In hilly areas of north-east India, especially in sub tropical region a black colour fly is present. The fly is 2-5mm in length and is known as "Dimdom" (Assamese) in Arunachal Pradesh in Assam. In English it is called as Simulium Fly or Black Fly. Till date total of 69 species of eight sub-genera under one genus belonging to the family Simuliidae of the order Diptera are reported from India, which is 3.11% of the total world extant simuliid fauna. Among these, 30.43% species are restricted to India. Out of 36 states and union territories of India, simuliids are reported only from 20 states and UTs. Highest numbers of species are reported from the Himalayan biogeographic zone (68.11%) and lowest in Indo Gangetic plains (5.79%). So far, nothing has been known from Islands biogeographic zone.

**KEYWORDS:** Simulium, Black Fly, Onchocerciasis, Black fly fever.

### INTRODUCTION

A black fly (sometimes called a blanford fly, buffalo gnat, turkey gnat, or white socks) is any member of the family Simuliidae. Over 1,800 species of black flies are known (of which 11 are extinct). Most species belong to the immense genus *Simulium*. Most black flies gain nourishment by feeding on the blood of mammals, including humans, although the males feed mainly on nectar. They are usually small, black or gray, with short legs, and antennae <sup>[1]</sup>. They are a common nuisance for humans, and many U.S. states have programs to suppress the black fly population. They spread several diseases, including river blindness in Africa (*Simulium damnosum* and *S. neavei*) and the Americas. Adult black flies are small insects that measure 1 to 5 mm in length, and possess a shiny thorax (middle of the fly) that ranges in color from black to various shades of gray or yellow. Females deposit eggs, 200 to 800 per female, on vegetation just below the water surface. Larvae emerge from eggs and attach themselves to aquatic or emergent vegetation as well as rocks. Black flies have preferences for a wide range of individual host species. Adult females feed on the blood of humans, cattle, horses, sheep, goats, poultry, other livestock and wild mammals and birds <sup>[2]</sup>. Each black fly species may prefer one type of host over another. The black fly common name

sometimes indicates host specificity, for example the turkey gnat. Black flies are daytime biters preferring low wind conditions. Female black flies are blood feeders whose bites can itch and persist for several days. The flies bite by cutting into the skin and feeding on the pool of blood that forms in the hole they make. Anticoagulants injected into the feeding site by black flies can cause mild to severe allergic reactions in sensitive individuals.



Fig. 1: Black Fly sucking blood from human

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### History of Taxonomic Research:

Probably, Latreille is the first man who described the type genus *simulium* in the year 1802. Later Meigen (1818) made it a well-defined group and finally the family named simuliidae was designated as a single genus by Newmen (1834). Becher (1885) was the first person who described a species of simuliidae from India. Later Dutta and Pal (1975) also studied the Indian simuliid fauna and described several species from this country. Several new distribution records of Indian simuliids have been reported by Takaoka *et.al* 2011 <sup>[3]</sup>.

**Distinguishing Characters:** [4]

Adults are usually small, dark coloured flies with a short thorn-like antenna (generally 11-segmented) and short mouthparts. Mandibles and maxilla are usually armed with teeth and adapted for blood sucking. Thorax is remarkably arched. Wings are broad, three anterior veins are more prominent than the posterior vein. The mature larva is more or less 6 mm long, cylindrical and swollen posteriorly. There is a pair of dark spots laterally and a proleg ventrally in the thoracic region (Datta, 1980).

**Habit and Habitats:**

The members of this family were found most abundantly in hilly terrain with watercourses like water channels, streams, nearby areas of the river etc. Actually, these areas are most common for their breeding (Datta, 1980). Females usually lay eggs in the vegetation (whatever it may live or dead), rocks or other suitable submerged substrate (Datta, 1975). After emerging from the pupae they usually used to fly near the water bodies. Most of the species of the simuliidae flies appear to mate in the mid-air and sheltered near the bushes and tree tops. (Datta, 1980). These flies are with sucking type of mouthparts as these are adapted to blood sucking of several animals and human [5].

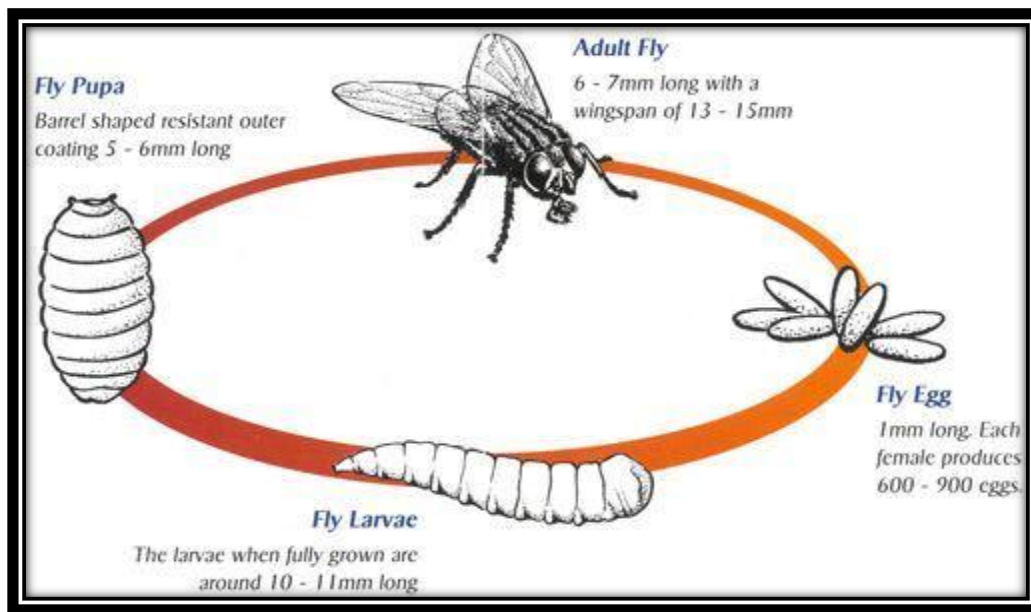
Borah et al., (2012) reported that Black flies are one of the biting dipteran insect groups of medical importance and have a worldwide distribution, occurring anywhere there are running streams or rivers suitable for breeding of their immature stages (Crosskey, 1990). In India, 71 species (56 named and 15 unnamed) of black flies, all in the genus *Simulium*. Laterally, have been recorded (Adler & Crosskey, 2011; Takaoka et al., 2011), of which four species are recorded from Arunachal Pradesh, the seven states in North-East India, and 16 species (eight named and eight unnamed) from Assam, a state located south-west of Arunachal Pradesh [6].

**Newly recorded species from Arunachal Pradesh, India:**

1. *Simulium (Montisimulium) nemorivagum* Datta, 1973
2. *Simulium (Gomphostilbia) darjeelingense* Datta, 1973
3. *Simulium (Gomphostilbia) decuplum* Takaoka & Davies, 1995
4. *Simulium (Simulium) barnesi* Takaoka & Suzuki, 1984
5. *Simulium (Simulium) pradyai* Takaoka, 2008

**Life Cycle of Black Flies:**

The life cycle of a black fly can be divided into four stages: Egg, Larva, Pupa and adult.



**Fig. 2: Life Cycle of a Black Fly**

The lifecycle of a black fly begins as an egg. After some time (few days or months depending on the fly type) the egg hatches and larva comes out of it. Larva feeds on the organic matter and when it has stored sufficient nutrients it goes into pupal stage.

Pupal stage can again be of several days or months. During the pupal period the development of the actual fly like features (wings, legs, etc) begin. From the pupa, the adult fly comes out and is ready to start the cycle again.

**Factor affecting black fly life span:** [7]

**Food availability:** Scientists have seen that – At moderate food levels, an adult black fly lives for about 45 – 50 days. But when

they have unlimited supply of food they can only last for 30-35 days.

But on contrary to this, if flies were supplied with ample food during larval stages their lifespan and reproduction capabilities increases whereas it decreases for the flies which had less or moderate food during larval stages.

**Temperature:** Temperature has an important role in the growth of a blackfly. For instance at 99 degrees Fahrenheit a black fly egg hatches in about 8 hours, where as it takes 2 days to hatch at a temperature of 39 degrees Fahrenheit [8].

**Turbidity:** Turbidity is an optical property that causes scattering of light due to presence of suspended particles like

clay, silt, organic matter, plankton and other microorganism in water [9]. In high turbid water the light penetration is reduced affecting photosynthesis of plants, phytoplankton and also increase the water temperature. The suspended particles may clog respiratory surfaces or interfere with feeding appendages.

**Dissolve Oxygen:** Oxygen gets into water by diffusion from the surrounding air by aeration (fast movement) and as a waste product of photosynthesis by aquatic plants is measured in the form of dissolved oxygen. Many factors affect the solubility of dissolved oxygen including water temperature, atmospheric temperature, altitude and salinity.

#### Importance of Black Flies:

Black flies are medically, economically and ecologically important insects. The adult females of most black flies feed on man and vertebrate blood causing intense itching, local swelling, redness and soreness. Just after biting the areas become red and

later turn to black spot. The most important parasites in man transmitted by black flies are the nematode, *Onchocerca volvulus* causing Onchocerciasis or River Blindness and *Mansonella ozzardi* responsible for serous cavity filariasis. Many black fly species belonging to genera *Simulium*, *Parasimulium*, *Austrosimulium* and *Cnephia* transmit other filarial worms, protozoans or arboviruses to livestock, wild mammals or birds. This could consequently culminate in low productivity, sickness and abandonment of the infested areas affecting socio-economic well-being of the human population in such areas. The biting nuisance of black flies also affects the tourism industry of a country. In spite of the medical importance of some of the species, black flies are keystone species in the ecology of running water because of their rare ability to filter dissolved organic matter and make it available to the food chain. They are also important for the environmental monitoring of freshwater contamination because immature stages (larvae and pupae) are susceptible to both organic and inorganic pollution and serve as bioindicator [10].



Fig. 3: Simuliid bite on child leg



Fig. 4: Red/ black spot on legs

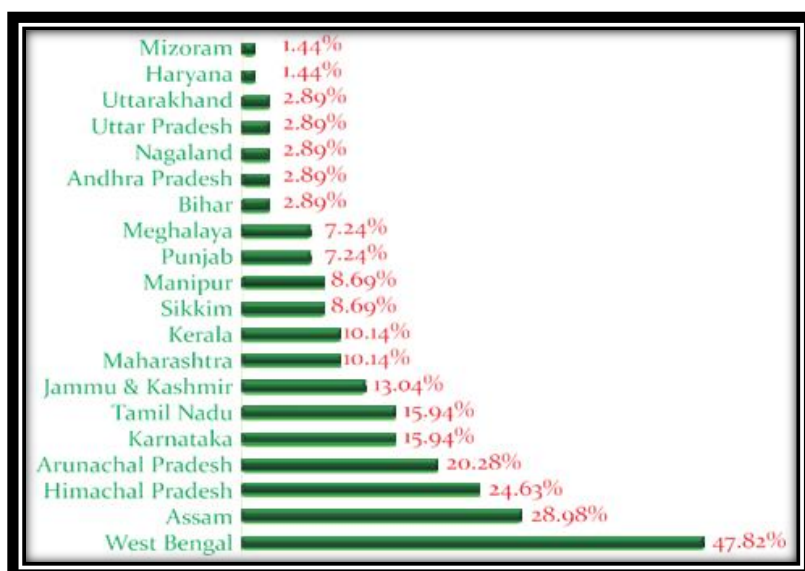


Fig. 5: State wise percentage of reported in India

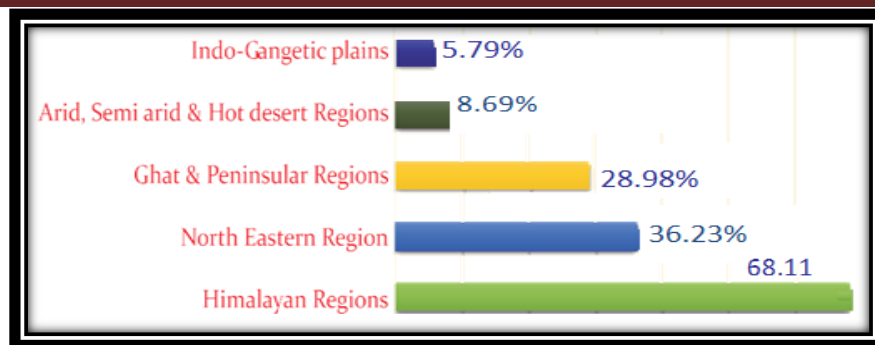


Fig. 6: Percentage of different Species Biogeographic zone of India

## DISCUSSION

As per the present data the simuliids are recorded from 20 out of 36 states of India. Of them, West Bengal represents maximum number of simuliidae about (47.82%) followed by Assam (28.98%), Himachal Pradesh (24.63%), Arunachal Pradesh (20.28%), Karnataka (15.98%), Jammu and Kashmir (13.04%), Kerala and Maharashtra (Each with 10.14%), Manipur and Sikkim (Each with 8.69%), Punjab and Meghalaya (Each with 7.24%). Bihar, Uttar Pradesh, Uttarakhand, Nagaland and Arunachal Pradesh (Each with 2.89%). Besides this Haryana and Mizoram each shared 1.44% of the simuliidae of India. Out of these 69 simuliid species, 20 species have restricted their distribution within India. Among the six major bio-geographic zone of India, the maximum no (68.11%) of species are reported from himalayan region followed by North-Eastern region (36.23% species) [11].

## REFERENCES:

- Adler PH, McCreadie JW. Black Flies (Simuliidae). In: Med Vet Entomol; Academic Press. **2002**;186-202.
- Datta M. New species of black flies (Diptera: Simuliidae) of the subgenera Eusimulium Roubaud and Gomphostilbia Enderlein from the Darjeeling area, India. *Orient Insect* **1973**;7:363-402.
- Takaoka H, Thapa S, Henry W. A new species of black fly with an entirely yellow thorax from Darjeeling India. *Zootaxa* **2011**;62-68.
- Borah S, Dhiman S. Notes on black flies (Diptera: Simuliidae) from North-East India: New records of five species from Arunachal Pradesh and taxonomic reviews of two species from Assam. *Trop Biomed* **2012**;29(1):92-97.
- Hazarika S, Dhiman S, Rabha B, Goswami D. Repellent activity of some essential oils against Simulium species in India. *J Insect Sci* **2010**;1(2):55-65.
- Dhiman S, Rabha B, Talukdar P, Goswami D. Black fly (Simulium sp) composition, daytime biting activity and possible onchocerciasis infection in north-east India. *J Environ Biol* **2012**;2(3):89-96.
- Barua P, Sharma A, Hazarika NK, Barua N, Bhuyan S and Alam ST. A rare case of ocular onchocerciasis in India. *SouthEast Asian J Trop Med Public Health* **2011**; 42:1359-1364.
- Das SC, Sarkar PK, Bhuyan M and Rao KM. Substrate preference of simuliid larvae in the field. *J Am Mosq Con Assoc* **1998**;559-562.
- LeChevallier MW and Norton WD. Examining relationship between particle counts and Giardia, Cryptosporidium, and turbidity. *J Am Water works Assoc* **1992**;84(12).
- Currie D C. and Adler PH. Global diversity of black flies (Diptera: Simuliidae) in fresh water. *Hydrobiologia* **2008**;595(1):469-475.
- Mitra B, Roy S, Halder S, Chattopadhyay U. Distribution of blackfly in India. *Ambient Sci* **2017**;4(1):65.

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