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Sergentomyia (*Parrotomyia*) *jerighatiansis*, a new species of sand fly (Diptera: Psychodidae: Phlebotominae) from Kandhamal district, Orissa, India

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ABSTRACT

Sergentomyia (*Parrotomyia*) *jerighatiansis* a new species of sand fly (Diptera: Psychodidae: Phlebotominae) from the villages of Kandhamal district, Orissa, located on the east coast of India is described. Descriptive morphology, character measurements, and illustrations of males and females are provided and its taxonomic position within the genus is also defined. Voucher specimens of the new species have been deposited at the museum, Vector Control Research Centre (Indian Council of Medical Research), Puducherry, India and Zoological Survey of India, India.

1. Introduction

Sand flies (Diptera: Psychodidae: Phlebotominae) are one of archaic lineages within the lower Diptera (Lewis, 1978). They occur in a wide range of habitats and individual species often has very specific habitat requirements. Therefore, sand fly distribution is highly distinct within the range, depending on locally occurring environmental factors such as frequency of precipitation, temperature, physical barrier, habitat availability and abundance of vertebrate hosts (Srinivasan et al., 2013). Indian subcontinent has a variety of physiographic zones, each with a specific feature in soil type, vegetation and climate; and hence it has a rich insect fauna. Among the insects, mosquitoes and sand flies are given much impetus due to their public-health importance. A long series on taxonomic features of sand flies, mainly from India were published from 1921 to 1933 by Sinton (1929, 1933).

Subsequently, Lewis (1978) compiled all the published literature on sandfly distribution from India, including Afghanistan, Pakistan, Nepal, Burma, Thailand, Vietnam, Taiwan, the Philippines, Malaysia, and western Indonesia and listed 26 species under the sub genus *Sergentomyia* (*Parrotomyia*). During the same period, Artemiev (1978) had described four species from Afghanistan. The recent revision of this subgenus includes the following species *viz*., *Sergentomyia* (*Parrotomyia*) *yencaudensis* (Ilango, 2004); *Sergentomyia* (*Parrotomyia*) *rectangulata* (Srinivasan and Jambulingam, 2010) and *Sergentomyia* (*Parrotomyia*) *vadhanurensis* (Srinivasan and Jambulingam, 2011) from India.

In view of expansion of the zone of sand fly-borne diseases such as cutaneous leishmaniasis (Sharma et al., 2005; Simi et al., 2010) and visceral leishmaniasis (Dey et al., 2007) in India, investigation on the taxonomy of sand flies gains importance (Ilango, 2010; Pradeepkumar et al., 2012). Exploration of sand fly species hither to unreported becomes an integral part in understanding the taxonomy of sand flies. In Orissa, Kaul et al. (1976) recorded 13 species of sand flies, while Lewis and Kaul (1987) described *Sergentomyia* (*Parrotomyia*) *koraputa*, a sand fly new species. In this communication, *Sergentomyia* (*Parrotomyia*) *jerighatiansis* sp. nov. is described and illustrated, based on specimens collected from two villages of Kandhamal district, Orissa, located on the east coast of India.

2. Materials and methods

Study area: Kandhamal dt. is located in the heart of Orissa state, stretching between 19°34′ and 20°54′ North latitude and 083°30′ and 84°48′ East longitude, with a surface area of 8021 km^2. The entire district lies at the altitude, ranging between 300 and 1100 m and includes inaccessible terrain of hilly ranges and narrow valley tracts. Temperature varies between 1 °C (minimum) in December

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and 35 °C (maximum) in May and relative humidity ranges from 56% and 79%. Average annual rain fall is 1597 mm. The socio-economic conditions of people and development of the district are impeded with the type of terrain and hill ranges. More than 50% of population are constituted by the aboriginal tribal races. The human dwellings are mainly huts, made of thatched roof, mud wall and mud floor. Cattle, goat and fowl are domesticated. As a land of mountains and valleys, it reflects the tribal culture and favour rich wild life.

Sand fly collections were carried out indoors and outdoors in two villages, Jerighat (N = 19°51′45.2″ and E = 083°43′27.5″), 920 m above sea level and Suluma (N = 19°57′40.1″ and E = 084°04′55.7″), 914 m above sea level from Kandhamal dt. Orissa, on August, 10, 2011. Since hand capture method has been reported to be the most effective of all the methods used for sand fly collection (Hati et al., 1987), this technique was selected for sampling. The specimens were treated with 10% NaOH, mounted on microscopic slides, using Hoyer's fluid and identified to species adopting the keys described by Lewis (1967, 1978), Artemiev (1978) and Kalra and Bang (1988).

A total of 172 sand fly specimens were collected, of which 36 specimens, apparently having the characteristic features of the subgenus *Parrotomyia* and genus *Sergentomyia* did not follow any of the keys, when taxonomic identification of the species was made. Of the 36 specimens, 34 (31 males and 3 females) were obtained from the buttresses of a banyan tree, *Ficus bengalensis* in the village, Jerighat and 2 males from a tree hole of *F. bengalensis* in other village, Suluma, A holotype♀ and paratypes ♀ (n = 2); and allotype ♂ and paratypes ♂ (n = 2) were again subjected for serial immersion in alcohols with different concentrations with distilled water and finally immersed in xylene for dehydration and then mounted on microscopic glass slides, using a permanent mounting medium, the DPX. Morphological features of both male and female specimens were found associated with each other. Morphological parameters were measured, for a holotype♀ and paratypes ♀ (n = 2); and allotype ♂ and paratypes ♂ (n = 10) using an Olympus binocular microscope (Model CHS, Olympus Optical Co Ltd, made in Japan) fitted with ocular and stage micrometers. All measurements were given in μm. Drawings and photographs of morphological and anatomical features of male and female specimens were made using camera Lucida fitted with an Olympus binocular microscope and a lucida compound trinocular microscope fitted with a camera respectively. Terminology of the characteristics adopted was that of Lewis (1967, 1978) and Sinton (1929). Both morphological (morphometric) and anatomical features of both male and female specimens of this group are distinct from other sand fly species; already described. Nomenclature applied, follows the guidelines provided by the International Code of Zoological Nomenclature (ICZN, 2012).

3. Result

Of the 172 sand fly specimens obtained 64 were males and 108 were females. Among them *Sergentomyia* (*Parrotomyia*) *babu* (Annandale) was predominant species, constituting 54.1%. Other species obtained in order of abundance were *Sergentomyia* (*Parrotomyia*) *jerighatiansis* sp. nov. (20.9%), *Phlebotomus* (*Euphlebotomus*) *argentipes* Annadale and Brunetti (15.2%), *Sergentomyia* (*nic nic gr.*) *bailyi* (Sinton) (7.6%), *Sergentomyia* (*Parrotomyia*) *baghdadis* (Adler and Theodor) (1.7%) and *Sergentomyia* (*Grassomyia*) *indica* (Theodor) (0.6%). Sand flies obtained indoors constituted 79.0% (human dwelling 65.1% and cattle shed 13.9%), while outdoors 21.0% (tree buttresses 19.8% and tree holes 1.2%). However, *Sergentomyia (Parrotomyia) jerighatiansis* sp. nov. was the only sand fly species recorded from outdoor habitats, during the study in this region.

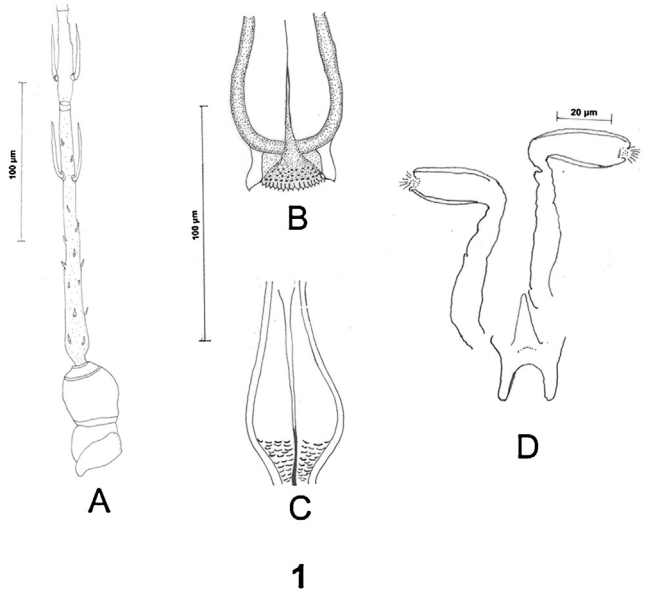

Fig. 1. *Sergentomyia* (*Parrotomyia*) *jerighatiansis* sp. nov.: (A) antenna (10×), (B) cibarium (40×), (C) pharynx (40×), (D) spermathecae (40×).

3.1. *Sergentomyia (Parrotomyia) jerighatiansis sp. nov.*

Measurements (μm) of holotype ♀ and allotype ♂ *Sergentomyia (Parrotomyia) jerighatiansis* sp. nov. were described below. Similarly, the measurements (μm) for paratype ♀ (n = 2); and ♂ (n = 9) with the mean (±SD), minimum and maximum values are given in Table 1.

Holotype: ♀ India, Orissa, Srinivasan and Jambulingam, Jerighat (N = 19°51′45.2″ and E = 083°43′27.5″), 2011.

General colour is homogeneous greyish brown. Body size 2.8 mm. Head: length 496, width 464. Interocular distance 224. Interocular suture complete. Palps: formula 1, (2 3), 4, 5. Palpomere measurements: P1 64, P2 184, P3 184, P4 200 and P5 488. Antenna (Fig. 1A): A III 328, A IV 128, A V 128. Antennal formula A III–A XV, each has two ascoids, one on either side. Ascoid length in A III: 70. Cibarium (Fig. 1B): inverted funnel in shape, the ventral plate bears cibarial teeth (horizontal teeth) and denticles (vertical teeth), dorsal plate with dark brown coloured pigment patch, which is dome shaped and ends with an anterior process, chitinous arch located at the base of the labrum-epipharynx. Cibarium with 16 horizontal teeth, which are comb-like, parallel and uniform in size, each tooth measures 4. Next to the cibarial teeth, there are many rows of denticles in the ventral plate, arranged in several rows. Denticles, which are adjacent to cibarial teeth are conspicuous and arranged rows and gradually become inconspicuous towards distal end. Similarly, each female paratype has 16 cibarial teeth. Pharynx (Fig. 1C): unarmed with minute setae, lamp-glass shaped, with a bulge in the lower middle length 200, width 84. Wings: length 2020, width 600. Length of principal vein sections: alpha 448, beta 256, gamma 568, delta 153. R_5 length 1520. Fore leg: coxa 557, trochanter 120, femur 1136, tibia 997, tarsomeres: T1 657, T2 393, T3 274, T4 192, T5 160. The mesanepisternum of lateral part of the thorax is devoid of any seta. Genitalia: cerci simple. Spermathecae (Fig. 1D): cylindrical in shape, length 80, width 72, smooth and capsulated, with tuft of secretary cells at the distal end (Plate 1B); individual spermathecal duct length 204. Common spermathecal duct present. Cerci length 160.

Paratypes: 2 ♀ India, Orissa, Jerighat (N = 19°51′45.2″ and E = 083°43′27.5″), Srinivasan and Jambulingam, 2011.

Allotype: ♂ India, Orissa, Srinivasan and Jambulingam, Jerighat (N = 19°51′45.2″ and E = 083°43′27.5″), 2011.