
TAXONOMIC NOTES ON TABANIDAE (INSECTA: DIPTERA) OF SUNDARBAN BIOSPHERE RESERVE AND ASSOCIATED MANGROVE ECOSYSTEM OF COASTAL REGION OF WEST BENGAL, INDIA

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ABSTRACT: A total of 11 tabanid species under three genera and two subfamilies are found in mangroves and associated coastal area of West Bengal. Among them two species namely *Chrysops designatus* Ricardo, 1911 and *Tabanus dorsiger* Wiedemann, 1821 are reported for the first time in West Bengal. Their taxonomic keys for identification and diagnostic accounts are discussed along with their pattern of distribution in coastal area of West Bengal.

KEYWORDS: Tabanidae, Taxonomy, New record, Distribution, Coastal area, West Bengal.

INTRODUCTION

Members of the family Tabanidae are commonly called horse flies, deer flies and clegs. Horse flies are also called greenheads especially in coastal areas. The majority of the species of horse flies are in the genus *Tabanus*; the majority of the deer flies in *Chrysops*; and the majority of the clegs in *Haematopota*.

The tabanids include several more or less 'marine' insects since many species are found in coastal areas. Some species grow in the soil in salt marshes, brackish pools and tidal over wash areas. A few species are found along beaches and seem to be associated with vegetative remains accumulating over there.

Most tabanids are large, robust, bristle less, strong fliers, vicious biters of man and animals, and, therefore, of economic importance. Their annoyance interferes with human activities and livestock culture. Their morphological similarities due to occurrence in more or less homogenous environment make their identification difficult and challenging task day by day. Though various tabanid species exhibit wide range of distribution but coastal tabanids are presumed to exhibit typical characters, altered distribution pattern and enhanced abundance due to availability of proper breeding places in vicinity.

Tabanids presumed to play role of primary consumer in mangrove ecosystem, feeding on soil invertebrates and larva of several other insect groups in premature stages. Their larval stages are probably longest among Dipteran insects. Their immature stages are parasitized by several hymenopterans in case of eggs, Tachinids in case of larvae, few hymenopterans for pupae and adults are mainly predated by Asilids and odonates. Few coastal tabanid species exhibit autogeny while most of them require blood meal for development of oocyte and first batch of egg laying. Adults are mainly studied in recent years due to their vector competence and role in transmitting several diseases. In spite of their interesting life histories and feeding behaviour, bionomy and overall taxonomic studies and studies on immature tabanids are very restricted in India except few old notable works^{7,1}.

They are becoming growing threats as they are mainly involved in mechanical as well as biological transmission of number of deadly viral, protozoan and bacterial diseases in livestock and wild lives. Especially in coastal area along West Bengal their growing abundance in monsoon and enhanced frequency of biting leads to potential emergence as Surra disease prone zone affecting large masses of house hold domestic cattle patches and other livestock. Taxonomic studies for their proper identification is therefore necessary for planning control measures

and implying disease intervention strategy for saving rural economy as well.

It is likely that tabanids, along with other insects, are important in mangrove ecosystems but little is known on the subject. In the present study, only a brief synopsis on taxonomy of the family is given with further discussions confined to their distribution pattern in coastal area of West Bengal.

MATERIALS AND METHODS

(i) Study area

Coastal area

S 24 Paraganas: It covers an area of 9960 square km. On one side it has urban fringe of Kolkata, the remote riverine villages in Sundarban on the other side. The district is located between 22.53° N latitude and 88.33° E longitude. It has an average annual precipitation of 1750 mm. It is the home to one biosphere reserve i.e. Sundarban and four wildlife sanctuaries namely Haliday island, Lothian island, Narendrapur and Sajnekhali. A network of estuaries, tidal rivers and creeks intersected by numerous channels, it encloses flat marshy islands covered with dense forest.

Study area includes Chandaneswar, Dhosa, Laxminarayanpur, Jharkhali, Gosaba, Bhandarkhali, Nolgora, Dharmatala, Sonagaon, Jyotishpur, Meraganj and Harishpur village side. This mangrove ecosystem and associated coastal region having wide array of faunal diversity especially rich tabanid faunal

assemblage is expected in wide cattle patches across rural belts around Sundarban mangroves of coastal region of West Bengal.

(ii) Sampling

A two year survey from March 2013 to March 2015 was conducted by the survey team of Diptera section of Zoological Survey of India. Adult flies were collected using aerial net sweeps around the dense forest patch, domestic and wild cattle patch etc. by following the method of Datta *et al.*³ later modified by Veer¹² and placed in killing jar containing cotton soaked with ether as narcotizing agent. Flies were pinned using insect pin and kept in the collection box and preserved following method of Datta *et al.*³ for further identification. All specimens were labelled with the location of the sampling along with date and time of collection.

(iii) Identification of the specimen

Identification of the adults followed the keys of Thomas¹⁰ and description by the Ricardo^{8,9}, Datta³, Thomson¹¹ keeping in mind the recent nomenclatural changes^{5,6}. Classification scheme of Burger and Thompson² was followed for the current study on tabanids. Morphology and terminology part were adapted from McAlpine *et al.*⁴ All the identified specimens were deposited to the designated repository of National Zoological Collection, Diptera section, Zoological Survey of India, Kolkata. The

photograph was taken in Leica Microscope M205A.

RESULTS AND DISCUSSION

Systematic account with key is given wherever deemed necessary. First reference, current reference, type locality, material examined, diagnosis and distribution are given for each tabanid species.

List of Taxa (New records are indicated with asterisks)

Subfamily Chrysopsinae

Tribe Chrysopsini

Genus *Chrysops* Meigen, 1803

1. *Chrysops designatus* Ricardo, 1911*
2. *Chrysops dispar* (Fabricius, 1798)

Subfamily Tabaninae

Tribe Tabanini

Genus *Atylotus* Osten Sacken, 1876

3. *Atylotus virgo* (Wiedemann, 1824)

Genus *Tabanus* Linnaeus, 1758

4. *Tabanus dorsiger* Wiedemann, 1821*
5. *Tabanus rufiventris* Fabricius, 1805
6. *Tabanus (Tabanus) brunnipennis* Ricardo, 1911
7. *Tabanus (Tabanus) diversifrons* Ricardo, 1911
8. *Tabanus (Tabanus) macer* (Bigot, 1892)
9. *Tabanus (Tabanus) rubidus* Wiedemann, 1821
10. *Tabanus (Tabanus) striatus* Fabricius, 1787

11. *Tabanus (Tabanus) tenens* Walker, 1850

Key to the subfamily, tribe, genus and species of tabanid flies of the study area

Systematic account

Family: Tabanidae

Key to the subfamily

1. Hind tibiae with paired apical spurs mostly, vertex with well-developed functional ocelli. Caudal ends of spermathecal ducts of female without cup like expansion..... Chrysopsinae
Vertex with rudimentary or no ocelli, hind tibiae without apical spurs. Caudal ends of spermathecal ducts of female with cup like expansion..... Tabaninae

Subfamily: Chrysopsinae

Tribe: Chrysopsini

Key to the species of Genus *Chrysops* Meigen

1. Abdomen with short black bifid stripe on 2nd tergite, often extending to 3rd or 4th tergite.....*C. dispar*
Abdomen with bifid stripe only on 2nd tergite and network of black markings on 3rd tergite, leaving only 3 yellow spots free.....*C. designatus*

Subfamily: Tabaninae

Tribe: Tabanini

Key to the genus

1. Antennal style with 4 annulations, frons with prominent callus.....*Tabanus* Linnaeus
Frons with reduced or spotted calli.....*Atylotus* Osten-Sacken

Key to the species of Genus *Tabanus*

Linnaeus

- Species with one or more stripes usually continuous on abdomen.....1
Species with no such abdominal stripes.....7
1. Frontal callus oblong or narrow.....2
Frontal callus neither oblong nor narrow.....6
2. Frontal callus with a spindle shaped linear extension.....3
Frontal callus with the linear extension not spindle shaped.....5
3. Abdomen with median stripe continuous up to 6th segment, except on 2nd tergite absent; costal cell clear.....*T. striatus*
Abdomen with median stripe complete, present on 2nd tergite; costal cell not clear.....4
4. Abdomen with median stripe light and complete, present on 2nd tergite, lateral stripes much straight, costal cell tinge yellowish.....*T. tenens*
Abdomen with median stripe complete, broad on 2nd tergite, lateral stripes in form of irregular spots appearing as steps, costal cell light yellowish.....*T. dorsiger*
5. Abdomen lilac or blackish brown, median stripes composed of triangular spots and lateral stripes appearing step like, costal cell dusky.....*T. rubidus*
6. Frontal callus light brown, somewhat square with irregular shaped linear extension; abdomen with a median stripe with two lateral stripes continuous throughout.....*T. macer*
Frontal callus reddish brown, club shaped with linear extension; abdomen with a median broad stripe and two round spots

on lateral side of 2nd tergite.....*T. brunnipennis*
 7. Each abdominal tergite densely covered with ashy grey tomentum and white abdominal spots on posterior margin; dark brown oblong callus with spindle shaped extension.....*T. rufiventris*

Abdominal tergite without any grey tomentum or spots on posterior margin, rather dull yellowish abdomen with dark apices; pear shaped reddish brown callus with broad linear extension.....*T. diversifrons*

Map 1. GIS map showing species richness and distribution of coastal Tabanidae on the basis of species density and eco-regions of Indo-malayan biome in West Bengal.

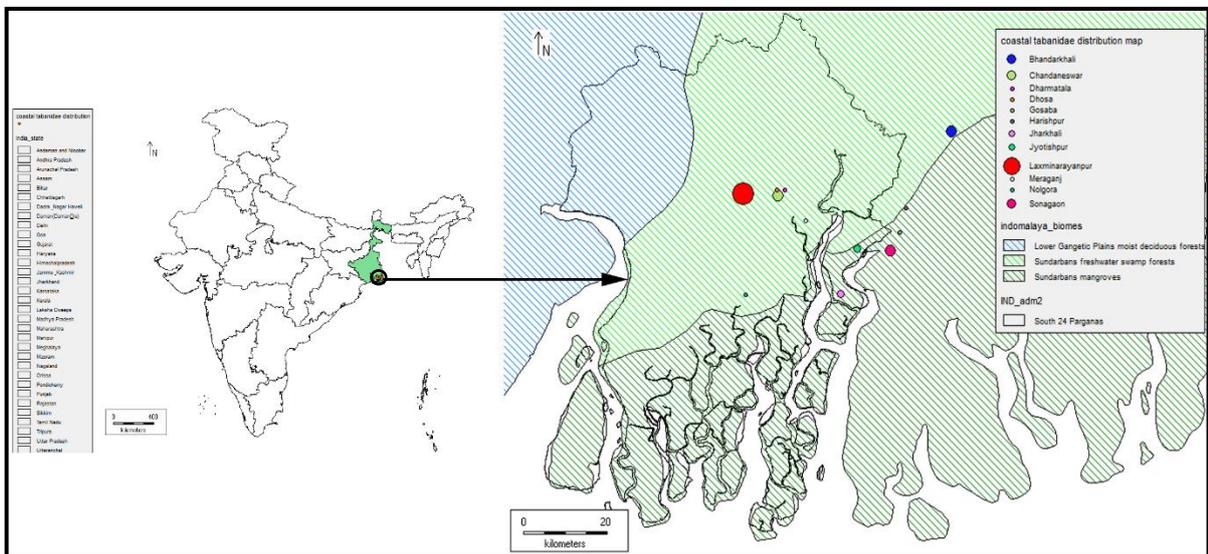


Plate 1. Habitus of six tabanid species namely *Chrysops designatus* Ricardo, 1911; *Chrysops dispar* (Fabricius, 1798); *Atylotus virgo* (Wiedemann, 1824); *Tabanus dorsiger* Wiedemann,



Chrysops designatus Ricardo, 1911



Chrysops dispar (Fabricius, 1798)



Atylotus virgo (Wiedemann, 1824)



Tabanus dorsiger Wiedemann, 1821



Tabanus rufiventris Fabricius, 1805



Tabanus (Tabanus) brunnipennis Ricardo, 1911

Plate 2. Habitus of remaining five tabanid species namely *Tabanus (Tabanus) diversifrons* Ricardo, 1911; *Tabanus (Tabanus) macer* (Bigot, 1892); *Tabanus (Tabanus) rubidus*



Tabanus (Tabanus) diversifrons Ricardo, 1911



Tabanus (Tabanus) macer (Bigot, 1892)



Tabanus (Tabanus) rubidus Wiedemann, 1821



Tabanus (Tabanus) striatus Fabricius, 1787



Tabanus (Tabanus) tenens Walker, 1850

Wiedemann, 1821; *Tabanus (Tabanus) striatus* Fabricius, 1787 and *Tabanus (Tabanus) tenens* Walker, 1850 recorded from coastal region of West Bengal.

**Diagnostic accounts of species of family
Tabanidae**

Subfamily Chrysopsinae

Diagnosis: Abdominal tergite IX divided. Style of male gonocoxite bluntly ended. Antennae with 3-4 flagellomeres. Caudal ends of spermathecal ducts with simple tubes. Hind tibiae mostly with pair of apical spurs.

Tribe Chrysopsini

Diagnosis: Scape much elongated than broad, flagellomere narrow without dorsal angle. Eyes bare with spots or variegated dark markings, rarely with bands. Posterior margin of cells open.

Genus *Chrysops* Meigen, 1803

1803. *Chrysops* Meigen, *Mag. Insekten Kude*, **2**: 267.

Type species: *Tabanus caecutiens*

Linnaeus 1761

Diagnosis: Varies from small to moderately long in size (5.5-12.5 mm in length), usually bright yellow to black coloured species. Callus usually transverse with three functional ocelli. Scape and pedicel much longer and scape in most often swollen. Proboscis long. Wings infuscated in irregular fashion or with dark cross band, Sc vein bare, r5 and m2 cells open widely. Abdomen with specific yellow and black patterns or yellowish or dark stripes, spots or triangles.

1. *Chrysops designatus* Ricardo, 1911

1911. *Chrysops designata* Ricardo, *Rec. Indian Mus.*, **4**: 383.

1927. *Chrysops designatus* Senior-white, *Cat. Indian Insects*, **12**: 61.

Type locality: Nepal

Material examined: 1♀, collected from cow, 22°22'55.8" N, 88°56'39.7" E, 4.6 m, Bhandarkhali, S 24 Paraganas, 08.vi.2013, Coll. T. Naiya

Diagnosis: Large yellow stripes in the centre of yellowish face with glossy blackish tubercles. Lower part of cheeks black with yellow hairs. Palpi yellowish to reddish with few yellow pubescence. Scape reddish yellow, scape and pedicel with black pubescence. Forehead with yellow pubescence. Frontal callus glossy, dark brown, oblique, not reaching eyes. Thorax dark brown with broad median stripe, composed of greyish yellow tomentum, divided into two by narrow brown line and sides with bright yellow pubescence. Scutellum greyish yellow with dark pubescence in the centre. Abdomen with yellowish pubescence dense on apical tergites, light yellow on first two tergites, rests bright yellow. Black narrow band on posterior border of first tergite widening in centre forming broad median spot reaching anterior margin with concave sides. V-shaped black spot meeting on anterior margin of second abdominal tergite and on third abdominal tergite V-shaped black spot becomes broader and not reaching anterior margin. Sides and posterior border have black bands. 2 small black triangular spots on 4th abdominal terga on anterior margin.

Legs reddish yellow, coxae, femora and apical joints of tarsi blackish. Wings hyaline with brown at fore border reaching apex. Presence of brown cross band which reaches anal cell. Apical spot narrow, reaching to centre of apices of wing.

Distribution: India (West Bengal: S 24 Paraganas; Arunachal Pradesh, Assam, Kashmir, UP, Uttarakhand)

Elsewhere: Myanmar, Nepal, Pakistan, China

Remarks: This species primarily occurs in North-West part of oriental region. This species is recorded for the first time from the state of West Bengal.

2. *Chrysops dispar* (Fabricius, 1798)

1798. *Tabanus dispar* Fabricius, *Ent. Syst. Suppl.*, **1**: 567.

Type locality: India orientalis

Material examined: 2♀♀, collected from cow, 22°31'24.0" N, 88°11'41.0" E, 4.5 m, Laxminarayanpur, S 24 Paraganas, 04.vii.2014, Coll. A. Naskar; 1♀, collected from cow, 22°31'24.0" N, 88°11'41.0" E, 4.5 m, Laxminarayanpur, S 24 Paraganas, 04.vii.2014, Coll. S. Hazra; 1♀, collected from cow, 22°07'58.0" N, 88°44'17.9" E, 3 m, Jyotishpur, S 24 Paraganas, 09.vi.2013, Coll. T. Naiya; 2♀♀, collected from cow, 22°15'04.0" N, 88°32'36.0" E, 4.5 m, Chandaneswar, S 24 Paraganas, 09.vi.2013, Coll. T. Naiya; 10♀♀, collected from cow, 22°15'04.0" N, 88°32'36.0" E, 4.5 m, Chandaneswar, S 24 Paraganas, 21.vi.2013, Coll. T. Naiya

Diagnosis: Antennae orange brownish with dark brown apex. Face rusty brownish with light coloured middle line. Cheeks rusty yellow with brown spot. Forehead with blackish brown transverse oval tubercle. Thorax brown with 2 mouldy grey stripes separated by brown line with pubescent golden yellow coloured. Breast at sides brown with golden stripes under base of wing. Scutellum rusty yellow. Abdomen brownish, brown at the middle of first abdominal tergite, brown spots united towards base of the second abdominal tergite. Wings hyaline, fore border brown from base to apices. Oblique small inconspicuous band below cross vein. Larger band has deep incision at inner margin. Legs bright rusty yellow.

Distribution: India (West Bengal: Nadia; S 24 Paraganas; Andaman island, Arunachal Pradesh, Assam, Bihar, Karnataka, Kerala, Manipur, Meghalaya, Nagaland, Orissa, Sikkim, Tripura)

Elsewhere: Bangladesh, China, Java, Laos, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Singapore, Sumatra, Sri Lanka, Taiwan, Thailand and Vietnam.

Remarks: They become active in low light or towards evening. Their abundance is notably high in rainy season.

Subfamily Tabaninae

Diagnosis: Hind tibia without apical spurs. Style of gonocoxite truncate by a shallow incision. Caudal ends of spermathecal ducts of female with cup like expansion.

Antennae with 3-4 flagellomeres. Cell r5 mostly closed, m3 always open.

Tribe Tabanini

Diagnosis: Basicosta densely setulose except in some palearctic species. Antennae usually short and stout. Basal flagellomere with well-developed dorsal angle. Flagellum with 4 flagellomeres.

Genus *Atylotus* Osten-Sacken, 1876

1876. *Atylotus* Osten-Sacken, *Mem. Boston Soc. Nat. Hist.*, **2**: 425-426.

Type species: *Tabanus bicolor* Wiedemann, 1821.

Diagnosis: Usually small sized fly, frons with spotted calli or without calli. Colour of eyes in living specimen green or yellow. Basal plate of flagellum broad and obtuse dorsal angle. Basicosta pale to brown setulose.

3. *Atylotus virgo* (Wiedemann, 1824)

1824. *Tabanus virgo* Wiedemann, *Analecta. Entomol.*, P 22.

1973. *Atylotus virgo* Philip, *Entomol. Scand. Suppl.*, **4**: 57.

Type locality: "Indies orientalis"

Material examined: 1♀, collected from cow, 22°07'35.5" N, 88°47'10.2" E, 6.3 m, Sonagaon, S 24 Paraganas, 11.vi.2013, Coll. T. Naiya

Diagnosis: Antennae bright rufous, palpi yellow, beard white, forehead yellowish grey with no callus. Thorax with faint white stripes and narrow median line. Abdomen greyish with light yellow haired segmentations, 2 white haired roundish spots on each segment. Wings hyaline with

ochre yellowish veins. Legs ochre yellow with chamois-leather coloured femora.

Distribution: India (West Bengal: Puruliya; S 24 Paraganas; Andaman Island, Himachal Pradesh, Madhya Pradesh, Punjab, Uttarakhand)

Elsewhere: Sri Lanka, Pakistan

Remarks: Burger² put forwarded the conflict regarding placement of this species under genus *Atylotus* as it differs in many features from it. It can transmit Surra disease pathogens i.e. *Trypanosoma evansi* Steel.

Genus *Tabanus* Linnaeus, 1758

1758. *Tabanus* Linnaeus, *Syst. Nat. Ed.*, **10**: 601.

Type species: *Tabanus bovinus* Linnaeus, 1758

Diagnosis: Robust flies with colourful eyes in live condition; vertex without prominent ocellar tubercle; in males entirely pollinose when present; eyes bare.

4. *Tabanus dorsiger* Wiedemann, 1821

1821. *Tabanus dorsiger*. Wiedemann, *Diptera Exotica, Kiliae*, pp. 43-50, 101.

Type locality: Indian subcontinent

Material examined: 1♀, collected from cow, 22°22'55.8" N, 88°56'39.7" E, 4.6 m, Bhandarkhali, S 24 Paraganas, 08.vi.2013, Coll. Tufan Naiya

Diagnosis: Adult fly is usually larger (14–16 mm in length) than the other two trivittate flies, *T. striatus* and *T. tenens*. Fore head slightly divergent above, frontal callus narrowly separated from eye

margins and median callus spindle-shaped and narrowly joined to dorsal extension of frontal callus. Abdomen trivittate, mid dorsal stripe complete and broad on tergum II, sub lateral pale stripes noticeably step-like; venter uniform with grey tomentum and light pilose. Fore femur and fore tibia are uniformly orange to orangey brown in colour but are darkened apically. Thoracic stripes are distinct. The male has a yellow tinted costal cell on the wing.

Distribution: India (West Bengal: East Midnapore, Hooghly; S 24 Paraganas; Orissa)

Elsewhere: Mexico to Argentina, Trinidad

Remarks: This species is previously known to us as *Tabanus triceps* Thunberg, 1827, later the species was synonymised as *Tabanus dorsiger* Wiedemann, 1821 due to basically same character of callus in fore head and abdominal pattern with sub lateral stripes step like in both species. This species is recorded for the first time from the state of West Bengal.

5. *Tabanus rufiventris* Fabricius, 1805

1805. *Tabanus rufiventris* Fabricius, *Syst. Antl.*, p. 96.

Type locality: India orientali (East India)

Material examined: 1♀, collected from cow, 22°07'35.5" N, 88°47'10.2" E, 6.3 m, Sonagaon, S 24 Paraganas, 11.vi.2013, Coll. T. Naiya

Diagnosis: Head ashy grey haired, flagellum brown at base, gradually

blackish at the apex. Thorax black with hardly seen linear shaped greyish white stripes. Fore head reddish. White beared. Frontal callus broad almost rectangular in shape with broad spindle shaped extension. White abdominal spots are present on posterior margin of each abdominal tergite. Each abdominal tergite densely covered with ashy grey tomentum. Wings almost hyaline, dark brownish on the border. Legs dark brownish to blackish and fore tibiae with grey tomentum.

Distribution: India (West Bengal: Nadia, S 24 Paraganas; Assam, Meghalaya)

Elsewhere: Indonesia.

Remarks: This species is also rare across different parts of West Bengal. This species shows some minute variation in different characters such as colouration of palpi and colour of legs.

6. *Tabanus (Tabanus) brunnipennis* Ricardo, 1911

1911. *Tabanus brunnipennis* Ricardo, *Rec. Indian Mus.*, **4**: 160.

Type locality: North Karnatka, SW India

Material examined: 5♀♀, collected from cow, 22°15'04.0" N, 88°32'36.0" E, 4.5 m, Chandaneswar, S 24 Paraganas, 21.vi.2013, Coll. T. Naiya; 1♀, collected from cow, 22°15'04.0" N, 88°32'36.0" E, 4.5 m, Chandaneswar, S 24 Paraganas, 09.vi.2013, Coll. T. Naiya; 1♀, collected from cow, 22°31'24.0" N, 88°11'41.0" E, 4.5 m, Laxminarayanpur, S 24 Paraganas, 4.vii.2014, Coll. A. Naskar; 2♀♀, collected from cow, 22°31'24.0" N,

88°11'41.0" E, 4.5 m, Laxminarayanpur, S 24 Paraganas, 20.vi.2014, Coll. A. Naskar; 1♀, collected from cow, 22°31'24.0" N, 88°11'41.0" E, 4.5 m, Laxminarayanpur, S 24 Paraganas, 26.v.2014, Coll. A. Maity
Diagnosis: Face with greyish tomentum and few white hairs. Palpi yellow with black hairs ending in obtuse apex. Antennae reddish, scape light coloured with whitish tomentum and black pubescence. Flagellum with small tooth and brown at apical annuli. Fore head with yellowish brown tomentum and few black hairs. Frontal callus club shaped, glossy, reddish brown and not reaching eyes with lineal extension ending in point beyond middle of fore head. Thorax dark with indistinct grey stripes composed of greyish tomentum, black pubescence and traces of yellow pubescence anteriorly. Scutellum reddish with grey tomentum and black hairs, white hairs on border. Abdomen dark reddish brown, usually reddish in anterior tergites. Abdomen with stripes and spots with short white hairs and black pubescence. White spots are short and round situated on each side of second abdominal tergite. Legs reddish, apices of fore tibiae and tarsi blackish. Femora with grey tomentum and chiefly white pubescence. Wings with dark colouring reaching to apex, veins and stigma brown.

Distribution: India (West Bengal: S 24 Paraganas; Assam, Maharashtra)
Elsewhere: Nil

Remarks: This species is very common in S 24 Paraganas district of West Bengal and exhibits maximum abundance in pre monsoon.

**7. *Tabanus (Tabanus) diversifrons*
Ricardo, 1911**

1911. *Tabanus diversifrons* Ricardo, *Rec. Indian Mus.* 4: 214.

Type locality: Shillong, Assam, India
Material examined: 1♀, collected from cow, 22°31'24.0" N, 88°11'41.0" E, 4.5 m, Laxminarayanpur, S 24 Paraganas, 28.v.2014, Coll. S. Hazra

Diagnosis: Face with a few or no brown hairs above, palpi yellow, black pubescent and broad at base. Antennae yellow, scape and pedicel with black hairs. Frontal callus reddish brown, callus pear shaped with rather broad linear extension. Thorax blackish with few appressed ferruginous hairs. Tibiae reddish yellow, fore tibiae blackish at apex. Wings slightly tinged brown. Abdomen reddish yellow with dark apex, dorsum black pubescent with grey tomentum, segmentations pale yellow with some yellow hairs at venter.

Distribution: India (West Bengal: East Midnapore; Hooghly; Howrah; Maldah; S 24 Paraganas; Assam, Himachal Pradesh, Meghalaya)

Elsewhere: Bangladesh, Thailand and Vietnam.

Remarks: This species is fairly common in occurrence during pre-monsoon.

8. *Tabanus (Tabanus) macer* (Bigot, 1892)

1892. *Tabanus macer* Bigot, *Tabanidi*.

Mem. Soc. Zool. Fr., 5: 602-691.

Type locality: India

Material examined: 1♀, collected from cow, 22°31'24.0" N, 88°11'41.0" E, 4.5 m, Laxminarayanpur, S 24 Paraganas, 28.v.2014, Coll. S. Hazra

Diagnosis: Face with grey tomentum and white pubescence. Palpi greyish with some white hairs at base and black hairs very few elsewhere. Scape yellow, pedicel and flagellum reddish with small tooth at base. Fore head broad and covered with yellowish brown tomentum and black pubescence. Frontal callus light brown nearly square almost reaching eyes, sometimes connected by very fine line is irregular shaped dark brown median callus isolated in middle of fore head. Thorax with median stripe linear while side stripes broad and sides greyish with black pubescence. Lateral stripes are continued in scutellum leaving centre blackish. Abdomen narrow, all three stripes continued from first to sixth abdominal tergites, sides grey with white pubescence. Legs uniformly reddish yellow except tarsi a bit dark, femora with grey tomentum and white pubescence. Wings clear, pterostigma and veins yellow.

Distribution: India (West Bengal: S 24 Paraganas; Bihar, Tamil Nadu)

Elsewhere: Nil.

Remarks: This species is rare in occurrence in different parts of study area across West Bengal.

9. *Tabanus (Tabanus) rubidus*

Wiedemann, 1821

1821. *Tabanus rubidus* Wiedemann, *Dipt. Exot.*, 1: 69.

Type locality: Bengalia

Material examined: 1♀, collected from cow, 22°31'24.0" N, 88°11'41.0" E, 4.5 m, Laxminarayanpur, S 24 Paraganas, 4.vii.2014, Coll. A. Naskar; 1♀, collected from cow, 22°31'24.0" N, 88°11'41.0" E, 4.5 m, Laxminarayanpur, S 24 Paraganas, 4.vii.2014, Coll. A. Maity

Diagnosis: Face covered with grey tomentum and white hairs. Palpi stout and large, light yellow with black pubescence. Frontal callus oblong with short linear extension. Abdomen lilac to reddish brown in colour. Thorax dark reddish with grey tomentum and indistinct stripes. Median abdominal stripes not continuous rather composed of greyish white tomentose triangular spots and lateral stripes are also composed of greyish white irregular tomentose spots, appears as step like. Sides of abdomen serrated. Femora dark, fore tibiae light yellowish but dark at apices. Wings hyaline, in middle slight yellowish.

Distribution: India (West Bengal:

Hooghly; Maldah; S 24 Paraganas; Arunachal Pradesh, Meghalaya, Orissa, Sikkim)

Elsewhere: Pakistan, Philippines, China, Indonesia.

Remarks: This species is widely known across different study area of West Bengal.

**10. *Tabanus (Tabanus) striatus*
Fabricius, 1787**

1787. *Tabanus striatus*. Fabricius,
Mantissa insect. 2: 356.

Type locality: China.

Material examined: 8♀♀, collected from cow, 22°07'35.5" N, 88°47'10.2" E, 6.3 m, Sonagaon, S 24 Paraganas, 11.vi.2013, Coll. T. Naiya; 6♀♀, collected from cow, 22°22'55.8" N, 88°56'39.7" E, 4.6 m, Bhandarkhali, S 24 Paraganas, 08.vi.2013, Coll. T. Naiya; 3♀♀, collected from cow, 22°15'04.0" N, 88°32'36.0" E, 4.5 m, Chandaneswar, S 24 Paraganas, 25.vii.2013, Coll. T. Naiya; 2♀♀, collected from cow, 22°15'04.0" N, 88°32'36.0" E, 4.5 m, Chandaneswar, S 24 Paraganas, 16.v.2013, Coll. T. Naiya; 3♀♀, collected from cow, 22°15'04.0" N, 88°32'36.0" E, 4.5 m, Chandaneswar, S 24 Paraganas, 21.vi.2013, Coll. T. Naiya; 1♀, collected from cow, 22°15'04.0" N, 88°32'36.0" E, 4.5 m, Chandaneswar, S 24 Paraganas, 12.viii.2013, Coll. T. Naiya; 1♀, collected from cow, 22°15'04.0" N, 88°32'36.0" E, 4.5 m, Chandaneswar, S 24 Paraganas, 26.v.2013, Coll. T. Naiya; 1♀, collected from cow, 22°00'38.2" N, 88°27'36.0" E, 7 m, Nolgora, S 24 Paraganas, 12.vi.2013, Coll. T. Naiya; 2♀♀, collected from cow, 22°07'58.0" N, 88°44'17.9" E, 3 m, Jyotishpur, S 24 Paraganas, 09.vi.2013, Coll. T. Naiya; 1♀, collected from cow, 22°15'20.0" N, 88°32'46.0" E, 4 m, Dhosa, S 24 Paraganas, 11.vi.2013, Coll. T. Naiya;

9♀♀, collected from cow, 22°31'24.0" N, 88°11'41.0" E, 4.5 m, Laxminarayanpur, S 24 Paraganas, 26.v.2014, Coll. A. Maity; 18♀♀, collected from cow, 22°31'24.0" N, 88°11'41.0" E, 4.5 m, Laxminarayanpur, S 24 Paraganas, 28.v.2014, Coll. S. Hazra; 1♀, collected from cow, 22°31'24.0" N, 88°11'41.0" E, 4.5 m, Laxminarayanpur, S 24 Paraganas, 28.v.2014, Coll. A. Maity; 3♀♀, collected from cow, 22°31'24.0" N, 88°11'41.0" E, 4.5 m, Laxminarayanpur, S 24 Paraganas, 28.v.2014, Coll. A. Naskar; 1♀, collected from cow, 22°31'24.0" N, 88°11'41.0" E, 4.5 m, Laxminarayanpur, S 24 Paraganas, 27.v.2014, Coll. A. Naskar; 1♀, collected from cow, 22°31'24.0" N, 88°11'41.0" E, 4.5 m, Laxminarayanpur, S 24 Paraganas, 27.v.2014, Coll. A. Maity; 1♀, collected from cow, 22°31'24.0" N, 88°11'41.0" E, 4.5 m, Laxminarayanpur, S 24 Paraganas, 20.vi.2014, Coll. A. Naskar; 4♀♀, collected from cow, 22°09'52.8" N, 88°48'25.4" E, 5.2 m, Gosaba, S 24 Paraganas, 14.viii.2014; Coll. T.K. Mondal; 3♀♀, collected from cow, 22°11'23.4" N, 88°36'11.7" E, 8 m, Meraganj, S 24 Paraganas, 12.viii.2014; Coll. R.S. Mridha; 2♀♀, collected from cow, 22°02'10.8" N, 88°40'42.9" E, 3.5 m, Jharkhali, S 24 Paraganas, 13.viii.2014, Coll. R.S. Mridha; 5♀♀, collected from cow, 22°12'57.9" N, 88°49'13.8" E, 7 m, Harishpur, S 24 Paraganas, 11.viii.2014, Coll. T.K. Mondal; 1♀, collected from cow, 22°15'03.3" N, 88°34'10.0" E, 5.6 m, Dharmatala, S 24 Paraganas, 21.vi.2013,

T. Naiya

Diagnosis: Face grey haired, white pubescent, beard white, palpi light yellow, white tomentose with some curved black hairs. Antennae reddish yellow with dark apex, forehead about 6 times as long as it is wide with yellowish grey tomentum and short white pubescence. Frontal callus shining reddish brown, oblong, not reaching eyes anteriorly, posteriorly receding and continued in fine line, then become broadened. A proboscis on back part of head short & wide, thorax reddish brown with 4 distinct greyish white tomentose stripes with white pubescence. Sides of thorax black haired, venter grey with white pubescence. Scutellum same colour as thorax with white hairs on posterior border. Legs reddish yellow, fore femora rusty reddish, with black hairs on upper sides. Middle and posterior pair blackish with grey tomentum, pubescent predominantly white. Tibiae with dorsal black hairs, tarsi reddish brown with black pubescence, coxae white pubescent. Wings hyaline, stigma yellowish, veins reddish. Abdomen long and slender, varying from reddish brown to blackish brown, median stripe continuous up to 6th segment, composed of grey tomentose spots, side stripes up to 4th segment. Venter sides with long white hairs, reddish yellow and covered with grey tomentum. Halteres yellowish brown with lighter knob.

Distribution: India (West Bengal: Alipurduar; Bankura; Birbhum;

Bardhaman; Darjeeling; East Midnapore; Hooghly; Howrah; Jalpaiguri; Kolkata; Maldah; Murshidabad; N 24 Paragana; Nadiya; Puruliya; S 24 Paraganas; S Dinazpur; West Midnapore; Arunachal Pradesh, Assam, Bihar, Delhi, Gujrat, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland, Orissa, Punjab, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh)

Elsewhere: Bangladesh, Bhutan, Comodia, China, Laos, Myanmar, Nepal, Pakistan, Sri Lanka, Thailand and Vietnam.

Remarks: There was taxonomic misinterpretation through ages and hence the distributional records associated with the species were in a mess everywhere. Later, Burger and Thompson² aptly illustrated, keyed and discussed these species with a view to making away with the recurrent confusion. This is a very common and widespread species in India, and is often found to enter the house, being attracted by light in hot summer night³.

11. *Tabanus (Tabanus) tenens* Walker, 1850

1850. *Tabanus tenens* Walker, *Insecta Saunders., Dipt., 1: 49.*

Type locality: East India

Material examined: 2♀♀, collected from cow, 22°02'10.8" N, 88°40'42.9" E, 3.5 m, Jharkhali, S 24 Paraganas, 13.viii.2014, Coll. R.S. Mridha

Diagnosis: Medium size fly (10–13 mm in length). Antennae rusty yellow. Scape and pedicel light yellowish, flagellum reddish, darker at apical annuli. Palpi orangish with long white hairs and few black hairs, ending at acute point. Face grey haired. Beared whitish. Frontal callus broad oblong with broad spindle shaped extension. Thorax with four distinct stripes composed white tomentum and a narrow brown line on the middle, ashy grey hairs at sides and posterior margin. Scutellum white pubescent and posterior margin with long whitish grey hairs. Brown to grey in colour with trivittate abdomen. The adult fly has a complete pale median abdominal stripe. Wings clear, veins brown, pterostigma light brownish. Fore tibia is bicoloured with blackish apical one-third and paler basal two-thirds.

Distribution: India (West Bengal: E Midnapore; Bankura; Maldah; Birbhum; Hooghly; S 24 Paraganas; Assam, Orissa, Sikkim)

Elsewhere: SE Asia.

Remarks: The adult fly is an important mechanical vector of Surra disease and is also implicated in the transmission of anthrax¹².

Among 11 tabanid species under three genera that were recorded from study sites of mangroves and associated costal region, two species under two genera namely *Chrysops designatus* Ricardo, 1911; *Tabanus dorsiger* Wiedemann, 1821; were recorded for the first time from

the state, and more specifically from coastal area of West Bengal. The Tabanid fauna were abundant throughout the study area and can be seen throughout the year with a little decline at during winter.

Two tabanid species under two genera exhibited new distributional record from the state of West Bengal. Among 11 tabanid species, two species viz. *Tabanus (Tabanus) brunnipennis* Ricardo, 1911; *Tabanus (Tabanus) macer* (Bigot, 1892) exhibited endemism to India. Surprisingly all these 11 tabanid species exhibited wide distribution pattern throughout India and none of them were endemic to the state of West Bengal. On the other hand within the state, three tabanid species exhibited restricted distribution to only coastal region of West Bengal. *Chrysops designatus* Ricardo, 1911; *Tabanus (Tabanus) brunnipennis* Ricardo, 1911; *Tabanus (Tabanus) macer* (Bigot, 1892) were found only from coastal stretch around mangrove ecosystem in S 24 Paraganas district of the state. Certain species occurring in mangroves and associated coastal region of West Bengal may immigrate at least to the neighbouring countries, such as Bangladesh, Myanmar, Thailand, etc. or emigrate from those countries in the influence of allied topographic and climatic conditions. Indeed, nearly several species showed discontinuous distribution, and this appeared to be due to the need of thorough exploration of several area, unfavourable

natural conditions in the area for survival and colonization, inaccessible area especially large part of Sundarban biosphere reserve, and border areas.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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