



Tipula (Vestiplex) hasiya sp. nov., a new crane fly species (Diptera, Tipulidae) from Nepal

Tipula (Vestiplex) hasiya sp. nov., новый вид комара-долгоножки (Diptera, Tipulidae) из Непала

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Abstract. A new crane fly species from Nepal, *Tipula (Vestiplex) hasiya* sp. nov. (Diptera: Tipulidae), is described and illustrated. The male and female genitalia are illustrated for the most closely related species, *T. (V.) subtincta* Brunetti, 1912. The female of *T. (V.) subtincta* is described for the first time.

Резюме. Новый вид комара-долгоножки *Tipula (Vestiplex) hasiya* sp. nov. (Diptera: Tipulidae) описан из Непала и проиллюстрирован. Приведены иллюстрации гениталий самца и самки наиболее близкого вида *T. (V.) subtincta* Brunetti, 1912. Впервые дано описание самки *T. (V.) subtincta*.

Key words: hypopygium, ovipositor, taxonomy, Nematocera, Tipulinae, *Vestiplex*, new species

Ключевые слова: гипопигий, яйцеклад, таксономия, Nematocera, Tipulinae, *Vestiplex*, новый вид

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Introduction

The World fauna of the subgenus *Vestiplex* Bezzi, 1924 of the genus *Tipula* Linnaeus, 1758 currently contains 176 recent species (including the type species *Tipula cisalpina* Riedel, 1913) distributed throughout the Holarctic and Oriental regions (Oosterbroek, 2020). The highest species diversity is observed in the East Palaearctic (77 species) and Oriental (76 species) regions, with 11 species known from Nepal (Oosterbroek, 2020).

Females belonging to the subgenus *Vestiplex*, are recognised by an ovipositor with powerfully constructed, heavily sclerotised cerci and serrate

outer margins, which may be smooth in some Asiatic species. The hypovalvae are small to rudimentary (Alexander, 1935, 1965; Alexander & Byers, 1981). The male genitalia in many *Vestiplex* member are characterised by tergite 9 typically forming a shallowly concave and sclerotised saucer; however, in some other species of this subgenus tergite 9 is completely divided longitudinally by a pale membrane, with dorsal portion simple or with paired extensions on the posterior margin. Ventral portion of tergite 9 has a pair of membranous plates or sclerotised, microscopically roughened armatures; some species have ventral portion enlarged, occupying about half of tergite surface (Alexander, 1935; Alexander & Byers, 1981; Starkevich et al., 2019a, 2019b).

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The aim of this study was to describe and illustrate a new species and to provide a description and illustrations of a closely related species.

Material and methods

The material of the new species was collected by the first author during a trip to Nepal in 2012.

Pinned specimens were examined with an Olympus SZ61 stereomicroscope. A Nikon d7000 digital camera equipped with a Tamron 70-300/4-5.6 and an EL-Nikkor 50/2.8 lenses or a Mitutoyo M Plan Apo 10x microscope objective lenses and controlled by Helicon Remote 2.6.5.w software was used to capture stacked images. The comparative material of *Tipula (Vestiplex) subtinctoria* Brunetti, 1912 was examined with a Nikon SMZ800 stereomicroscope. The photos were taken with an Infinity-1 camera mounted on a Nikon Eclipse 200 stereomicroscope and Canon EOS 80D mounted on an Olympus SZX10 dissecting microscope. Stacked images were combined using Helicon Focus 6.7.1.Pro software. The resulting photos were adjusted in Adobe Photoshop CS2.

The male and female genitalia were examined after heating in 10% NaOH solution for 10 minutes. Cleared genitalia were preserved in microvials filled with glycerol and pinned together with the corresponding specimens. Photos of genital structures were taken using the equipment and technique described above.

Descriptive terminology generally follows that of Cumming & Wood (2017), with some additions for particular features for *Vestiplex*. The term 'appendage of sternite 9' (=A9S) is adopted from Mannheims (1963), and the terms 'ventral lobe' and 'dorsal lobe' of A9S were adopted from Gelhaus (2005).

Abbreviations for the collections and institutions used herein are as follows: BMNH, Natural History Museum, London, the United Kingdom; NRC, Nature Research Centre, Vilnius, Lithuania; USNM, United States National Museum of Natural History, Washington, D.C., USA; VPC, private collection of Valentin E. Pilipenko, Moscow, Russia; ZISP, Zoological Institute of Russian Academy of Sciences, St Petersburg, Russia; ZMUM, Zoological Museum of Moscow State University, Moscow, Russia.

Taxonomic part

Order Diptera

Family Tipulidae

Subfamily Tipulinae

Genus *Tipula* Linnaeus, 1758

Subgenus *Vestiplex* Bezzi, 1924

Tipula (Vestiplex) hasiya sp. nov.

(Figs 1–3)

Holotype. Male, **Nepal**, Kathmandu Valley, 12 km E of Kathmandu, hilltop of Changu Narayan, 27°42'54.0"N85°27'39.6"E, 1400–1500 m, 23.IX.2012, coll. V. Pilipenko (ZISP).

Paratypes. 3 males, 1 female, with same labels as in holotype: male (ZMUM), female (ZISP), male (NRC), male (VPC).

Diagnosis. A medium-sized crane fly with head and thorax yellow to brownish yellow, abdomen with basal segments yellow, trivittate, and terminal segments brownish black. Antenna if bent backward reaching almost the base of wing, with weak bicolor appearance. Wings yellowish brown. Prescutum and presutural scutum with four brown stripes. Tergite 9 divided at midline by pale membrane, posterior margin with two finger-shaped lobes directed caudally. Ventral side of tergite 9 with a pair of blackened, microscopically roughened lobes. Gonocoxite apically produced into two spines; outer spine slender, black, slightly curved with acute tip; inner spine shorter, yellowish with blackened obtuse tip. Sternite 9 with dorsal lobe of A9S curved nearly at right angle.

Description. *Male* (Figs 1A, C–E, 2). Body length 13.5–14.2 mm, wing length 19.2–19.5 mm, length of antenna 3.8–3.9 mm ($n = 4$).

Head (Fig. 1D). Coloration mainly yellow, with dark median line. Rostrum yellowish brown with distinct yellow nasus. Antenna relatively short, 13-segmented, if bent backward reaching almost the base of wing. Scape and pedicel yellow; first flagellomere brownish yellow; succeeding flagellar segments dark brown, apically narrowly pale, giving indistinct bicoloured appearance; terminal segments dark brown. Apical flagellomere very small, light brown. Verticils slightly longer than corresponding segments. Proboscis and palpus brown.

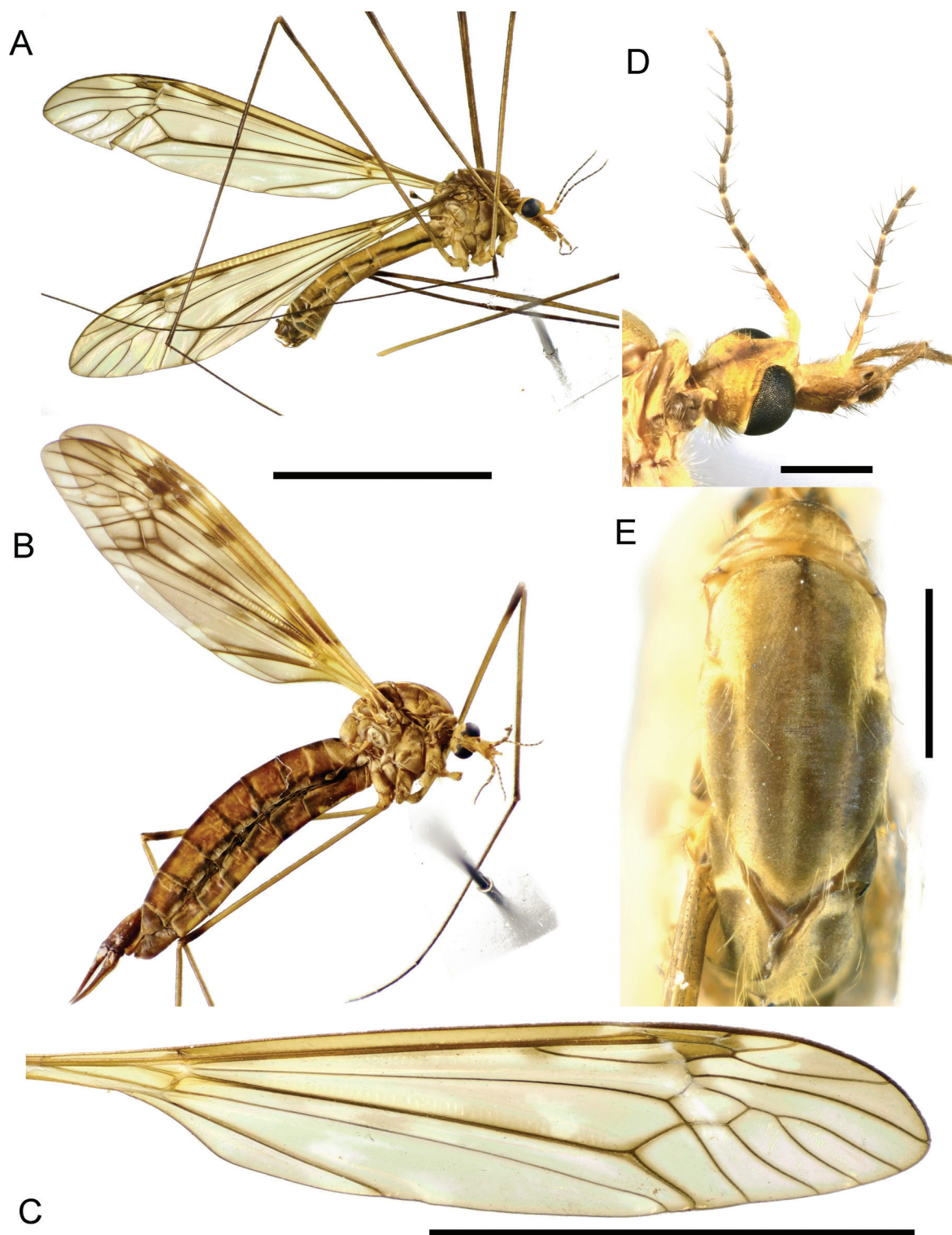


Fig. 1. *Tipula (Vestiplex) hasiya* sp. nov. Paratypes, adult male and female. **A**, male habitus, lateral view; **B**, female habitus, lateral view; **C**, wing of male; **D**, head of male; **E**, thorax of male, dorsal view. Scale bars: A, B, C – 10 mm; D, E – 1 mm.

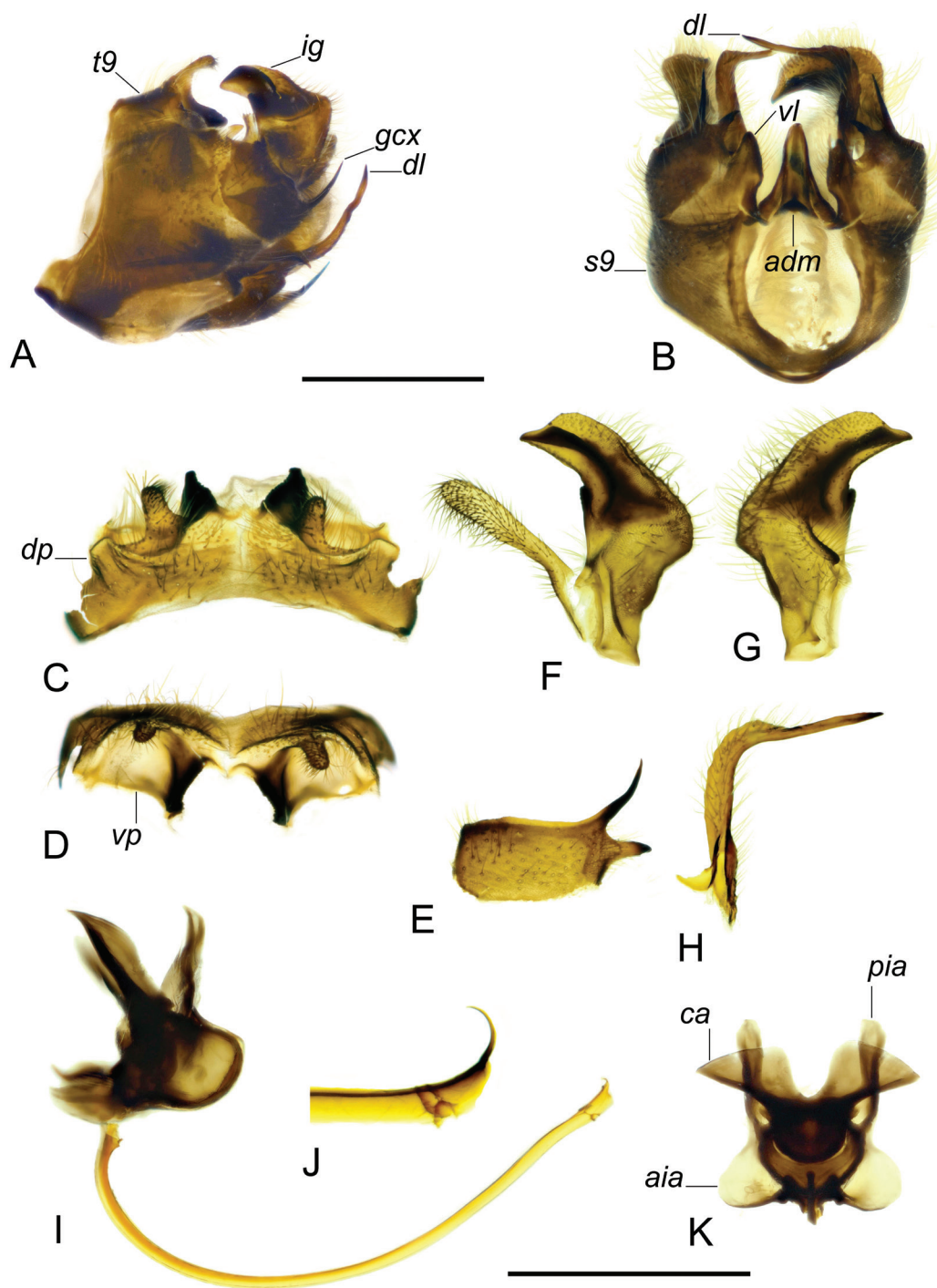


Fig. 2. *Tipula (Vestiplex) hasiya* sp. nov. Hypopygium of male. **A**, hypopygium, lateral view; **B**, hypopygium, ventral view; **C**, tergite 9, dorsal view; **D**, tergite 9, ventral view; **E**, left gonocoxite; **F**, left outer and inner gonostyli, lateral view; **G**, left inner gonostylus, medial view; **H**, dorsal lobe of appendage of sternite 9; **I**, sperm pump and aedeagus, lateral view; **J**, distal part of aedeagus; **K**, sperm pump, frontal view. Scale bars: **A**, **B** – 1 mm; **C**–**K** – 0.5 mm. Abbreviations: *adm* – adminiculum, *aia* – anterior immovable apodeme, *ca* – compressor apodeme, *dl* – dorsal lobe of appendage of sternite 9, *dp* – dorsal portion of tergite 9, *gcx* – gonocoxite, *ig* – inner gonostylus, *pia* – posterior immovable apodeme, *s9* – sternite 9, *t9* – tergite 9, *vl* – ventral lobe of appendage of sternite 9, *vp* – ventral portion of tergite 9.

Thorax (Fig. 1E). Coloration mainly brownish yellow. Pronotum yellowish with median line. Prescutum and presutural scutum with four brown stripes. Intermediate pair apically fused into a broad brown median stripe. Postsutural scutum brownish yellow; scutal lobe each with two dark brown spots. Scutellum and postnotum yellow with narrow median dark brown line. Pleura yellow. Halter yellow with the base of knob dark brown. Coxae and trochanters yellow, femora brownish yellow with tip dark brown (Fig. 1A). Tibiae and tarsal segments dark brown. Tarsal claws with a tooth. Wing yellowish brown, variegated by brown and whitish subhyaline areas (Fig. 1C). Cells *c* and *sc* darker than ground colour; stigma brown.

Abdomen. Abdominal segments 1–5 yellow, trivittate; remaining segments brownish black. Tergites 6–7 laterally pale; sternites 6–7 with posterior margin pale.

Hypopygium (Fig. 2A–K). Coloration yellowish brown. Tergite 9 short, divided at midline by pale membrane (Figs 2C, 2D). Dorsal portion of tergite 9 covered with setae, its posterior margin with two finger-shaped lobes directed caudally and provided with abundant setae. Ventral portion of tergite 9 yellow, with a pair of blackened, microscopically roughened lobes; the lobes broadened at base, with narrowed tip. Gonocoxite entirely cut off from sternite 9, apically produced into two spines (Figs 2B, 2E). Outer spine slender, black, slightly curved with acute tip, inner spine shorter, yellowish with blackened obtuse tip. Outer gonostylus narrow, elongate, finger-shaped (Fig. 2F). Inner gonostylus elongated (Figs 2F, 2G). Upper beak short and obtuse; lower beak in shape of black narrow lobe; dorsal crest with margin sloping, middorsally expanded into a hump. Medial surface beneath the lower beak with a narrow blackened lobe (Fig. 2G). Sternite 9 with ventral lobe of A9S nearly triangular with narrowed tip, covered with setae (Fig. 2B). Dorsal lobe of A9S curved nearly at right angle, basally flattened, with setae, apically in shape of straight acute spine (Figs 2B, 2H). Adminiculum triangular in ventral view, apically with rounded tip (Fig. 2B). Sperm pump with central vesicle swollen (Fig. 2I). Compressor apodeme with a broad and deep median incision (Figs 2I, 2K). Posterior immovable

apodeme narrowed. Anterior immovable apodeme in shape of rounded plate. Aedeagus yellow, about 2.8 times as long as sperm pump (Fig. 2I). Distal part of aedeagus funnel-shaped, with two rounded microscopic formations; margin extended at tip into a narrow strip (Fig. 2J).

Female (Fig. 1B). Body length 20.1 mm, wing length 20.0 mm, length of antenna 2.3 mm ($n = 1$). Generally similar to male. Antenna short, if bent backward reaching pronotum. Scape and pedicel yellow; first flagellomere brownish yellow; succeeding flagellar segments cylindrical, dark brown, apically broadly yellow, giving bicoloured appearance. Abdomen reddish yellow; dorsal abdominal stripe broad, dark brown.

Female terminalia (Fig. 3A–E). Tergite 10 shining brown. Cercus brown, narrow and slender, its tip narrowed, dorsal and ventral margins with distinct fine serration (Figs 3A, 3B). Sternite 8 light brown, with posterolateral margin darkened (Fig. 3C). Hypoalva in shape of short brown plate, with lateral edge darkened, tip with distinct incision. Posterolateral angle of sternite 8 sclerotised, nearly triangular with tip obtuse. Median incision between hypoalvae with serrated edge. Posterior part of sternite 9 covered with short filaments, shovel-shaped, medially with a broad groove, posterior margin with U-shaped incision and small medial point (Fig. 3D). Anterior parts of sternite 9 narrow and straight. Furca posteriorly oblong and broadened, its anterior part short and narrow (Fig. 3D). Posterior part of furca frontally splitted into two layers (Fig. 3E). Spermathecae spherical, three in number.

Comparison. *Tipula* (V.) *hasiya* **sp. nov.** is considered here as a member of *T. subtinctoria* species-group, which was proposed by Savchenko (1964) for *T. (V.) subtinctoria* Brunetti, 1912, *T. (V.) distifurca* Alexander, 1942 and *T. (V.) optanda* Alexander, 1935; the list of species was later revised by Starkevich (2012). The males of *T. subtinctoria* species-group are characterised by the dorsal portion of tergite 9 with paired extensions on posterior margin and ventral portion with a pair of blackened, microscopically roughened lobes, the gonocoxite with one or two spines, and dorsal lobe of the appendage of sternite 9 long, with the tip acute or splitted (Starkevich, 2012).

Tipula (V.) *hasiya* **sp. nov.** is the closest species to *T.* (V.) *subtinctoria* (India, Nepal) based on the body coloration, wing pattern and the shape of the male and female genitalia. The two species can be separated by the thoracic stripes, which are not bordered in *T.* (V.) *hasiya* **sp. nov.**, while *T.* (V.) *subtinctoria* has stripes bordered by darker brown. Both species can be also separated by a set of genital features discussed below.

The males of both species are characterised by the narrow tergite 9, which has two finger-shaped lobes on the posterior margin and black roughened lobes on the ventral side, the gonocoxite with two apical spines and the shape of the inner gonostylus. They can be separated by the dorsal lobe of A9S, which is specifically curved nearly at a right angle in *T.* (V.) *hasiya* **sp. nov.**, the feature being distinctly visible in undissected specimens. Contrastingly, *T.* (V.) *subtinctoria* has a slightly curved dorsal lobe of A9S. The two species can be also separated by the following features: *T.* (V.) *hasiya* **sp. nov.** has black lobes of tergite 9 distinctly broadened at the base, while in *T.* (V.) *subtinctoria* they are much slenderer. The inner gonostylus in *T.* (V.) *hasiya* **sp. nov.** has a middorsal hump, while in *T.* (V.) *subtinctoria* the hump is located more basally. In *T.* (V.) *hasiya* **sp. nov.**, the medial surface of the inner gonostylus beneath the lower beak has a relatively long narrow blackened lobe, which is short and medially broadened in *T.* (V.) *subtinctoria*. *Tipula* (V.) *subtinctoria* has a specific adminiculum with the tip distinctly slender and acute, while in *T.* (V.) *hasiya* **sp. nov.** the tip is rounded.

The females of both species are characterised by the narrow slender cerci and specific shape of sternite 8. They can be separated by the following details: in *T.* (V.) *subtinctoria*, the median incision between the hypovalvae is finely toothed, while in *T.* (V.) *hasiya* **sp. nov.** it has no teeth; in *T.* (V.) *subtinctoria*, the posterolateral angles of sternite 8 are acute and incision between the angle and hypovalva is deep and narrow, while in *T.* (V.) *hasiya* **sp. nov.** the lateral angles are obtuse and incision is shallower.

Etymology. The new species has a specific shape of the appendage of sternite 9, resembling a *hasiya*, a Nepalese sickle with a curved blade, which is used as an agricultural tool.

Distribution. Nepal.

Habitat. Four males and one female were collected in Kathmandu Valley, Nepal, in late September 2012. The new species was collected with an entomological net at altitudes of approximately 1400–1500 metres in a tropical forest dominated by various deciduous trees, bamboo and bushes (Fig. 6).

***Tipula* (*Vestiplex*) *subtinctoria* Brunetti, 1912**
(Figs 4–5)

Tipula subtinctoria Brunetti, 1912: 326.

Tipula (*Vestiplex*) *subtinctoria*: Alexander, 1935: 119; 1942: 42; 1963: 23; Savchenko, 1964: 149; Joseph, 1974: 272; Alexander & Alexander, 1973: 65.

Material examined. **India, West Bengal:** 1 male, Darjeeling, 6900 ft., 8.VI.1917, E. Brunetti, B.M.1927-184 (BMNH); 1 male, "Umgebung Darjiling" [environs of Darjeeling], [date unknown], "*Tipula* (*Vestiplex*) sp. *gedehana*? de Meij. *papandajanica*? Edw., Mannheims det. 1947, Zool. Staatselg. München" (USNM); 1 female, same data including identification (USNM); 1 male [antenna, leg, wing and genitalia slide-mounted], Darjeeling, 5.V.1958, Matthew (USNM); 1 male [antenna, leg, wing and genitalia slide-mounted], Kurseong, 5455 ft., 9.IX.1958, Camilleri (USNM); 1 male [genitalia slide-mounted], Labha, 5000 ft., 11.IX.1959, Schmid (USNM). **Meghalaya,** 1 male, Shillong, Sept.-Oct. [19]18, pres.[ented] by T.B. Fletcher, B.M.1925-546 (BMNH). **Sikkim:** 1 male [antenna, legs, wing and genitalia slide-mounted], 1 male [antennae, palpus, legs, wing and genitalia slide mounted], Yugang, 5700 ft., 14.V.1959, F. Schmid (USNM); 1 male [antenna, leg, wing and genitalia slide-mounted], same data but 24.VII.1959 (USNM); 1 male [antenna, legs, wing and genitalia slide-mounted], Nanga, 5000 ft., 11.V.1959, F. Schmid (USNM); 1 male [antenna, leg, wing and genitalia slide-mounted], Chumtang, 5120 ft., 30.VII.1959, Schmid (USNM).

Redescription. Male. General body coloration yellow, with thorax yellowish brown and terminal segments of abdomen darkened. Head yellow, with distinct nasus. Antenna 13-segmented, if bent backward reaching the base of wing. Scape, pedicel and first flagellomere yellow; succeeding flagellar segments dark brown, apically narrowly pale, giving indistinct bicoloured appearance; terminal segments dark brown. Verticils longer than corresponding segments. Palpus brown. Thorax yellowish brown. Prescutum and presutural scutum yellowish brown with four dark brown stripes narrowly bordered by darker brown. Pleura yellow. Coxae and trochanters yellow; femora

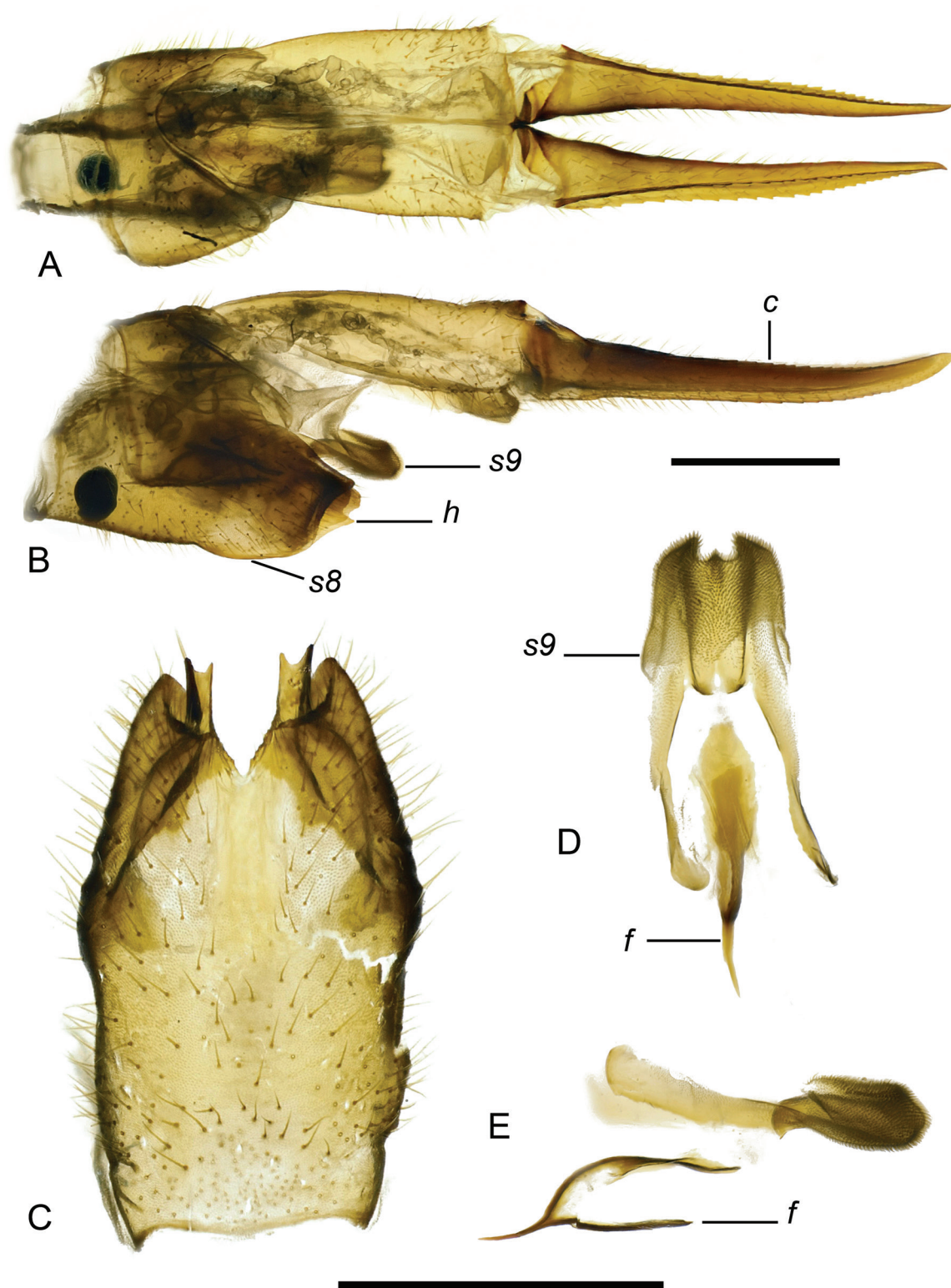


Fig. 3. *Tipula (Vestiplex) hasiya* sp. nov. Female terminalia. **A**, ovipositor, dorsal view; **B**, ovipositor, left lateral view; **C**, sternite 8 with hypovalva ventral view; **D**, sternite 9 and furca, dorsal view; **E**, sternite 9 and furca, lateral view. Scale bar: 1 mm. Abbreviations: *c* – cerci, *f* – furca, *h* – hypovalvae, *s8* – sternite 8, *s9* – sternite 9.

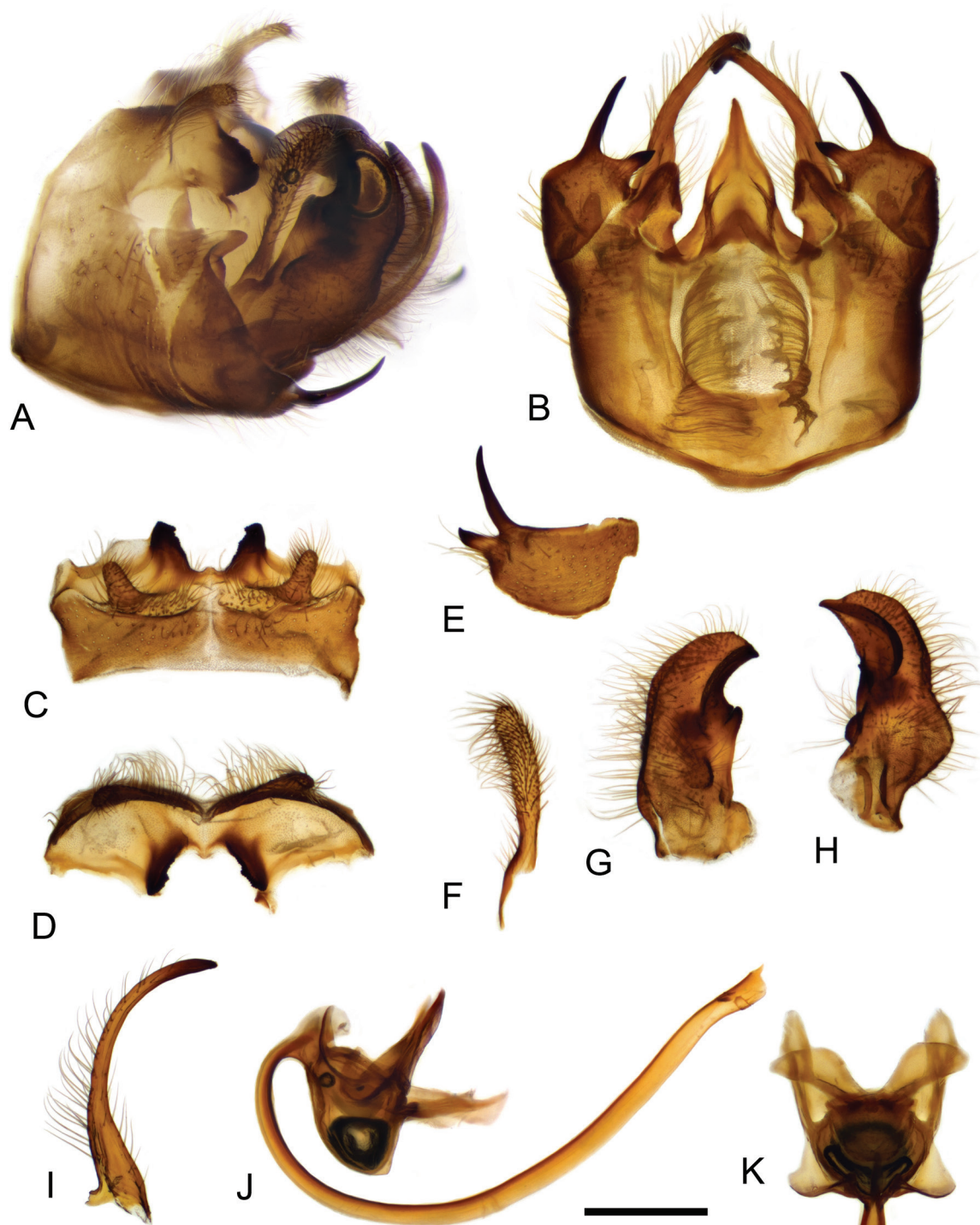


Fig. 4. *Tipula (Vestiplex) subtinctoria* Brunetti, 1912. Hypopygium of male (India, West Bengal). **A**, hypopygium, lateral view; **B**, hypopygium, ventral view (tergite 9, left outer and inner gonostyli removed); **C**, tergite 9, dorsal view; **D**, tergite 9, ventral view; **E**, left gonocoxite; **F**, left outer gonostylus, lateral view; **G**, left inner gonostylus, lateral view; **H**, left inner gonostylus, medial view; **I**, dorsal lobe of appendage of sternite 9; **J**, sperm pump and aedeagus, lateral view; **K**, sperm pump, frontal view. Scale bar: 0.5 mm.

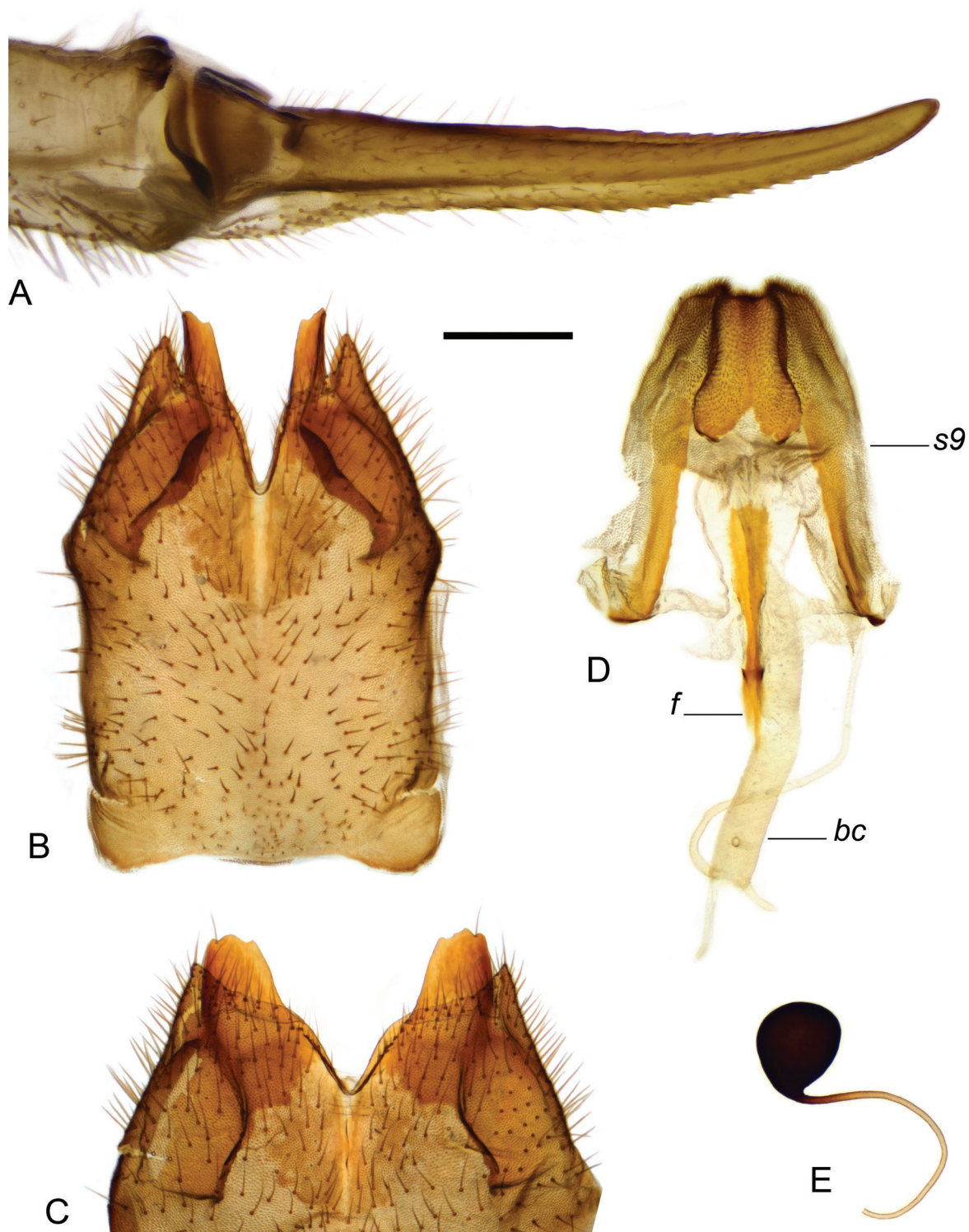


Fig. 5. *Tipula (Vestiplex) subtinctoria* Brunetti, 1912. Female terminalia (India, West Bengal). **A**, cercus, left lateral view; **B**, sternite 8 with hypovalvae, ventral view; **C**, distal part of sternite 8 with hypovalvae, ventral view; **D**, sternite 9, furca and bursa copulatrix, dorsal view; **E**, spermatheca. Scale bar: 0.5 mm. Abbreviations: *bc* – bursa copulatrix, *f* – furca, *s9* – sternite 9.



Fig. 6. Type locality of *Tipula (Vestiplex) hasiya* sp. nov. (Nepal, 12 km E of Kathmandu, hilltop of Changu Narayan, 27°42'54.0"N 85°27'39.6"E).

brownish with tips dark brown. Tibiae and tarsal segments dark brown. Tarsal claws with a tooth. Wing pale brown, sparsely variegated by darker brown and whitish subhyaline areas. Abdominal segments 1–4 yellow; segments 5–9 brown to dark brown. Tergites with posterior margins narrowly pale, dorsally with brown median stripe and narrow lateral streak.

Hypopygium (Fig. 4A–K). Hypopygium dark brown. Dorsal surface of tergite 9 covered with setae, its posterior margin with two finger-shaped lobes directed caudally and provided with abundant setae (Figs 4A, 4C). Ventral side of tergite 9 yellow, with a pair of blackened, microscopically roughened lobes (Fig. 4D). Gonocoxite entirely cut off from sternite 9, apically produced into two spines (Figs 4B, 4E); outer spine slender, brown-

ish-black, slightly curved, with subacute tip; inner spine shorter, yellowish with blackened obtuse tip. Outer gonostylus narrow, elongate, finger-shaped (Fig. 4F). Inner gonostylus elongate, brownish yellow (Figs 4G, 4H). Upper beak short and obtuse; lower beak in shape of black narrow lobe, dorsal crest with margin sloping, basally expanded into hump. Medial surface beneath the lower beak with a short medially broadened lobe having a blackened edge (Fig. 4G). Sternite 9 with ventral lobe of A9S nearly triangular with rounded tip, covered with setae (Fig. 4B). Dorsal lobe of A9S elongate, gently curved, with narrowed and blackened tip (Figs 4B, 4I). Adminiculum triangular in ventral view, basally broad, apically extended, with acute tip (Fig. 4B). Sperm pump with central vesicle swollen (Fig. 4J). Compressor

apodeme with a broad and deep median incision (Fig. 4K). Posterior immovable apodeme narrow. Anterior immovable apodeme in shape of rounded plate. Aedeagus yellow, about 3.3 times as long as sperm pump (Fig. 4J). Distal part of aedeagus funnel-shaped, with two rounded microscopic formations; margin with short triangular tip.

Female. Body length 21.2 mm, wing length 19.1 mm (n = 1). Generally similar to male. Antenna short, if bent backward reaching prescutum. Scape and pedicel yellow; flagellum yellowish brown; flagellar segments cylindrical, darkened at base, giving indistinct bicoloured appearance. Abdomen yellowish, with dorsal abdominal stripe broad, dark brown.

Female terminalia (Fig. 5A–E). Tergite 10 shining brown. Cercus yellowish brown, narrow and slender, its tip narrowed, dorsal and ventral margins with distinct serration (Fig. 5A). Sternite 8 light brown, with posterolateral margin darkened (Fig. 5B). Hypoalva in shape of short light brown plate, with tip toothed (Fig. 5C). Posterolateral angle of sternite 8 sclerotised, nearly triangular with tip narrow. Median incision between hypoalvae with serrated edge. Posterior part of sternite 9 covered with short filaments, shovel-shaped, medially with a broad groove, posterior margin with shallow U-shaped incision (Fig. 5D). Anterior part of sternite 9 narrow and straight. Furca in shape of elongate, anteriorly narrowed stripe (Fig. 5D). Bursa copulatrix stout (Fig. 5D). Spermatheca nearly spherical (Fig. 5E).

Distribution. India, Nepal.

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