

## Research article

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**Six new species of *Tipula (Vestiplex) Bezzi*  
(Diptera, Tipulidae) from Tibet**Qi-cheng YANG<sup>1</sup>, Yan LI<sup>2</sup>, Zhao-hui PAN<sup>3</sup>, Xiao-yan LIU<sup>4,\*</sup> & Ding YANG<sup>5,\*</sup><sup>1,4</sup>Hubei Insect Resources Utilization and Sustainable Pest Management Key Laboratory, College of Plant Science & Technology of Huazhong Agriculture University, Wuhan, Hubei, 430070, China.<sup>2</sup>Plant Protection College, Shenyang Agricultural University, Shenyang, Liaoning, 110866, China.<sup>3</sup>Institute of Plateau Ecology, Tibet Agriculture & Animal Husbandry University, Linzhi, Xizang, P.R. 860000, China.<sup>5</sup>China Agricultural University, Beijing, 100193, China.

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**Abstract.** Twelve species of the subgenus *Vestiplex* (Diptera, Tipulidae) were previously known to occur in Tibet (= Xizang), China. Here, six species are described and illustrated as new to science: *Tipula (Vestiplex) bucera* sp. nov., *Tipula (Vestiplex) magatama* sp. nov., *Tipula (Vestiplex) motuoensis* sp. nov., *Tipula (Vestiplex) nayogabuensis* sp. nov., *Tipula (Vestiplex) platyphylla* sp. nov. and *Tipula (Vestiplex) uncinella* sp. nov. The following three species are redescribed: *Tipula (Vestiplex) himalayensis* Brunetti, 1911, *Tipula (Vestiplex) nigroapicalis* Brunetti, 1911 and *Tipula (Vestiplex) zayulensis* Alexander, 1963. A key to the species of *Tipula (Vestiplex)* from Tibet is presented.

**Keywords.** Crane flies, new species, Tibet, Tipulinae, *Vestiplex*.

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**Introduction**

The tipulid subgenus *Tipula (Vestiplex)* was erected by Bezzi (1924) for the species *Tipula cisalpina* Riedel, 1913 and *T. hemapterandra* Bezzi, 1924. The subgenus currently includes 178 known species and subspecies worldwide, which are distributed in the Holarctic (112 taxa) and the Oriental Realms (76 taxa) (Oosterbroek 2021). To date, 76 species are known from China, including 12 species from Tibet

Autonomous Region (hereafter abbreviated as Tibet). Most species of this subgenus have variegated wings, while some species have reduced wings. The male tergite 9 commonly forms a shallowly concave sclerotized saucer or can be longitudinally divided into two parts, some species have two pubescent finger-like arms. The female ovipositor is commonly with saerrated outer margin (Alexander 1935, 1965; Savchenko 1964; Alexander & Byers 1981; Starkevich & Podenas 2011; Starkevich 2012; Men *et al.* 2017).

The currently described species of the subgenus *Vestiplex* are prevalent in the Holarctic and Oriental zoogeographical regions. The majority of the species are related to mountain systems (Alps, Pyrénées, Caucasus and Himalayas), at altitudes up to 4500 m a.s.l. Adults are often found in broad-leaved, mixed coniferous woods, rock meadows, steppes and tundras (Savchenko 1960, 1964; Starkevich 2012). The Qinghai-Tibetan Plateau (QTP) is the largest and highest plateau in the world with an average elevation above 4000 m. The uplift and formation of the QTP has strongly influenced the climate, environment and evolution of biota in this region (Li & Fang 1999). The QTP has an important status in zoogeographical regionalization, which spans three biodiversity hotspots in the world, including the mountains of Southwest China, the Himalaya, and the Indo-Burma, respectively (Li *et al.* 2019). Tibet is located in southwest China and the Qinghai-Tibet Plateau with its peculiar biodiversity in Asia. It mostly belongs to the Palaearctic Region except that southern Tibet is considered as Oriental (Su *et al.* 2019). The following 12 species of *Vestiplex* are known to occur in Tibet: *Tipula (Vestiplex) adungensis* Alexander, 1963, *T. (V.) alyxis* Alexander, 1963, *T. (V.) avicularia* Edwards, 1928, *T. (V.) distifurca* Alexander, 1942, *T. (V.) eurydice* Alexander, 1961, *T. (V.) himalayensis* Brunetti, 1911, *T. (V.) nigroapicalis* Brunetti, 1911, *T. (V.) opilionimorpha opilionimorpha* Savchenko, 1955, *T. (V.) rongtoensis* Alexander, 1963, *T. (V.) scandens* Edwards, 1928, *T. (V.) subscripta* Edwards, 1928 and *T. (V.) zayulensis* Alexander, 1963 (Oosterbroek 2021). In this paper, six new species are added to the fauna of Tibet, and descriptions with illustrations of three previously known species have been added to improve the recognition of these taxa. A key to the species of *Vestiplex* in Tibet is presented.

## Material and methods

The specimens were studied and illustrated with ZEISS Stemi 2000-c stereo microscope. Details of coloration were checked in specimens immersed in 75% ethyl alcohol (C<sub>2</sub>H<sub>5</sub>OH), to observe pruinescence specimens were examined in dry condition, some specimens were not soaked in alcohol. Genitalic preparations of males were made by immersion in a heated Lactic acid solution (C<sub>3</sub>H<sub>6</sub>O<sub>3</sub> > 85%, 95–97°C) for 4–6 minutes and cooled down to room temperature. After examination, genitalia were transferred to fresh glycerine (C<sub>3</sub>H<sub>8</sub>O<sub>3</sub>) and stored in a microvial attached to the specimen. Type specimens are deposited in the Entomological Museum of China Agricultural University (CAU), Beijing. All pictures were adjusted and assembled into plates with Adobe Photoshop CS6. The morphological terminology mostly follows Gelhaus (2005), Cumming & Wood (2017), de Jong (2017) and Starkevich *et al.* (2020). Species group definitions follows Starkevich (2012).

## Institutional acronyms

BMNH = Natural History Museum, London, UK  
 CAU = China Agricultural University, Beijing, China  
 USNM = National Museum of Natural History, Washington, US  
 ZSI = Zoological Survey of India, India

## Place name interpretation (Chinese, Chinese Pinyin and Tibetan Pinyin):

波密 = Bomi = Bome  
 察隅 = Chayu = Zayu  
 墨脱 = Motuo = Medog

通麦 = Tongmai = Tangmai

亚东 = Yadong = Yadung

80K = 80 km away from Medog County (formerly a material transfer station, it has now become a recognized place name, near Gongri Village) (Fig. 85)

106K = 106 Daoban (refers to the base area of road maintenance workers, it has now become a recognized place name, located on National Highway 318)

### Morphological abbreviations

adm = adminiculum

aia = anterior immovable apodeme

ca = compressor apodeme

d ct = dorsal crest

goncx = gonocoxite

ig = inner gonostylus

l bk = lower beak

obl = outer basal lobe of inner gonostylus

og = outer gonostylus

pia = posterior immovable

st 8 = sternite eight

st 9 = sternite nine

tg 8 = tergite eight

tg 9 = tergite nine

u bk = upper beak

### Results

Class Insecta Linnaeus, 1758  
Order Diptera Linnaeus, 1758  
Family Tipulidae Latreille, 1802  
Subfamily Tipulinae Kertész, 1902  
Genus *Tipula* Linnaeus, 1758

Subgenus *Vestiplex* Bezzi, 1924

### Key to species (male) of *Vestiplex* from Tibet, China

1. Posterior margin of tergite 9 broadly depressed, wide and flat ..... 2  
– Tergite 9 with appendages or divided into two parts ..... 4
2. Wing reduced in both sexes; inner gonostylus blunt .....  
..... *T. (V.) opilionimorpha opilionimorpha* Savchenko, 1955  
– Wing fully developed, or only reduced in female; inner gonostylus slender ..... 3
3. Body mainly yellow; gonocoxite ends with strong spine ..... *T. (V.) subscripta* Edwards, 1928  
– Body mainly blackish; gonocoxite unarmed ..... *T. (V.) scandens* Edwards, 1928
4. Ventral surface of tergite 9 with a pair of appendages, strong or weak ..... 5  
– Tergite 9 without appendages, divided into two parts, lobed ..... 14
5. Ventral armature of tergite 9 black and bifid ..... *T. (V.) eurydice* Alexander, 1961  
– Ventral armature of tergite 9 yellow or not bifid ..... 6

6. Arms of ventral surface of tergite 9 leaf-shaped; suture between tergite 9 and gonocoxite with a spiny projection ..... *T. (V.) platyphylla* sp. nov.  
 – Arms of ventral surface of tergite 9 not leaf-shaped; suture between tergite 9 and gonocoxite without a spiny projection ..... 7
7. Ventral surface of tergite 9 with a pair of strong arms with granulated margin; without distinct appendages on sternite 9 ..... 8  
 – Arms of tergite 9 weak or smooth, without granulated margin; sternite 9 with appendages ..... 10
8. Posterior margin of gonocoxite spiny; posterior margin of inner gonostylus swollen ..... 9  
 – Posterior margin of gonocoxite hook-like; inner gonostylus not swollen .....  
 ..... *T. (V.) motuoensis* sp. nov.
9. Inner gonostylus with lower beak; outer gonostylus anteriorly bent, posterior margin of basal half truncated ..... *T. (V.) uncinella* sp. nov.  
 – Inner gonostylus without lower beak; outer gonostylus spoon-like ..... *T. (V.) magatama* sp. nov.
10. Arms of tergite 9 slender; lower beak of inner gonostylus with bent angle; apex of outer gonostylus truncated relatively ..... 11  
 – Arms of tergite 9 not slender, lower beak of inner gonostylus without bent angle; apex of outer gonostylus oval ..... 12
11. Stripe of prescutum with dark brown margin; arms of tergite 9 sharp; appendages of sternite 9 truncated at tip ..... *T. (V.) adungensis* Alexander, 1963  
 – Stripe of prescutum with pale margin; arms of tergite 9 not sharp; appendages of sternite 9 with rather acute tip ..... *T. (V.) rongtoensis* Alexander, 1963
12. Posterior margin of gonocoxite short thorn-like; appendages of sternite 9 strong, bifurcate at the apex; lower beak of inner gonostylus usual ..... *T. (V.) distifurca* Alexander, 1942  
 – Posterior margin of gonocoxite not special or hooked; appendages of sternite 9 not bifurcate at the apex, slender or short; lower beak of inner gonostylus rolled up ..... 13
13. Lower posterior margin of tergite 9 with a pair of puny arms; sternite 9 with a pair of slender appendages ..... *T. (V.) nayogabuensis* sp. nov.  
 – Arms of tergite 9 strong; appendages of sternite 9 short ..... *T. (V.) zayulensis* Alexander, 1963
14. Adminiculum trident-shaped ..... 15  
 – Adminiculum not trident-shaped ..... 17
15. Outer gonostylus with protrusion; sternite 9 with appendages .... *T. (V.) nigroapicalis* Brunetti, 1911  
 – Outer gonostylus without protrusion; sternite 9 without appendages ..... 16
16. Lower posterior margin of gonocoxite with abundant long setae; lateral processes of adminiculum very short ..... *T. (V.) bucera* sp. nov.  
 – Lower posterior margin of gonocoxite without long setae; lateral processes of adminiculum long ..... *T. (V.) alyxis* Alexander, 1963
17. Sternite 9 with appendages, the tips of which are shaped like a bird's head .....  
 ..... *T. (V.) avicularia* Edwards, 1928  
 – Sternite 9 without appendages ..... *T. (V.) himalayensis* Brunetti, 1911

*Tipula (Vestiplex) deserrata* group in Tibet

*Tipula (Vestiplex) magatama* sp. nov.

*Tipula (Vestiplex) uncinella* sp. nov.

*Tipula (Vestiplex) magatama* sp. nov.

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Figs 1–9, 86

**Diagnosis**

Nasus elongate, apex slightly expanded. Scape and pedicel of antenna yellow; flagellar segments 1–4 grayish yellow, other segments pale brown, except base darker. Prescutum almost wholly reddish brown with four olive-gray striped pruinescence, median stripe broadened apically and gradually narrowing to base. Posterior margin of gonocoxite with a sharp black spine. Tergite 9 separated medially, with a pair of angular arms arising from ventral surface of tergite 9, with granulated margins, apex with a small inner projection, outer surface of arms with a pair of depressions (Fig. 9). Outer gonostylus slender, spoon-like. Lower beak of inner gonostylus absent.

**Etymology**

The species is named after the shape of inner gonostylus, it looks like a ‘Magatama’, a curved comma-shaped bead from prehistoric Japan, called ‘勾玉’ in China. The name is to be treated as a noun in apposition.

**Material examined**

**Holotype**

CHINA • ♂; Tibet, Bomi, Yigong (易贡); 30°16'19" N, 94°48'28" E; 2270 m a.s.l.; 5–7 May 2017; Qicheng Yang leg.; light trap; CAU.

**Paratypes**

CHINA • 13 ♂♂; same collection data as for holotype; CAU • 4 ♂♂; Tibet, Motuo, 80K; 29°39'29" N, 95°29'24" E; 2020 m a.s.l.; 8 May 2017; Qicheng Yang leg.; light trap; CAU.

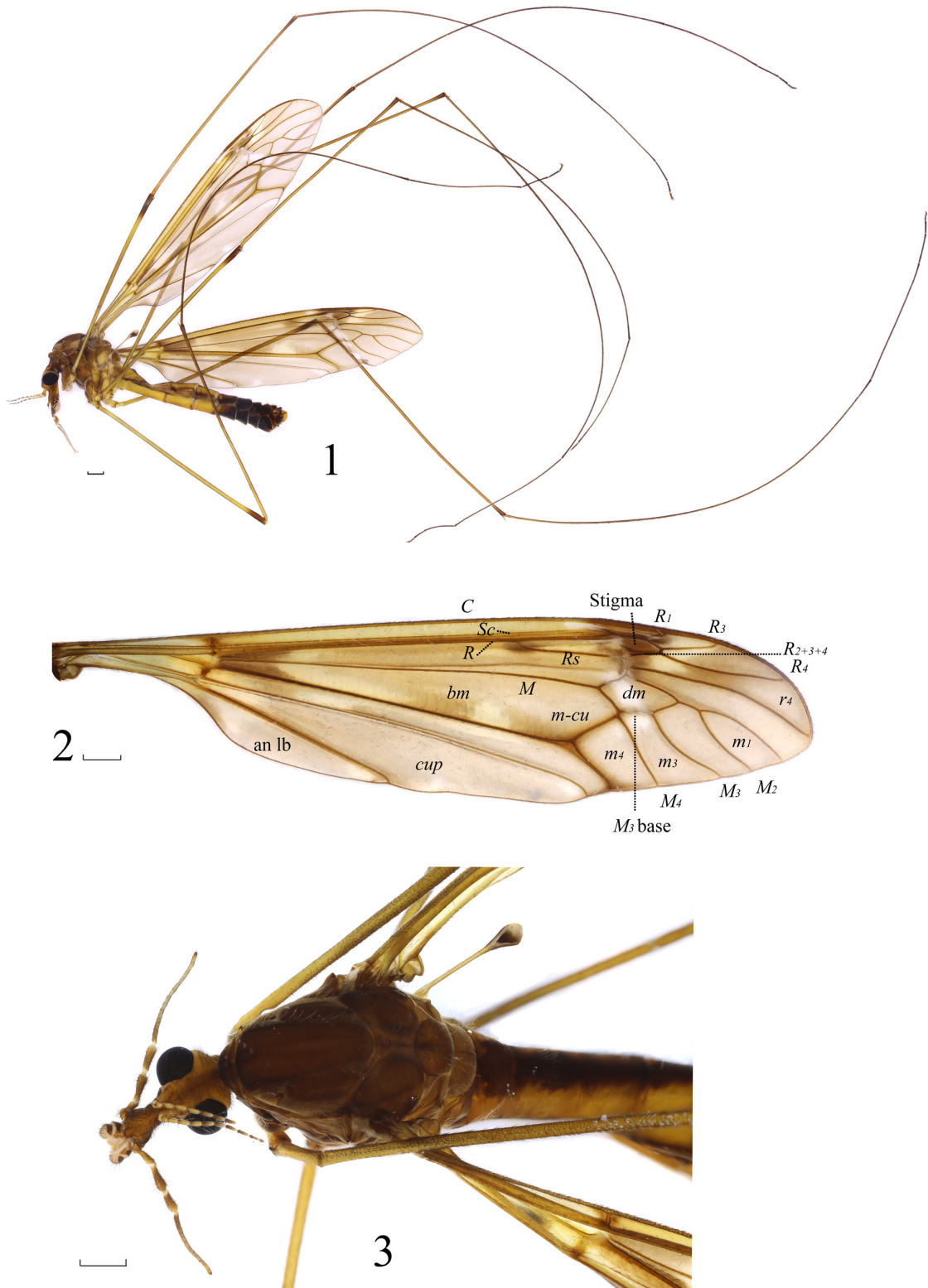
**Description**

**Male**

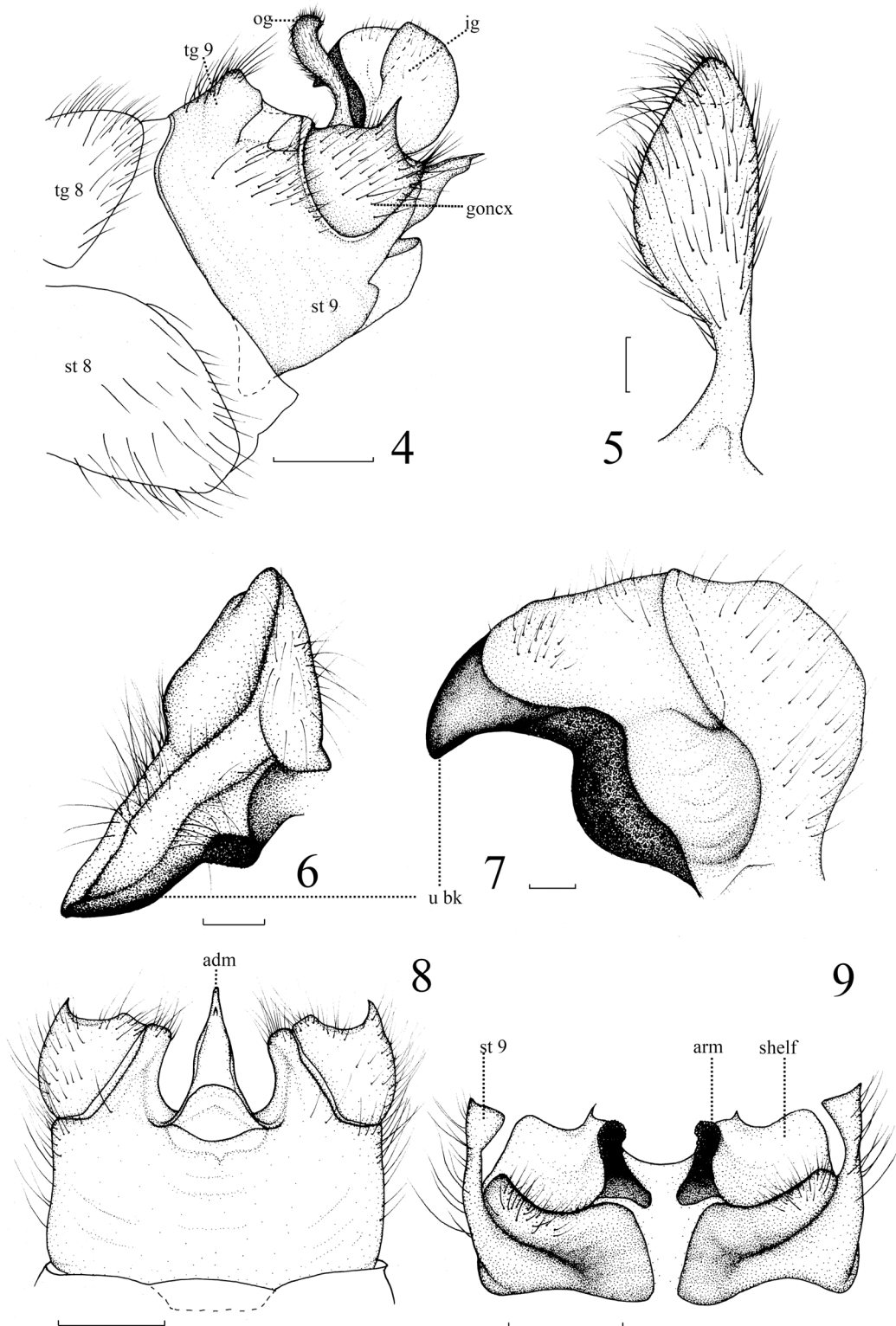
MEASUREMENTS. Body length 16.5–20.0 mm, wing length 21.0–24.0 mm, antenna length 2.5–3.0 mm (n = 18).

HEAD (Figs 1, 3). Mainly brownish yellow. Occipital marking brown, elongated to vertex, broadened apically and gradually narrowing to base. Rostrum and nasus grayish yellow with brown setae, nasus elongate, apex slightly expanded. Setae on head dark brown. Antenna relatively short; scape and pedicel yellow; flagellar segments 1–4 grayish yellow, other segments pale brown, except base darker. Proboscis and palpus brown.

THORAX (Figs 1, 3). Mainly reddish brown, heavily grayish yellow pruinescence. Pronotum brown with yellow setae, middle black. Prescutum almost wholly reddish brown with four olive-gray striped pruinescence, median stripe broadened apically and gradually narrowing to base. Scutum brown with two olive-gray pruinose spots. Scutellum reddish brown with dark gray pruinescence. Mediotergite dark yellow with yellow pruinescence and olive-gray mid-longitudinally. Thoracic pleuron dark yellow with grayish yellow pruinescence. Anepisternum, katepisternum and anepimeron dark brown at antero-upper corners. Anatergite and katatergite yellow. Parascutellum yellow. Meron dark yellow. Setae on thorax



**Figs 1–3.** *Tipula (Vestiplex) magatama* sp. nov., paratype, ♂ (CAU). 1. Habitus, lateral view. 2. Wing. 3. Head and thorax, dorsal view. Abbreviations: see Material and methods. Scale bars = 1.0 mm.



**Figs 4–9.** *Tipula (Vestiplex) magatama* sp. nov., holotype, ♂ (CAU). 4. Hypopygium, lateral view. 5. Outer gonostylus, lateral external view. 6–7. Inner gonostylus, dorsal view and lateral external view. 8. Hypopygium, ventral view. 9. Tergite nine, dorsal view. Abbreviations: see Material and methods. Scale bars: 4, 8–9 = 0.5 mm; 5–7 = 0.1 mm.

yellow. Legs with coxae and femora yellow, femora with brownish black apices; tibiae brownish yellow with black tips. Tarsi brownish black. Setae on legs dark brown. Wing variegated brown with numerous smaller pale areas; pterostigma pale black; petiole of cell  $m_1$  distinctly shorter than discal cell (Fig. 2). Halter with stem dark yellow, knob black.

ABDOMEN (Figs 1, 3). Mainly dark yellow. Abdominal tergites each with three black stripes, middle stripe stout; lateral stripes relatively narrow. Abdominal segments 5–9 black. Setae on abdomen yellow.

HYPOPYGIUM (Figs 4–9). Posterior margin of gonocoxite with a sharp black spine. Tergite 9 separated medially, with a pair of angular arms arising from ventral surface of tergite 9, with granulated margins, apex with a small inner projection, outer surface arms with a pair of depressions. Sternite 9 with a median prominence. Apex of adminiculum slim. Outer gonostylus slender, spoon-like, apex circular (Fig. 5). Inner gonostylus with big concavity; inner margin black sclerotized; lower beak absent; reversed side with big concavity (Figs 6–7).

#### Female

Unknown or unrecognized.

#### Distribution

China (Tibet).

#### Remarks

The new species is similar to *T. (V.) yunnanensis* Alexander, 1942 from Yunnan, China, but the latter differs in the following characters: posterior margin of gonocoxite with a slightly twisted spine; outer gonostylus long and slender; lower beak of inner gonostylus sharp.

#### *Tipula (Vestiplex) uncinella* sp. nov.

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Figs 10–20, 86

#### Diagnosis

Scape and pedicel yellow, flagellum grayish yellow. Prescutum with four grayish yellow stripes, all stripes with brown margins. Scutellum yellow with dark brown mid-longitudinal stripe. Mediotergite yellow with brown mid-longitudinal stripe. Tergite 9 separated medially, pair of angular arms arising from ventral surface of tergite 9, arms with granulated margins. Base of posterior margin of inner gonostylus without a small protrusion; upper beak slightly twisted, lower beak curved, middle concave.

#### Etymology

The species is named after the uncinatus of the adminiculum, the Latin adjective ‘*uncinella*’ means ‘bearing hooks, barbed’.

#### Material examined

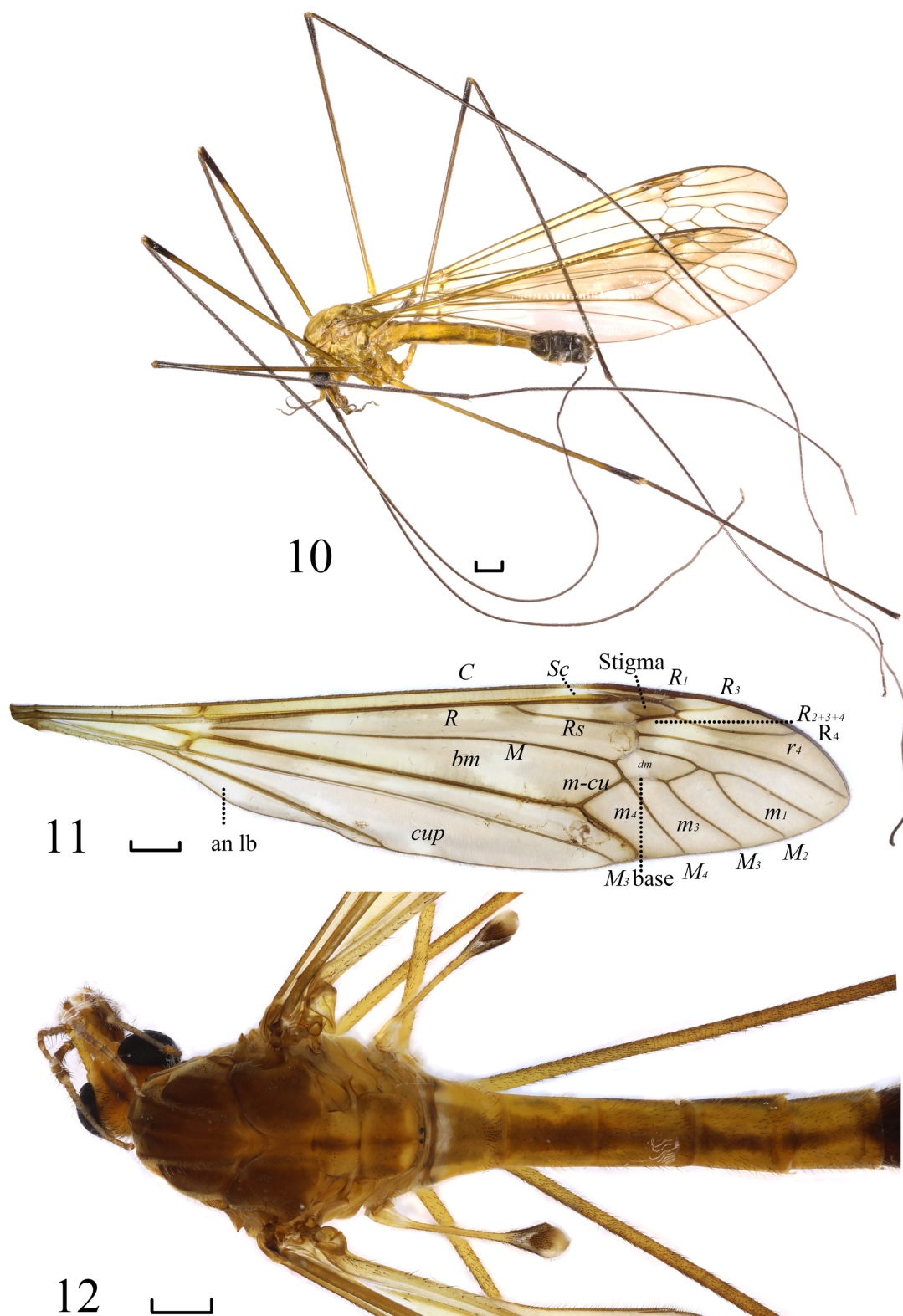
##### Holotype

CHINA • ♂; Tibet, Bomi, Yigong; 30°16'19" N, 94°48'28" E; 2270 m a.s.l.; 5–7 May 2017; Qicheng Yang leg.; sweeping net; CAU.

##### Paratypes

CHINA • 12 ♂♂; same collection data as for holotype; CAU • 9 ♂♂; Tibet, Bomi, 106K; 29°50'04" N, 94°44'36" E; 2290 m a.s.l.; 17 May 2017; Qicheng Yang leg.; light trap; CAU.





**Figs 10–12.** *Tipula (Vestiplex) uncinella* sp. nov., paratypes, ♂♂ (CAU). **10.** Habitus, lateral view. **11.** Wing. **12.** Habitus, dorsal view. Abbreviations: see Material and methods. Scale bars = 1.0 mm.

## Description

### Male

MEASUREMENTS. Body length 14.0 mm, wing length 18.0–20.0 mm, antenna length 3.0–3.5 mm (n = 22).

HEAD (Figs 10, 12). Mainly yellow. Occipital stripe dark gray. Rostrum and nasus yellow. Setae on head brown. Scape and pedicel yellow, flagellum grayish yellow. Proboscis and palpus brownish yellow.

THORAX (Figs 10, 12). Mainly yellow, heavily pruinose. Pronotum brownish yellow with yellow setae. Prescutum with four grayish yellow stripes, all stripes with brown margins, median stripe broadened apically and gradually narrowing to base, lateral stripes long-oval. Scutum yellow with four grayish yellow spots, anterior margins of anterior two spots brown. Scutellum yellow with dark brown mid-longitudinal stripe. Mediotergite yellow with brown mid-longitudinal stripe. Thoracic pleuron yellow. Parascutellum yellow. Meron yellow. Setae on thorax yellow. Legs with coxae and femora yellow, femora with dark brown apices, tibiae and tarsi dark brown. Setae on legs dark brown. Wing variegated light brown; pterostigma brown; petiole of cell m, distinctly shorter than discal cell (Fig. 11). Halter with stem yellow, knob pale black with pale yellow apex.

ABDOMEN (Figs 10, 12). Mainly yellow. Abdominal tergites each with three brown stripes. Abdominal segments 5–9 dark brown to black. Setae on abdomen brownish yellow.

HYPOPYGIUM (Figs 13–17, 20). Gonocoxite elongated, separated from sternite 9, posterior margin with an unusually strong and slender black spine, directed chiefly dorsally, slightly twisted. Tergite 9 separated medially, middle of posterior margin of lobe slightly protrude; a pair of angular black arms arising from ventral surface of tergite 9, surface of arms not smooth, with granulated margin. Sternite 9 with a median prominence. Adminiculum narrow spade-like, apex slightly furcal, ventral caudal part with a small uncinuate projection. Outer gonostylus anteriorly bent, posterior margin of basal half truncated (Fig. 16). Inner gonostylus with concavity at middle, posterior margin with big semicircular bulge; base of posterior margin of inner gonostylus without a small protrusion; upper beak slightly twisted, lower beak curved, middle concave (Fig. 14). Semen pump (Figs 18–19) as shown in figures. Aedeagus wide, basal width about 0.5 mm, gradually narrowing towards apex, and apex not bifurcated.

### Female

Unknown or unrecognized.

### Distribution

China (Tibet).

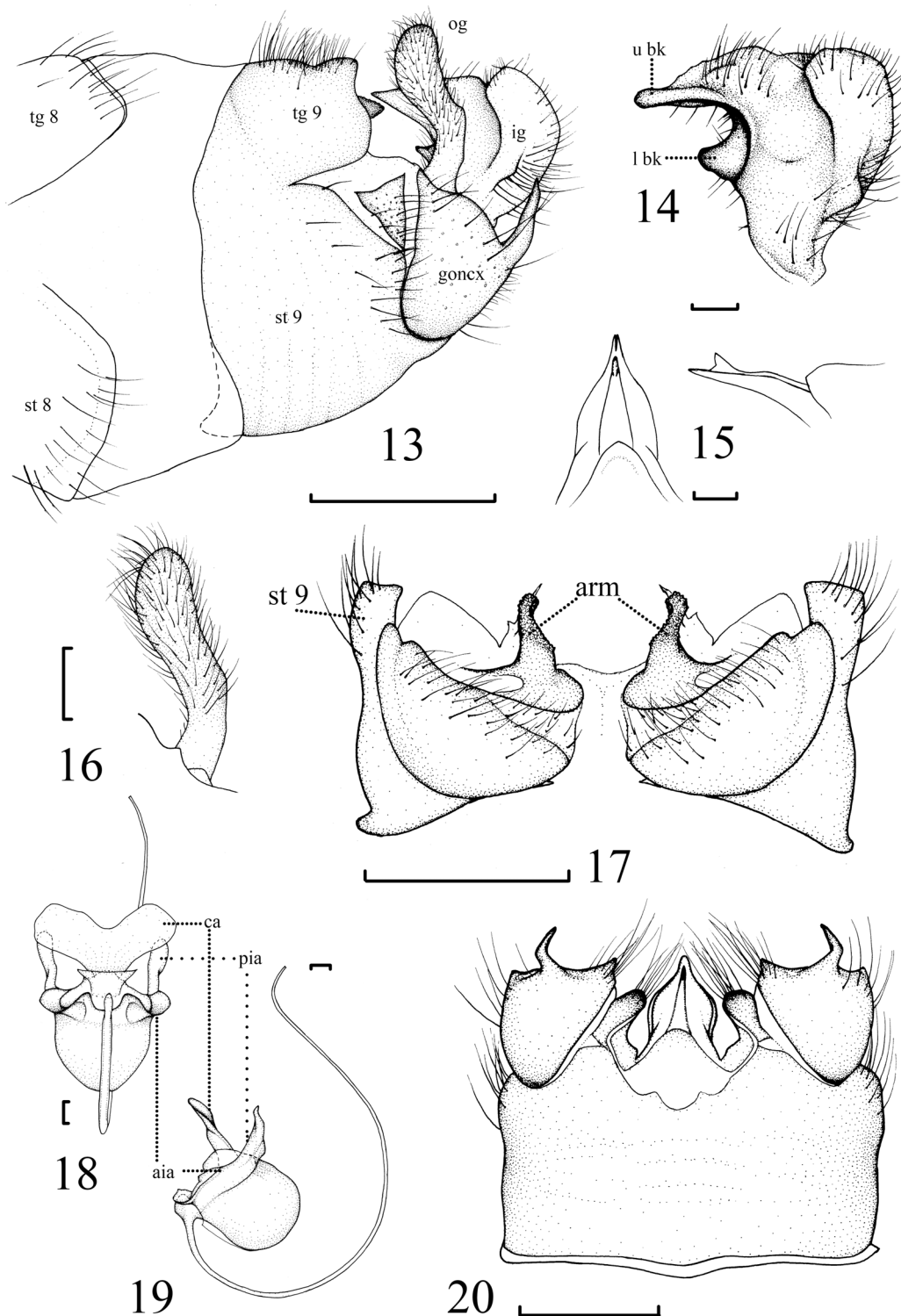
### Remarks

The new species is similar to *T. (V.) schizophallus* (Alexander, 1973), but the latter differs in the following characters: arms of tergite 9 with only inner margin roughened; gonocoxite with an additional small spine (the one near posterior margin of basistylar suture); outer gonostylus with very abundant black setae from conspicuous punctures; apex of adminiculum profoundly divided into two long parallel spines, ventral caudal part without uncinatus. It is also similar *T. (V.) deserrata* Alexander, 1934 and *T. (V.) factiosa* Alexander, 1940, but the posterior margin of inner gonostylus in the latter has no protrusion. The posterior margin of tergite 9 of *T. (V.) factiosa* is smooth, its arms are large and strong.

### *Tipula (Vestiplex) divisotergata* group in Tibet

*Tipula (Vestiplex) adungensis* Alexander, 1963

*Tipula (Vestiplex) rongtoensis* Alexander, 1963



**Figs 13–20.** *Tipula (Vestiplex) uncinella* sp. nov., holotype, ♂ (CAU). **13.** Hypopygium, lateral view. **14.** Inner gonostylus, lateral external view. **15.** Adminiculum, ventral view and oblique view. **16.** Outer gonostylus, lateral external view. **17.** Tergite nine, dorsal view. **18–19.** Semen pump, lateral view and dorsal view. **20.** Hypopygium, ventral view. Abbreviations: see Material and methods. Scale bars: 13, 17, 20 = 0.5 mm; 14–16, 18–19 = 0.1 mm.

*Tipula (Vestiplex) nayogabuensis* sp. nov.

*Tipula (Vestiplex) zayulensis* Alexander, 1963

***Tipula (Vestiplex) nayogabuensis* sp. nov.**

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Figs 21–29, 86

### Diagnosis

Vertex brownish black, relatively protruded. Prescutum virtually brownish black, black stripes distinct, all stripes with dark black margins. Scutum virtually brownish black. Scutellum dark yellow with brownish black mid-longitudinal stripe. Mediotergite reddish dark brown, dried with pale gray pruinescence and black mid-longitudinally. Thoracic pleuron dark brown with pale gray pruinescence. Posterior margin of tergite 9 with long setae, pair of weak arms arising from ventral surface of tergite 9, slender hidden bridge between them.

### Etymology

The species is named after the type locality Nayogabu Snow Mountain.

### Material examined

#### Holotype

CHINA • ♂; Tibet, Bomi, Yigong; 30°16'19" N, 94°48'28" E; 2290 m a.s.l.; 7 May 2017; Qicheng Yang leg.; light trap; CAU.

#### Paratypes

CHINA • 8 ♂♂; same collection data as for holotype; CAU.

### Description

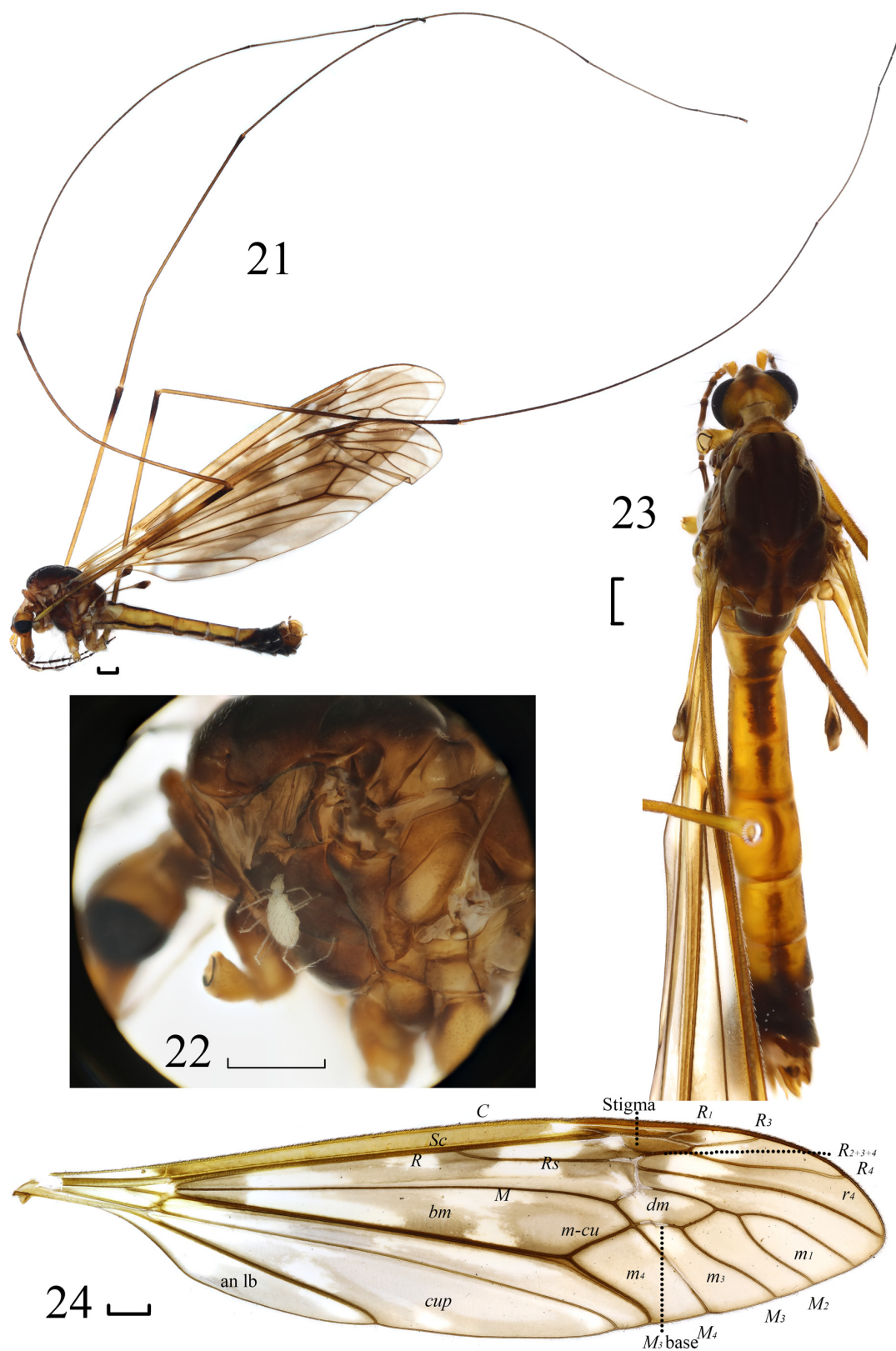
#### Male

MEASUREMENTS. Body length 16.5–18.5 mm, wing length 20–22.0 mm, antenna length 4.5 mm (n = 9).

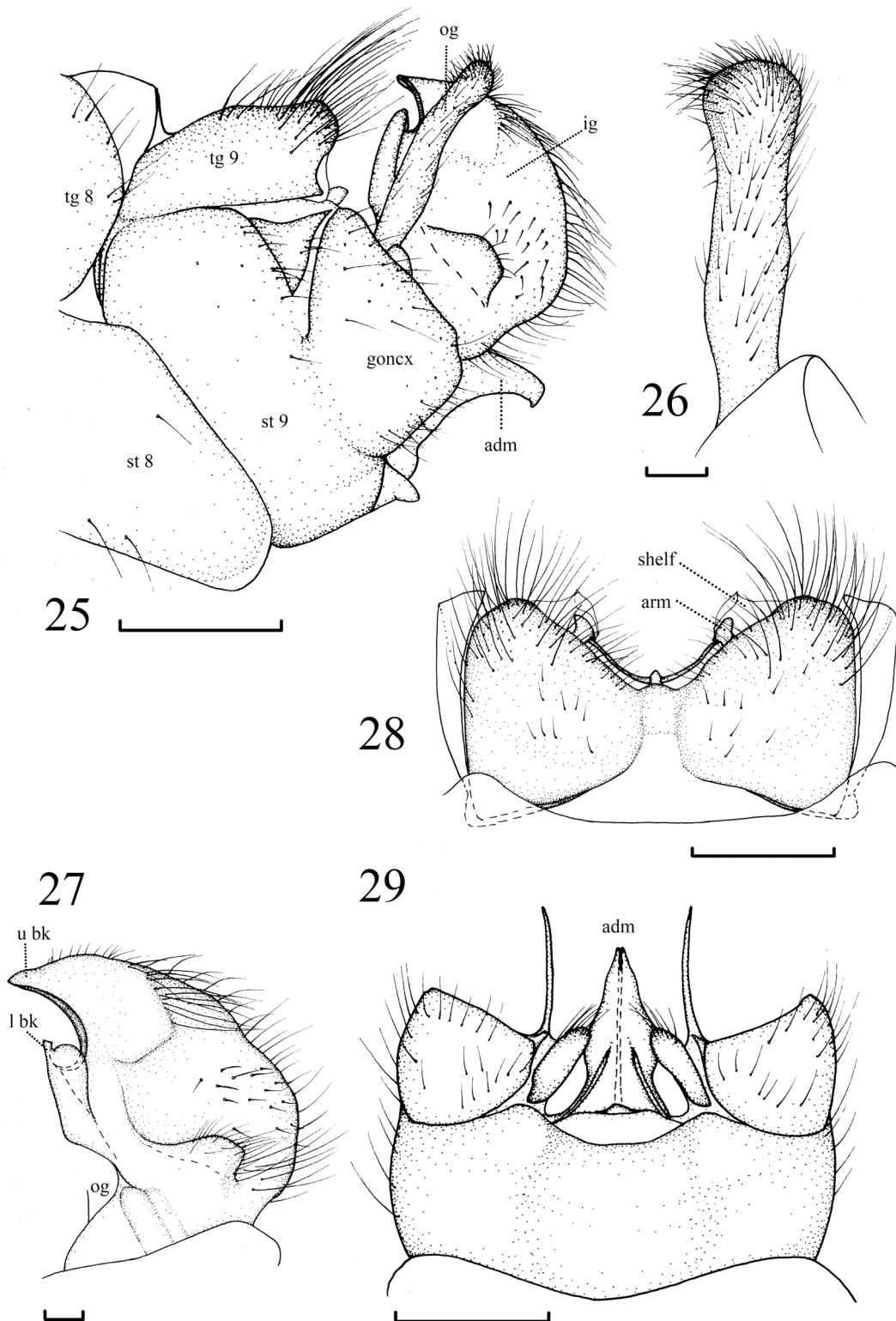
HEAD (Figs 21, 23). Mainly brownish yellow. Occipital mark dark brown, vertex brownish black, relatively protruded. Rostrum and nasus dark yellow, nasus relatively long. Setae on head dark brown. Scape dark yellow, pedicel pale yellow, flagellum brownish black except first flagellar segment yellowish brown. Proboscis and palpus yellowish gray.

THORAX (Figs 21–23). Mainly dark brown, heavily pale gray pruinescence. Pronotum brown with yellow setae. Prescutum virtually brownish black, black stripes distinct, all stripes with dark black margin. Scutum virtually brownish black. Scutellum dark yellow with brownish black mid-longitudinal stripe. Mediotergite reddish dark brown, dried with pale gray pruinescence and black mid-longitudinally. Thoracic pleuron dark brown with pale gray pruinescence. Parascutellum dark brown. Meron brown. Setae on thorax pale yellow. Legs with coxae and femora yellow, femora with brownish black apexes; tibiae and tarsi dark brown. Setae on legs dark brown. Wing variegated brown; pterostigma brown; petiole of cell m distinctly shorter than discal cell (Fig. 24). Halter with stem yellow, knob dark brown.

ABDOMEN (Figs 21, 23). Mainly yellow. Abdominal tergites each with three stripes, middle stripe of tergites 1–2 brownish black, wide, others brown; bilateral stripes black. Abdominal segments 6–9 dark black. Setae on abdomen yellow.



**Figs 21–24.** *Tipula (Vestiplex) nayogabuensis* sp. nov., holotype, ♂ (CAU). **21.** Habitus, lateral view. **22.** Parasitic mites. **23.** Habitus, dorsal view. **24.** Wing. Abbreviations: see Material and methods. Scale bars = 1.0 mm.



**Figs 25–29.** *Tipula (Vestiplex) nayogabuensis* sp. nov., holotype, ♂ (CAU). **25.** Hypopygium, lateral view. **26.** Outer gonostylus, lateral external view. **27.** Inner gonostylus, lateral external view. **28.** Tergite nine, dorsal view. **29.** Hypopygium, ventral view. Abbreviations: see Material and methods. Scale bars: 25, 28–29 = 0.5 mm; 26–27 = 0.1 mm.

**HYPOPYGIUM** (Figs 25–29). Gonocoxite hardly elongated, unseparated from sternite 9. Tergite 9 longitudinally divided into two parts, posterior margin with long setae, a pair of weak arms arising from ventral surface of tergite 9, a slender hidden bridge between them (Fig. 28). Appendages of sternite 9 slender (Fig. 29). Apex and middle of outer gonostylus slightly wide (Fig. 26). Inner gonostylus with concavity at middle, posterior part with many bristles, lower margin with bristled raise; base of lower beak inward-rolled, enwrapped black lower beak; upper beak yellow, lower margin black, base with a slight raise (Fig. 27). Apex of adminiculum hooked.

#### **Female**

Unknown or unrecognized.

#### **Distribution**

China: Tibet.

#### **Remarks**

The new species is similar to *T. (V.) zayulensis* from Chayu (= Zayu) of Tibet, but the latter differs in the following characters: prescutum and scutum yellowish brown; thoracic pleuron brownish yellow; all sterno-pleurite with dark brown margin. The outer gonostylus is different from that of *T. (V.) nayogabuensis* sp. nov.

#### *Tipula (Vestiplex) zayulensis* Alexander, 1963 Figs 30–38

*Tipula (Vestiplex) zayulensis* Alexander, 1963: 328. Type locality: China: Tibet, Zayul.

#### **Diagnosis**

Occipital stripe dark brown, middle wide, anterior part extended to vertex. All sterno-pleurites with dark brown margins. Tergite 9 longitudinally divided into two parts, posterior margin with long setae, and a bridge between them, a pair of angular arms arising from ventral surface of tergite 9. Inner gonostylus with concavity at middle, concavity with many bristles, lower margin of concavity with bristled raise; base of inner gonostylus inward-rolled, enwrapped black and swollen lower beak; upper beak relatively obtuse, slightly recurved.

#### **Material examined**

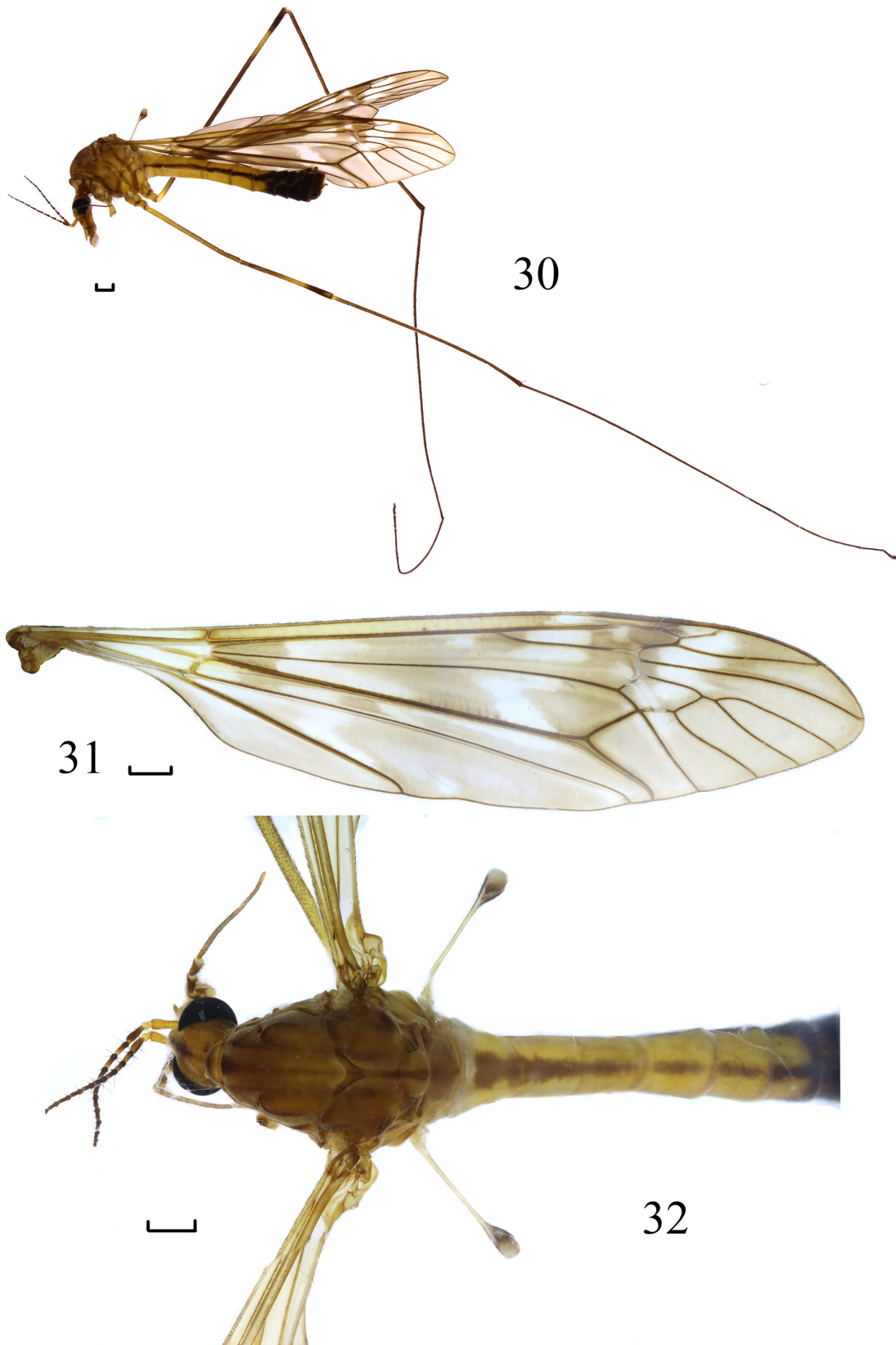
CHINA • 1 ♂; Tibet, Chayu, Longgucun (龙古村); 28°50'44" N, 97°29'29" E; 2640 m a.s.l.; 7 Jul. 2015; Shaolin Han leg.; CAU • 2 ♂♂; Tibet, Chayu, Shuidianqiao (水电桥); 28°39'60" N, 97°28'07" E; 2640 m a.s.l.; 12 Jun. 2019; Qicheng Yang leg.; sweeping net; CAU • 1 ♂; Tibet, Chayu County; 28°39'49" N, 97°27'52" E; 2337 m a.s.l.; Jun. 2020; Hui Wang leg.; CAU.

#### **Redescription**

##### **Male**

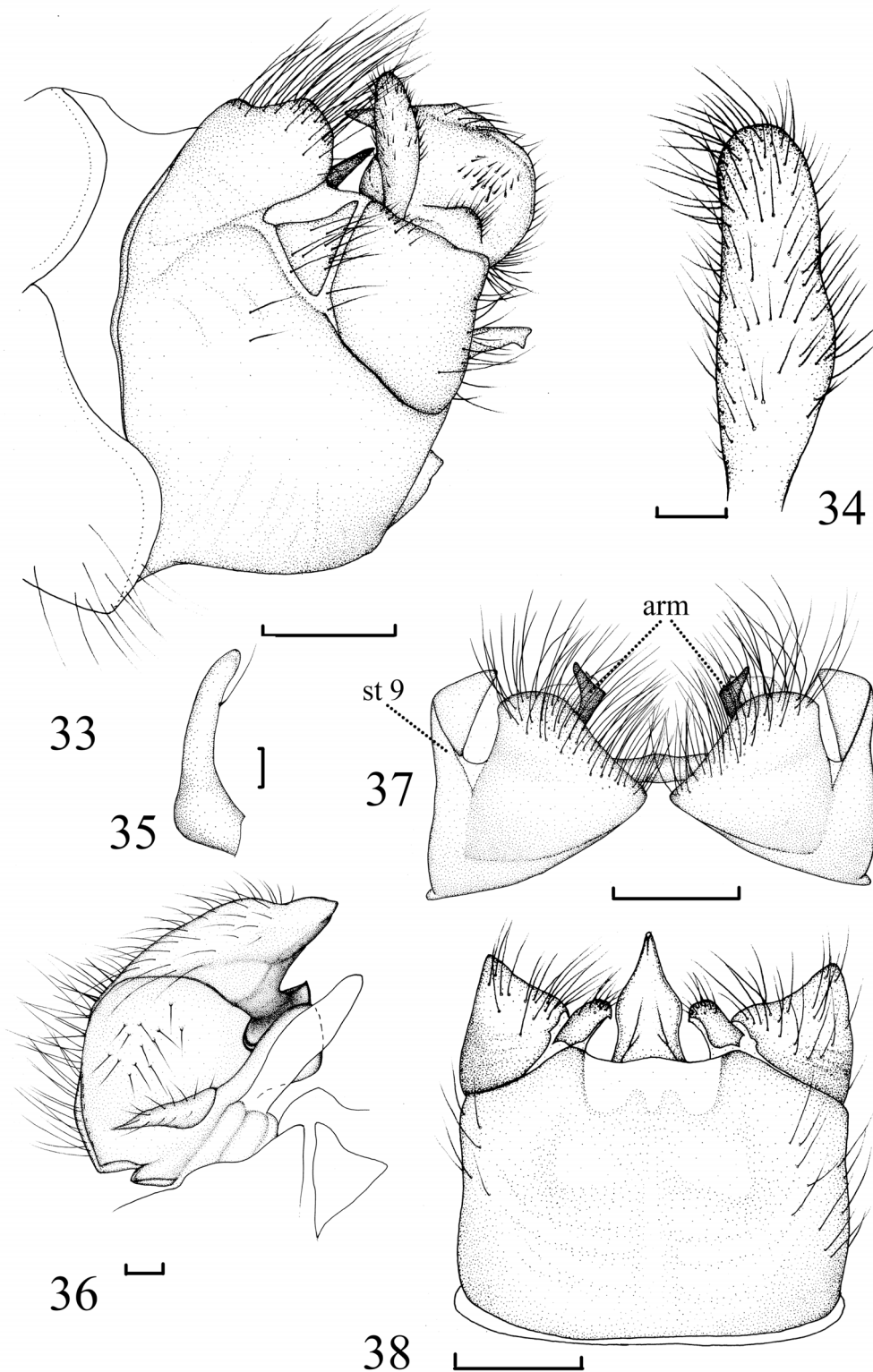
**MEASUREMENTS.** Body length 18.5 mm, wing length 20.0 mm, antenna length 4.0 mm (n = 3).

**HEAD** (Figs 30, 32). Mainly yellow. Occipital stripe dark brown, middle wide, anterior part extended to vertex. Rostrum and nasus yellow, nasus long. Setae on head dark brown. Scape yellow, pedicel pale yellow, flagellum yellowish brown. Proboscis and palpus yellowish dark brown.



**Figs 30–32.** *Tipula (Vestiplex) zayulensis* Alexander, 1963, ♂ (CAU). **30.** Habitus, lateral view. **31.** Wing. **32.** Habitus, dorsal view. Scale bars = 1.0 mm.





**Figs 33–38.** *Tipula (Vestiplex) zayulensis* Alexander, 1963, ♂ (CAU). **33.** Hypopygium, lateral view. **34.** Outer gonostylus, lateral external view. **35.** Appendages of sternite 9, lateral view. **36.** Inner gonostylus, lateral external view. **37.** Tergite nine, dorsal view. **38.** Hypopygium, ventral view. Abbreviations: see Material and methods. Scale bars: 33, 37–38 = 0.5 mm; 34–36 = 0.1 mm.

THORAX (Figs 30, 32). Mainly brownish yellow, heavily gray pruinescence. Pronotum yellowish brown, middle and both side each with brown spot. Prescutum yellowish brown with four brown stripes, all stripes with dark brown margins. Scutum yellowish brown with four dark brown spots. Scutellum yellowish brown with dark brown mid-longitudinal stripe. Mediotergite brown with dark brown mid-longitudinal stripe. Thoracic pleuron brownish yellow. All sterno-pleurite with dark brown margins. Setae on thorax yellow. Legs with coxae yellow, femora with dark brown tips; tibiae and tarsi dark brown. Setae on legs dark brown. Wing variegated pale brown; pterostigma brown; petiole of cell  $m_1$  distinctly shorter than discal cell (Fig. 31). Halter with stem yellow, knob greyish black.

ABDOMEN (Figs 30, 32). Mainly yellow. Abdominal tergites each with three stripes, middle stripe brown, bilateral stripes black. Abdominal segments 6–9 dark black. Setae on abdomen brownish yellow.

HYPOPYGIUM (Figs 33–38). Gonocoxite slightly elongated, separated from sternite 9. Tergite 9 longitudinally divided into two parts, posterior margin with long setae, and a bridge between them, a pair of angular arms arising from ventral surface of tergite 9. Sternite 9 with a pair of very short appendages, as shown in figure, with a long seta (Fig. 35), covered by inner gonostylus and not visible in the lateral external view. Outer gonostylus relatively small, posterior margin basally slightly wide (Fig. 34). Inner gonostylus with concavity at middle, concavity with many bristles, lower margin with bristled raise; base of inner gonostylus inward-rolled, enwrapped black and swollen lower beak; upper beak relatively obtuse, slightly recurved (Fig. 36).

#### Female

Described by Alexander (1963).

#### Distribution

China: Tibet.

#### *Tipula (Vestiplex) himalayensis* group in Tibet

*Tipula (Vestiplex) alyxis* Alexander, 1963

*Tipula (Vestiplex) bucera* sp. nov.

*Tipula (Vestiplex) himalayensis* Brunetti, 1911

*Tipula (Vestiplex) nigroapicalis* Brunetti, 1911

#### *Tipula (Vestiplex) bucera* sp. nov.

urn:lsid:zoobank.org:act:4AB06AB7-6108-40AF-A8C8-CAEDF0226964

Figs 39–50, 84, 86

#### Diagnosis

Scape and pedicel yellow, first flagellar segment dark yellow, other flagellar segments bicolor, yellowish with dark brown base. Scutellum and mediotergite dark yellow. Gonocoxite elongated, separated from sternite 9, posterior margin with an unusually strong black spine, bent inward and horn-like.

#### Etymology

The species is named after the shape of gonocoxite, the Latin adjective ‘*bucera*’ means ‘ox-horned’.

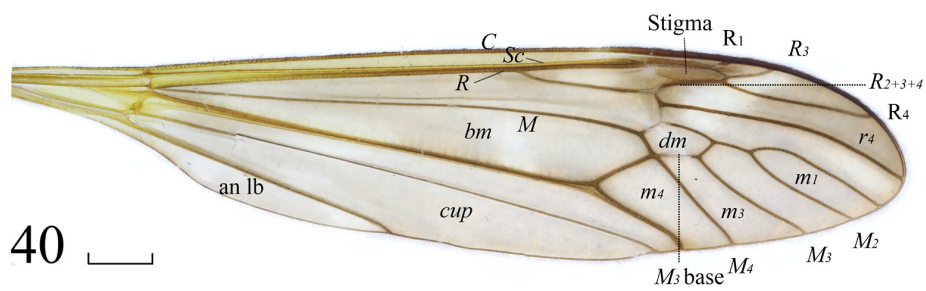
#### Material examined

##### Holotype

CHINA • ♂; Tibet, Bomi, Yigong; 30°16'19" N, 94°48'28" E; 2240 m a.s.l.; 7 Jun. 2017; Qicheng Yang leg.; light trap; CAU.



39



40

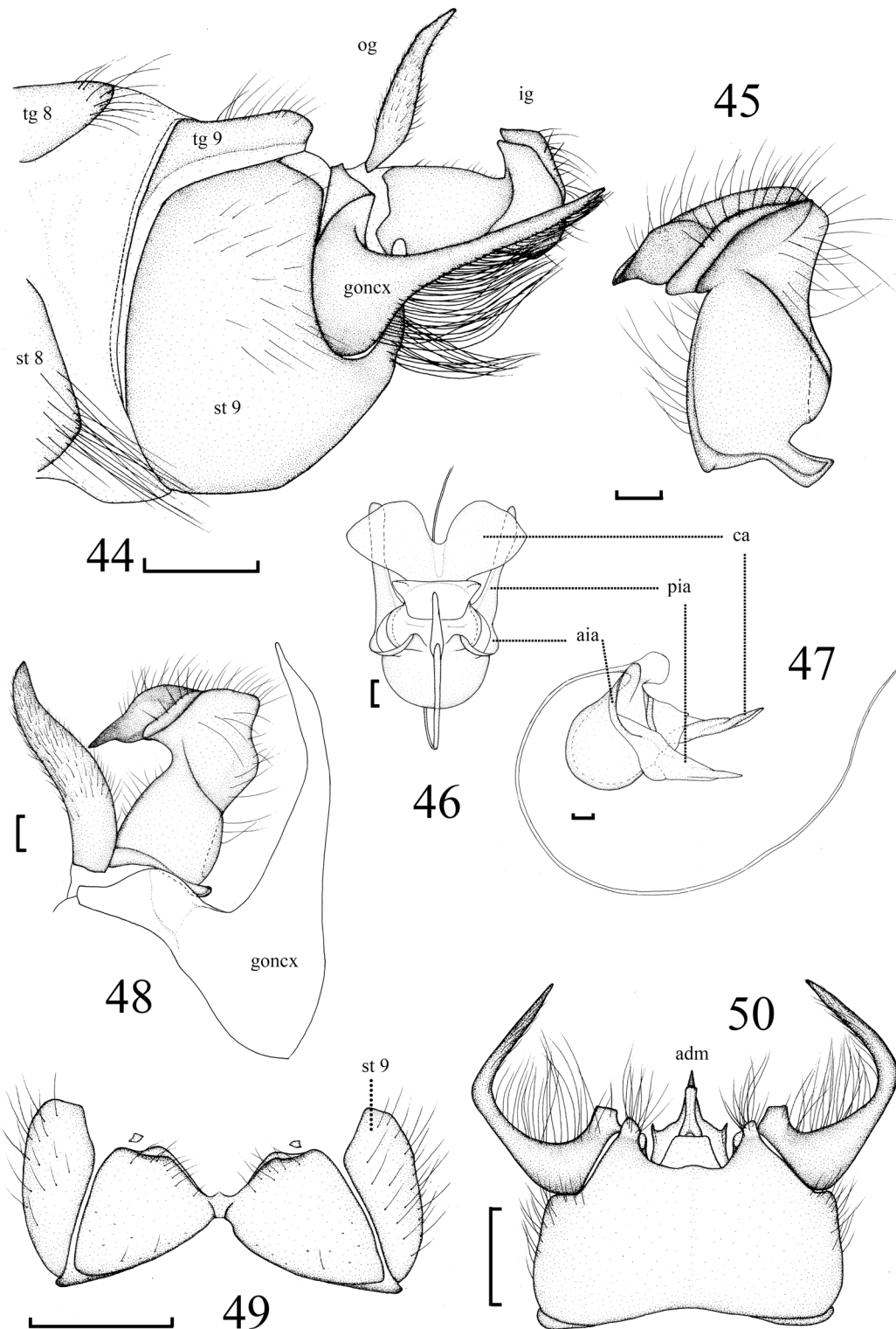


41

**Figs 39–41.** *Tipula (Vestiplex) bucera* sp. nov., holotype, ♂ (CAU). **39.** Habitus, lateral view. **40.** Wing. **41.** Habitus, dorsal view. Abbreviations: see Material and methods. Scale bars = 1.0 mm.



**Figs 42–43.** *Tipula (Vestiplex) bucera* sp. nov., allotype, ♀ (CAU). **42.** Habitus, lateral view. **43.** Ovipositor, lateral view. Scale bars = 1.0 mm.



**Figs 44–50.** *Tipula (Vestiplex) bucera* sp. nov., holotype, ♂ (CAU). **44.** Hypopygium, lateral view. **45.** Inner gonostylus, lateral external view. **46–47.** Semen pump, lateral view and dorsal view. **48.** Outer and inner gonostylus, lateral external view. **49.** Tergite nine, dorsal view. **50.** Hypopygium, ventral view. Abbreviations: see Material and methods. Scale bars: 44, 49–50 = 0.5 mm; 45–48 = 0.1 mm.

**Allotype**

CHINA • ♀; same collection data as for holotype; CAU.

**Paratypes**

CHINA • 9 ♂♂; same collection data as for holotype; CAU.

**Description**

**Male**

MEASUREMENTS. Body length 13.0 mm, wing length 15.0 mm, antenna length 4.5 mm (n = 10).

HEAD (Figs 39, 41). Mainly yellow. Occipital stripe dark brown, with brown setae. Rostrum and nasus yellow, rostrum with brown setae and nasus with dark yellow setae. Scape and pedicel yellow, first flagellar segment dark yellow, other flagellar segments bicolor yellowish with dark brown base. Proboscis and palpus grayish yellow.

THORAX (Figs 39, 41). Mainly yellow, heavily pruinose. Pronotum yellow with yellow setae. Prescutum with four yellowish gray stripes, median stripe broadened apically and gradually narrowing to base, lateral stripes long-oval. Scutum yellow with four yellowish gray spots. Scutellum and mediotergite dark yellow. Thoracic pleuron yellow. Parascutellum pale yellow. Meron yellow. Setae on thorax yellow. Legs with coxae and femora yellow, femora with dark brown apices and brown middle parts; tibiae and tarsi dark brown. Setae on legs dark brown. Wing light brown; pterostigma brown; petiole of cell  $m_1$  and discal cell almost equilong (Fig. 40). Halter with stem brown, knob dark brown with pale tip.

ABDOMEN (Figs 39, 41). Mainly yellow. Abdominal tergites each with three stripes, middle stripe pale gray, lateral stripes brown. Abdominal segments 5–9 black. Setae on abdomen brownish yellow.

HYPOPYGIUM (Figs 44–45, 48–50). Gonocoxite elongated, separated from sternite 9, gonocoxite ends with an unusually strong black spine, bent inward and horn-like, ventral of spine with long setae, basal setae longest and decreases to tip, curl inward. Tergite 9 longitudinally divided into two parts, slightly connected. Sternite 9 with a median prominence, adminiculum with a pair of sharp projections on both sides. Outer gonostylus black with yellow bristles, bent, willow leaf shaped (Figs 44, 48). Inner gonostylus with a slanted bar like raise; upper beak sharp, curled inward (Figs 45, 48). Semen pump (Figs 46–47) as shown in figures. Aedeagus with a sclerotized suborbicular appendage at base.

**Female**

MEASUREMENTS. Body length 17.5 mm, wing length 17 mm, antenna length 3 mm (n = 1).

COLORATION. Body color slightly darker than male. Antenna relatively shorter than male. Scape and pedicel yellow, flagellar segments 1–4 bicolor yellow with pale brown base, other segments pale brown. Brown and black part of legs paler than male. Wing same as male except knob of halter without pale tip. Abdominal tergites each with three stripes, middle stripe brown, lateral stripes black, abdominal segments 5–7 yellowish brown, and brown gradually deepened, 8<sup>th</sup> segment dark brown. Other characteristics as in male (Fig. 42).

OVIPOSITOR. Tergite 9 dark brown, tergite 10 shining reddish brown. Cercus brown, tip slightly up-turned, outer margin with rough serration (Fig. 43).

**Distribution**

China (Tibet).

## Remarks

The new species is similar to *T. (V.) coxitalis* Alexander, 1935 from Anhui and Taiwan, China, but the latter differs in the following characters: gonocoxite ends with a slightly twisted spine; outer gonostylus narrow, filiform; inner gonostylus without slanted bar-like raise; sternite 9 near caudal end on either side of midline with a conspicuous hair pencil of reddish bristles, these pencils not arising from basal tubercles (Men 2015). This species is similar to *T. (V.) bicalcarata* Savchenko, 1965 and *T. (V.) maoershanensis* Men & Young, 2017, but the outer gonostylus of the latter is not willow leaf shaped. The posterior margin of inner gonostylus with a finger-like protrusion (Men *et al.* 2017).

### *Tipula (Vestiplex) himalayensis* Brunetti, 1911 Figs 51–57, 86

*Tipula himalayensis* Brunetti, 1911: 252. Type locality: India: Darjeeling.

*Tipula (Vestiplex) subreposita* Alexander, 1942: 39. Type locality: India: Darjiling, Mangpu.

*Tipula himalayensis* – Edwards 1924: 305.

*Tipula (Vestiplex) himalayensis* – Alexander 1942: 41; 1963: 325. — Joseph 1974: 269. — Starkevich & Podenas 2011: 276. — Starkevich 2012: 75. — Pilipenko *et al.* 2019: 10.

## Diagnosis

Scape yellow, pedicel pale yellow, first flagellar segment yellowish brown, other flagellar segments dark brown. Middle of abdominal tergites 2–4 with pale brown spots, both sides each with brown stripe. Gonocoxite strongly elongated. Outer gonostylus brownish black, without setae except margins of apex and base with few setae. Inner gonostylus with upper beak bearing horn-like elevation.

## Material examined

CHINA • 2 ♂♂; Tibet, Bomi, Yigong; 30°16'19" N, 94°48'28" E; 2200 m a.s.l.; 5 May 2017; Qicheng Yang leg.; light trap; CAU.

## Redescription

### Male

MEASUREMENTS. Body length 15.0 mm, wing length 17.0 mm, antenna length 4.0 mm (n = 2).

HEAD (Figs 51, 53). Mainly reddish yellow. Vertex with brown stripe. Rostrum and nasus dark yellow. Setae on head dark brown. Scape yellow, pedicel pale yellow, first flagellar segment yellowish brown, other flagellar segments dark brown. Proboscis and palpus brownish yellow.

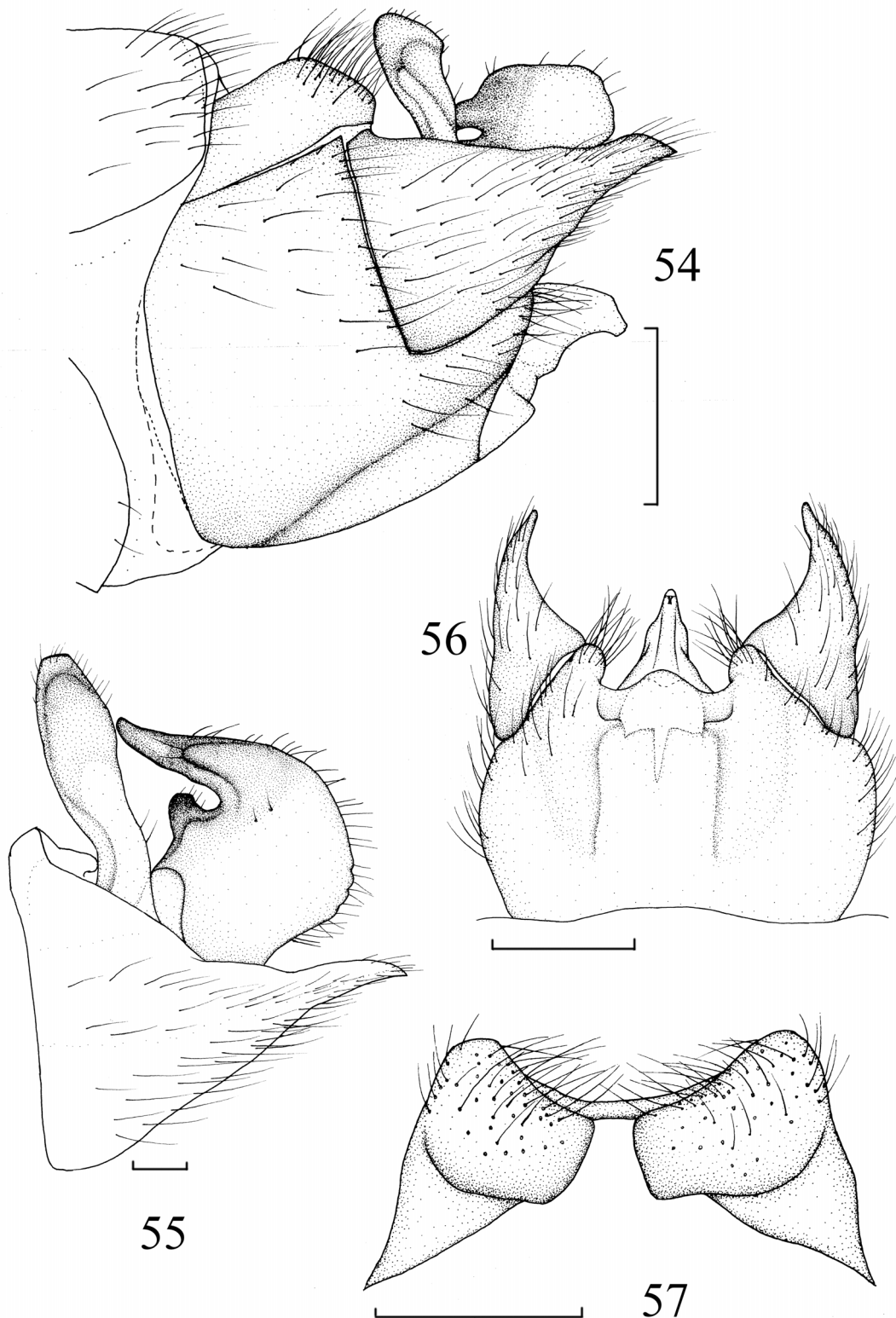
THORAX (Figs 51, 53). Mainly dark yellow, heavily pruinose. Pronotum dark yellow with dark yellow setae, middle pale brown and both sides with a pale brown spot. Prescutum dark yellow with four reddish brown stripes, median stripes broadened apically and gradually narrowing to base. Scutum with four reddish brown spots. Scutellum yellow with black mid-longitudinal stripe. Mediotergite yellow. Thoracic pleuron reddish yellow. Setae on thorax yellow. Legs with coxae and femora yellow, femora with brownish black apices and middle portions, tibiae and tarsi brownish black. Setae on legs brownish black. Wing light brown; pterostigma pale brown; petiole of cell  $m_1$  slightly shorter than discal cell (Fig. 52). Halter with stem yellow, knob pale yellow.

ABDOMEN (Figs 51, 53). Mainly yellow. Middle of abdominal tergites 2–4 with pale brown spots, both sides each with a brown stripe. Abdominal segment 5 yellowish brown, segments 6–9 brownish black. Setae on abdomen yellow.



**Figs 51–53.** *Tipula (Vestiplex) himalayensis* Brunetti, 1911, ♂ (CAU). **51.** Habitus, lateral view. **52.** Wing. **53.** Habitus, dorsal view. Scale bars = 1.0 mm.





**Figs 54–57.** *Tipula (Vestiplex) himalayensis* Brunetti, 1911, ♂ (CAU). **54.** Hypopygium, lateral view. **55.** Outer and inner gonostylus, lateral external view. **56.** Hypopygium, ventral view. **57.** Tergite nine, dorsal view. Scale bars: 54, 56–57 = 0.5 mm; 55 = 0.1 mm.

HYPOPYGIUM (Figs 54–57). Gonocoxite strongly elongated, thick, separated from sternite 9. Tergite 9 longitudinally divided into two parts, a bridge present between them. Sternite 9 with a median prominence. Outer gonostylus sclerotized, brownish black, without setae except margins of apex and base with few setae. Inner gonostylus with setae dorsally; upper beak with a horn-like elevation bearing 2 setae at tip, base of upper beak with 2 distinct setae; inner gonostylus with setae dorsally (Fig. 55).

**Female**

See Brunetti (1911).

**Distribution**

China (Tibet, Yunnan); India (Assam, Himachal Pradesh, Sikkim, Uttarakhand, Uttar Pradesh, W Bengal); Myanmar; Vietnam.

**Remarks**

Here, we add new distributional data and new illustrations. Yigong Township is now the current northernmost distribution of *T. (V.) himalayensis*. The species was considered by Brunetti to be variable but within certain limits and can be easily recognized by the pale yellow wide ring on all the femora about as far from the tip as the width of the ring. We examined other additional material, in addition to the previously indicated: 1 ♂ (paratype) Darjiling; 6000 feet a.s.l.; 22 Sep. 1908; Brunetti (USNM) / 1 ♂ (syntype) Darjiling; 20 Oct. 1905; Brunetti (BMNH(E)#246064). There is no difference in the characteristics of the femora of the three, but the wing veins are slightly different. It seems that the difference in the wing veins shown in Joseph's illustrations (Joseph 1974) can be regarded as intraspecific variation. But there are also some differences in the shape of inner gonostylus as shown in the illustrations, especially the beak different from others. It is necessary to make further observations on the specimens of ZSI.

*Tipula (Vestiplex) nigroapicalis* Brunetti, 1911  
Figs 58–65

*Tipula nigroapicalis* Brunetti, 1911: 257. Type locality: India: Darjiling.

*Tipula lepcha* Alexander, 1958: 151. Type locality: Nepal: Simbhanjang Pass.

*Tipula nigroapicalis* – Edwards 1928: 692.

*Tipula (Vestiplex) nigroapicalis* – Alexander 1953: 342; 1968: 91. — Pilipenko *et al.* 2019: 10.

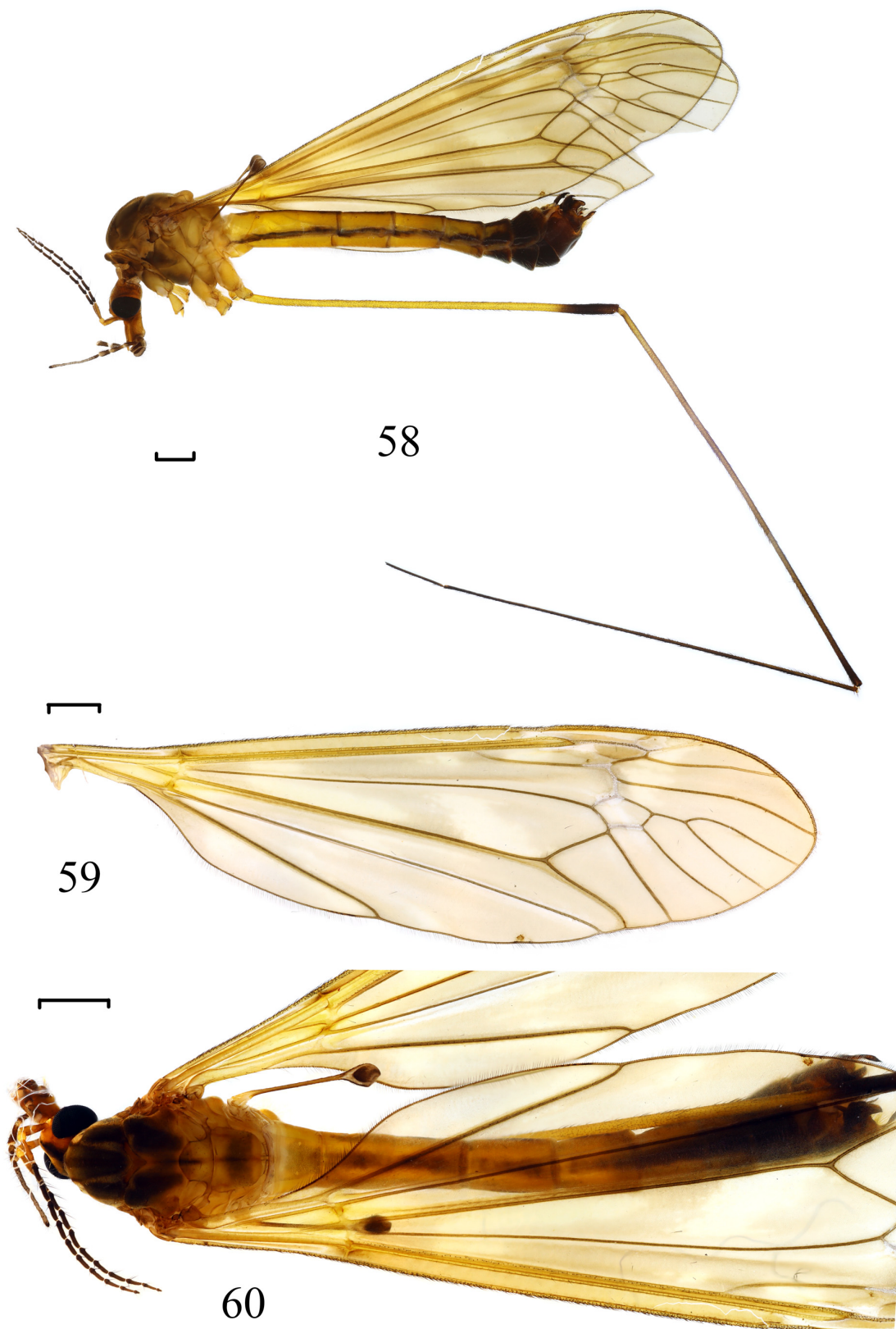
*Tipula lepcha* – Alexander 1960: 144.

**Diagnosis**

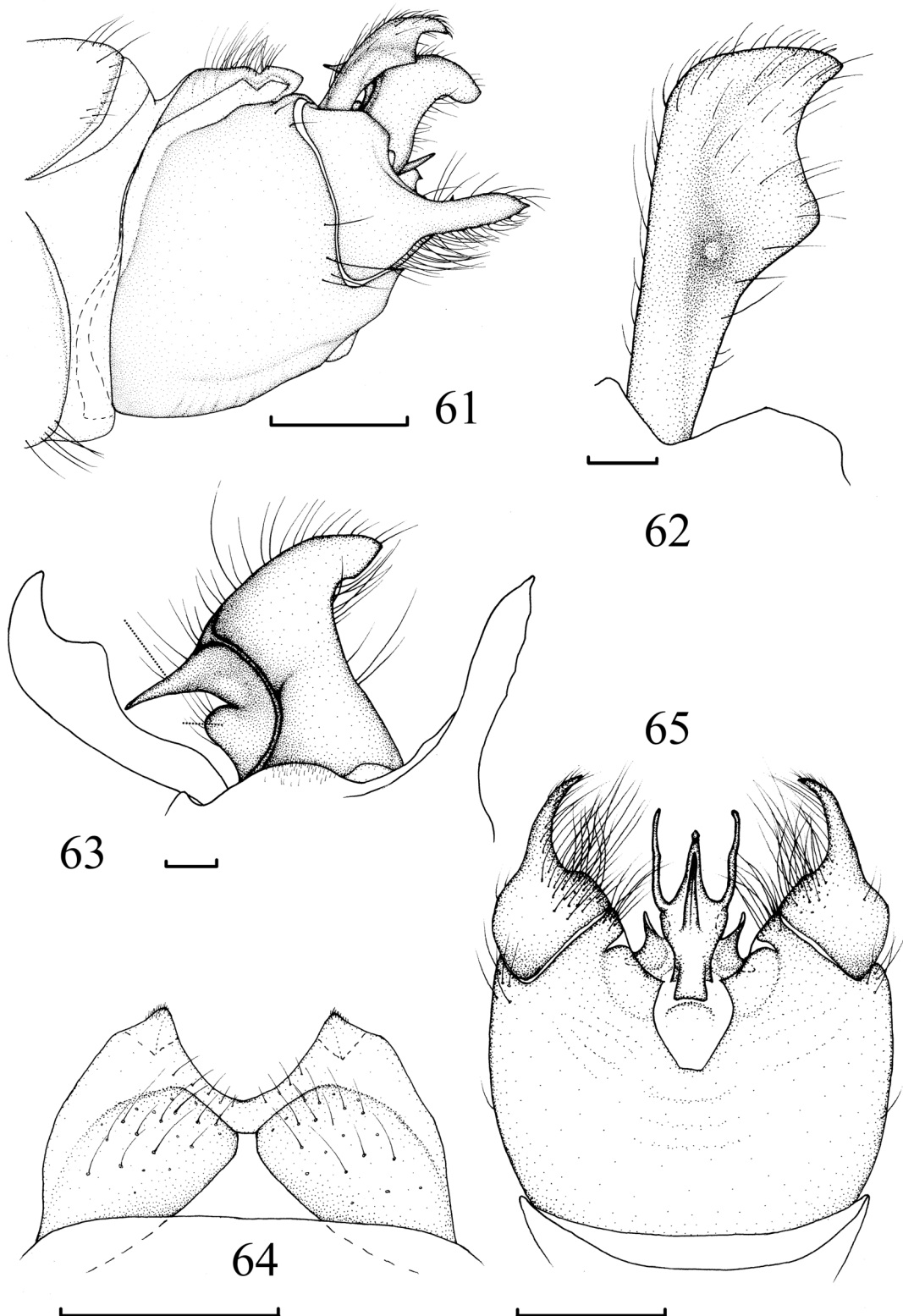
Occipital stripe dark brown. Rostrum brownish yellow, nasus brown with yellow setae. Scape brownish yellow and pedicel pale yellow, first flagellar segment brownish yellow, other flagellar segments black. Scutum yellow with four brownish black spots, which are virtually confluent on each side, anterior two spots small; all spots with olive-gray pruinescence. Upper part of fore coxa brownish black. Inner gonostylus with upper beak sharp bearing, a semicircular striped raise at base; posterior crest produced backward. Adminiculum with a pair of long projections on both sides, longer than apex of phallic guide.

**Material examined**

CHINA • 3 ♂♂; Tibet, Yadong; 27°29'52" N, 88°55'51" E; 3200 m a.s.l.; 12 Jul. 2018; Qicheng Yang leg.; light trap; CAU.



**Figs 58–60.** *Tipula (Vestiplex) nigroapicalis* Brunetti, 1911, ♂ (CAU). **58.** Habitus, lateral view. **59.** Wing. **60.** Habitus, dorsal view. Scale bars = 1.0 mm.



**Figs 61–65.** *Tipula (Vestiplex) nigroapicalis* Brunetti, 1911, ♂ (CAU). **61.** Hypopygium, lateral view. **62.** Outer gonostylus, lateral external view. **63.** Inner gonostylus, lateral external view. **64.** Tergite nine, dorsal view. **65.** Hypopygium, ventral view. Scale bars: 61, 64–65 = 0.5 mm; 62–63 = 0.1 mm.

## Redescription

### Male

MEASUREMENTS. Body length 12.0–13.0 mm, wing length 15.0 mm, antenna length 3.0 mm (n = 3).

HEAD (Figs 58, 60). Mainly brownish yellow. Occipital stripe dark brown. Rostrum brownish yellow, nasus brown with yellow setae. Setae on head brownish black. Scape brownish yellow, pedicel pale yellow, first flagellar segment brownish yellow, other flagellar segments black. Proboscis and palpus black.

THORAX (Figs 58, 60). Mainly brownish yellow, heavily yellow and gray pruinescence. Pronotum brownish gray. Prescutum with four dark brownish black stripes, median stripes virtually confluent, broadened apically and gradually narrowing to base, lateral stripes long-oval; all stripes with olive-gray pruinescence. Scutum yellow with four dark brownish black spots, which are virtually confluent on each side, anterior two spots small, all spots with olive-gray pruinescence. Scutellum yellow with dark brown mid-longitudinal stripe. Mediotergite yellow, middle pale gray with dark brown mid-longitudinal stripe. Scutellum and mediotergite with golden pruinescence. Thoracic pleuron with yellow pruinescence. Anepisternum and katepisternum yellow, each with a brownish black anterior lower spot. Anepimeron yellow with a small brownish black upper spot; katepimeron yellow. Meron yellow with brownish black lower part. Parascutellum yellow. Anatergite and katatergite yellow. Setae on thorax dark yellow. Legs with coxae and femora yellow, except upper part of fore coxa brownish black, femora with black apices; tibiae brownish yellow with black apices; tarsi dark black. Setae on legs black. Wing yellowish brown; pterostigma brown; petiole of cell  $m_1$  slightly shorter than discal cell (Fig. 59). Halter with stem brown, knob grayish black with pale gray apex.

ABDOMEN (Figs 58, 60). Mainly yellow. Abdominal tergites each with three brown stripes, middle stripe pale. Abdominal segments 7–9 brownish black. Setae on abdomen yellow except black setae on middle stripe.

HYPOPYGIUM (Figs 61–65). Gonocoxite elongated into dagger-shaped extension, separated from sternite 9. Posterior margin of tergite 9 depressed medially, connected by a short bridge. Sternite 9, adminiculum trident-shaped, with a pair of long projections on both sides, longer than apex of phallic guide, ventral part of adminiculum with a large projection. Outer gonostylus black, with a central bulge posterior margin bearing subtriangular protrusion (Fig. 62). Inner gonostylus with upper beak sharp, base of beak with a semicircular striped raise; posterior crest produced backward (Fig. 63).

### Female

See Brunetti (1911).

### Distribution

China (Tibet); India (Uttarakhand, W Bengal); Nepal (Simbhanjang Pass).

### *Tipula (Vestiplex) subtincta* group in Tibet

*Tipula (Vestiplex) distifurca* Alexander, 1942

*Tipula (Vestiplex) platyphylla* sp. nov.

### *Tipula (Vestiplex) platyphylla* sp. nov.

urn:lsid:zoobank.org:act:36161517-739E-408A-8F37-B5161284802B

Figs 66–73

### Diagnosis

Vertex with brownish black stripe. Scape, pedicel and first flagellar segment yellow, other flagellar segments bicolor, yellowish with dark brown base. Scutellum and mediotergite dark yellow with dark

gray mid-longitudinally. Prescutum dark yellow with four stripes, median stripes reddish brown, lateral stripes dark. Tergite 9 of male separated medially, with fleshy upper tergal lobes flattened, and two widened black sclerotized blades at a lower level.

### Etymology

The species is named after the shape of blades of tergite 9, the Latin adjective '*platyphylla*' refers to 'having flat leaves'.

### Material examined

#### Holotype

CHINA • ♂; Tibet, Bomi, Tongmai (通麦); coordinates of the town: 30°06'00" N, 95°04'56" E; 21 Aug. 2011; Lihua Wang leg.; light trap; specific geographic coordinates and altitude not recorded; CAU.

### Description

#### Male

MEASUREMENTS. Body length 15.0 mm, wing length 17.5 mm, antenna length 5.0 mm (n = 1).

HEAD (Figs 66, 68). Mainly reddish yellow. Vertex with brownish black stripe. Rostrum and nasus dark yellow. Setae on head dark brown. Scape, pedicel and first flagellar segment yellow, other flagellar segments bicolor, yellowish with dark brown base. Proboscis brown; palpus yellowish brown.

THORAX (Figs 66, 68). Mainly reddish yellow with dark yellow pruinescence. Pronotum reddish yellow with yellow setae. Prescutum dark yellow with four reddish brown stripes, median stripes broadened apically and gradually narrowing to base, lateral stripes long-oval, dark reddish brown. Scutum almost entirely brown with four olive-gray pruinose spots. Scutellum and mediotergite dark yellow with dark gray mid-longitudinally. Thoracic pleuron reddish yellow. Anepisternum pale brown. Setae on thorax yellow. Legs with coxae and femora dark yellow, femora with dark brown apices and brown middle portion, tibiae and tarsi dark brown. Setae on legs dark brown. Wing variegated light brown; pterostigma brown; petiole of cell  $m_1$  shorter than discal cell (Fig. 67). Halter with stem yellow, knob pale yellow with dark brown lower margin.

ABDOMEN (Figs 66, 68). Mainly yellow. Middle of abdominal tergites 1–2 with pale brown stripes, other tergites without spot. Abdominal segments 5–9 brown. Setae on abdomen yellow.

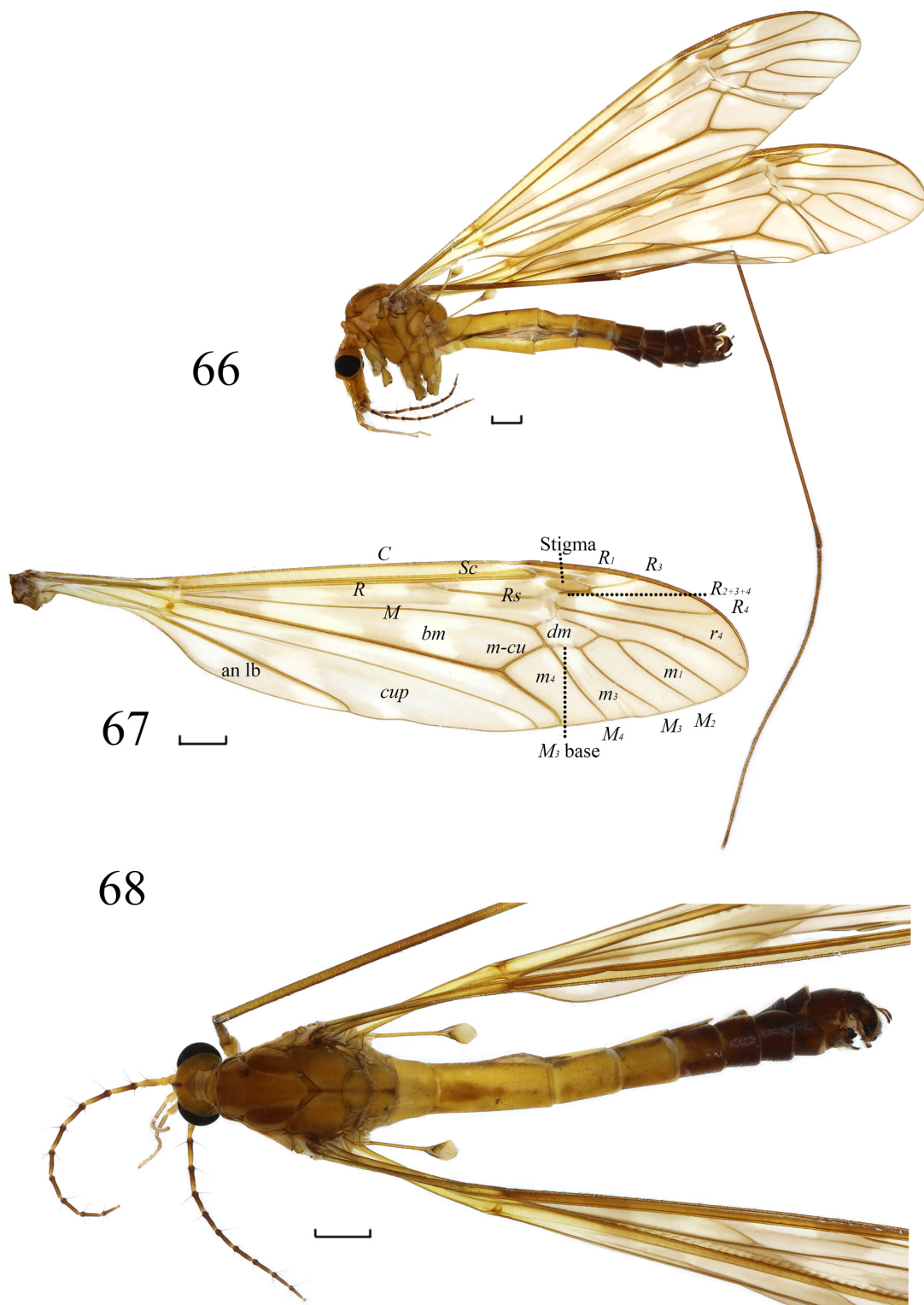
HYPOPYGIUM (Figs 69–73). Gonocoxite elongated, separated from sternite 9, gonocoxite ends with a sharp black upper spine, directed chiefly upward, bottom of gonocoxite also with a black upper spine (Figs 69, 73). Posterior margin of membranous suture between tergite 9 and gonocoxite with a spiny projection. Tergite 9 separated medially, with fleshy upper tergal lobes flattened, two widened sclerotized blades at a lower level, apex of blade black and serrulate. Sternite 9 with a median prominence; apex of appendages of sternite 9 slender, basally dilated. Outer gonostylus slender, strip-shaped; stem almost without setae (Fig. 71). Inner gonostylus with a subtriangular elevation, lower beak close to base of upper beak (Fig. 72).

#### Female

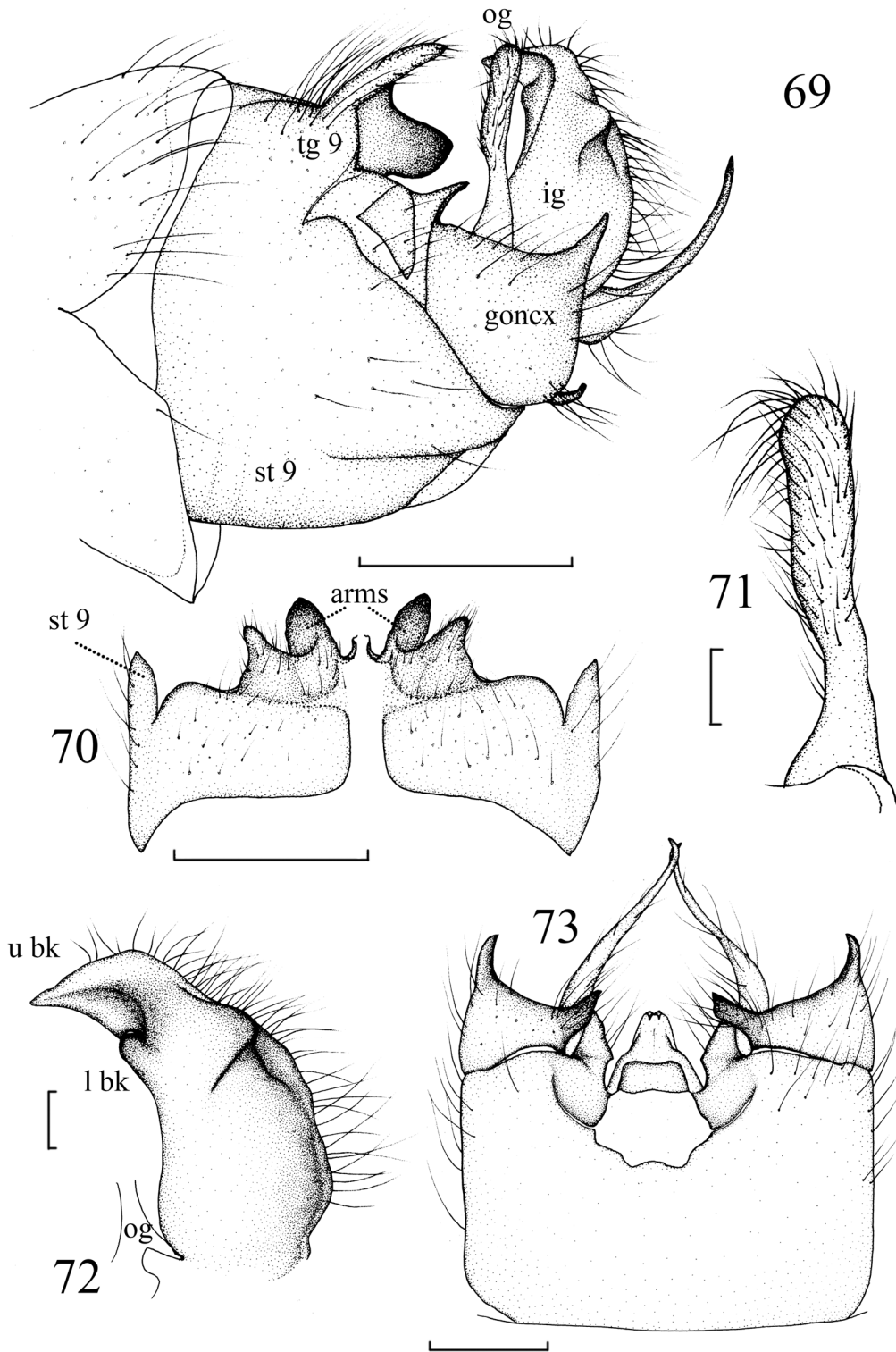
Unknown or unrecognized.

### Distribution

China (Tibet).



**Figs 66–68.** *Tipula (Vestiplex) platyphylla* sp. nov., holotype, ♂ (CAU). **66.** Habitus, lateral view. **67.** Wing. **68.** Habitus, dorsal view. Abbreviations: see Material and methods. Scale bars = 1.0 mm.



**Figs 69–73.** *Tipula (Vestiplex) platyphylla* sp. nov., holotype, ♂ (CAU). **69.** Hypopygium, lateral view. **70.** Tergite nine, dorsal view. **71.** Outer gonostylus, lateral external view. **72.** Inner gonostylus, lateral external view. **73.** Hypopygium, ventral view. Abbreviations: see Material and methods. Scale bars: 69–70, 73 = 0.5 mm; 71–72 = 0.1 mm.



### Remarks

The new species is similar to *T. (V.) gandharva* Alexander, 1951 from India (Assam) and Myanmar, but the latter differs in the following characters: dorsolateral extensions of tergite 9 long and slender, sclerotized ventral blades much less massive; the spine of gonocoxite is smaller than this new species.

### Other groups in Tibet

#### *Tipula (Vestiplex) avicularia* group

*Tipula (Vestiplex) avicularia* Edwards, 1928

#### *Tipula (Vestiplex) coquillettiana* group

*Tipula (Vestiplex) scandens* Edwards, 1928

#### *Tipula (Vestiplex) eurydice* group

*Tipula (Vestiplex) eurydice* Alexander, 1961

#### *Tipula (Vestiplex) scripta* group

*Tipula (Vestiplex) subscripta* Edwards, 1928

#### *Tipula (Vestiplex) virgatula* group

*Tipula (Vestiplex) opilionimorpha opilionimorpha* Savchenko, 1955

### Group unknown

*Tipula (Vestiplex) motuoensis* sp. nov.

*Tipula (Vestiplex) motuoensis* sp. nov.

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Figs 75–83

### Diagnosis

Proboscis relatively short. Pronotum brownish yellow with dark yellow setae. Prescutum mainly reddish yellow with four olive-brown striped pruinescence, velvety, two middle stripes virtually fused. Gonocoxite ends hook-like, not separated from sternite 9; tergite 9 with two pairs of lobes, longitudinally divided into two parts, slightly connected, pair of emarginate arms arising from ventral surface of tergite 9. Inner gonostylus with posterior crest produced backward, base of inner gonostylus and outer basal lobe of inner gonostylus rolled inward, produced depression with row of short setulae.

### Etymology

The species is named after the type locality Motuo.

### Material examined

#### Holotype

CHINA • ♂; Tibet, Motuo, 80K; 29°39'29" N, 95°29'24" E; 2020 m a.s.l.; 13 Jun. 2017; Qicheng Yang leg.; light trap; CAU.

#### Allotype

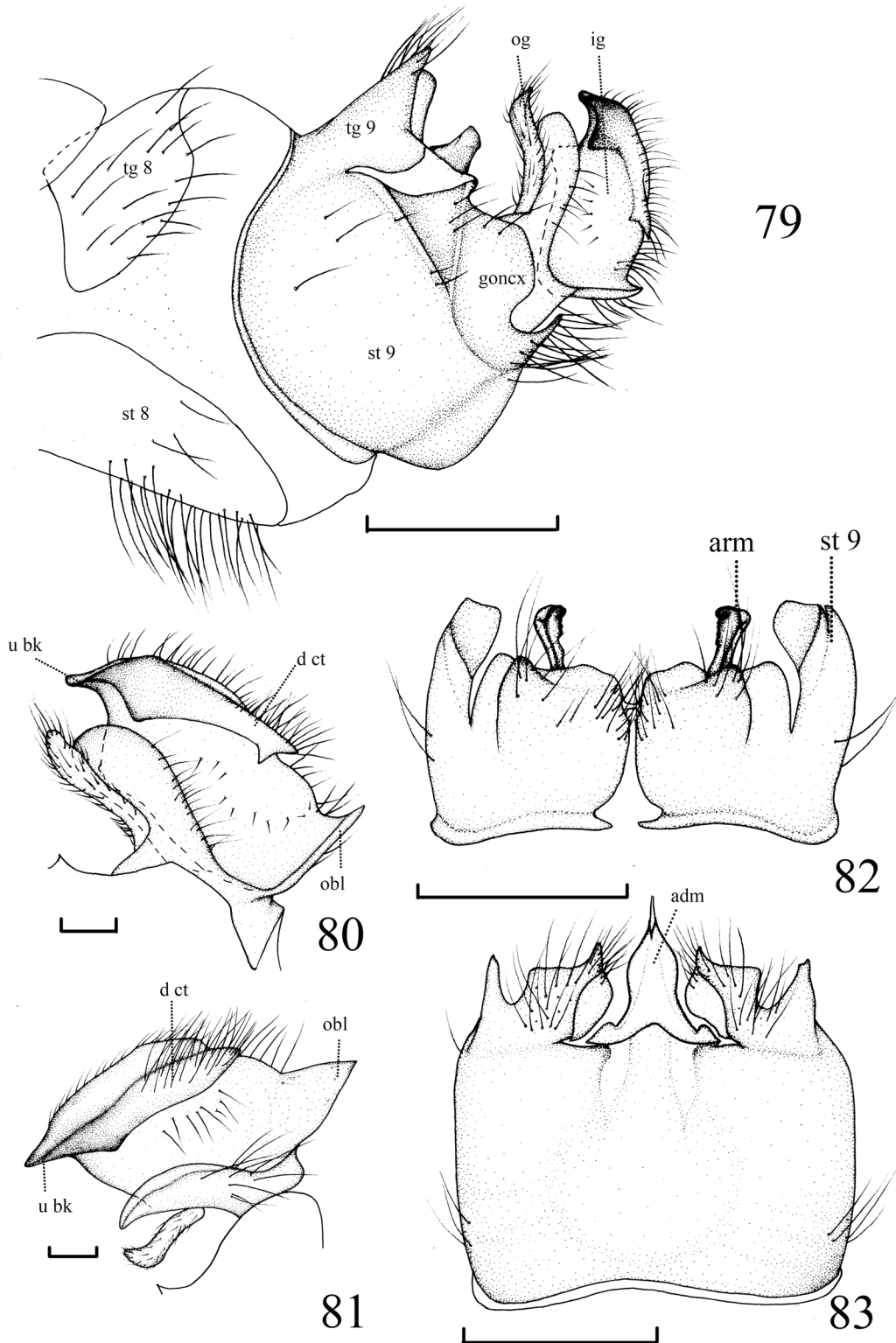
CHINA • ♀; same collection data as for holotype; CAU.



**Figs 74–76.** *Tipula (Vestiplex) motuoensis* sp. nov., holotype, ♂ (CAU). 74. Habitus, lateral view. 75. Male habitus, dorsal view. 76. Wing. Abbreviations: see Material and methods. Scale bars = 1.0 mm.



**Figs 77–78.** *Tipula (Vestiplex) motuoensis* sp. nov., allotype, ♀ (CAU). 77. Habitus, lateral view. 78. Ovipositor, lateral view. Scale bars = 1.0 mm.



**Figs 79–83.** *Tipula (Vestiplex) motuoensis* sp. nov., holotype, ♂ (CAU). **79.** Hypopygium, lateral view. **80–81.** Outer and inner gonostylus, lateral external view and lateral dorsal view. **82.** Tergite nine, dorsal view. **83.** Hypopygium, ventral view. Abbreviations: see Material and methods. Scale bars: 79, 82–83 = 0.5 mm; 80–81 = 0.1 mm.

### Paratype

CHINA • 1 ♂; same collection data as for holotype; CAU.

### Description

#### Male

MEASUREMENTS. Body length 12.0 mm, wing length 15.0 mm, antenna length 4.0 mm (n = 2).

HEAD (Figs 74–75). Mainly dark yellow. Vertex with dark brown stripe. Frontal tubercle relatively high. Proboscis relatively short, rostrum and nasus dark yellow. Setae on head dark brown. Scape yellow, pedicel pale yellow, flagellum dark brown. Proboscis and palpus brownish yellow.

THORAX (Figs 74–75). Mainly dark yellow, heavily pruinescence. Pronotum brownish yellow with dark yellow setae. Prescutum mainly reddish yellow with four olive-brown striped pruinescence, velvety, two middle stripes virtually fused. Scutum with four reddish brown spots, with olive-brown striped pruinescence. Scutellum and mediotergite yellow with pale brown mid-longitudinal stripes. Thorax yellow in lateral view. Pleura below anterior thoracic spiracle to middle with an irregular brownish black spot; anepisternum and katepisternum pale brownish yellow. Setae on thorax yellow. Legs with coxae and bases of femora pale yellow, apices of femora brown; tibiae and tarsi dark brown. Setae on legs brownish black. Wing light brown; pterostigma brown; petiole of cell  $m_1$  shorter than discal cell (Fig. 76). Halter with stem dark yellow, knob brownish yellow.

ABDOMEN (Figs 74–75). Mainly yellow. Abdominal dorsum with three brown longitudinal stripes, abdominal segment 6 brownish yellow, segments 7–9 brown. Setae on abdomen dark brown and yellow.

HYPOPYGIUM (Figs 79–83). Gonocoxite ends hook-like, not separated from sternite 9, tergite 9 bearing two pairs of lobes, longitudinally divided into two parts, slightly connected, inner margin with dense setae; a pair of emarginate arms arising from ventral surface of tergite 9, inner margin black, other areas yellow. Sternite 9 with a median prominence, middle of sternite 9 slightly raised. Sternite 8 with abundant setae. Outer gonostylus slender and small, apex curly (Figs 79–81). Inner gonostylus, dorsal crest produced into fishtail, base of inner gonostylus and outer basal lobe of inner gonostylus inward-rolled, produced depression with a row of short setulae, outer basal lobe of inner gonostylus large triangular (Figs 80–81).

#### Female

MEASUREMENTS. Body length 13 mm, wing length 15 mm, antenna length 2.4 mm (n = 1).

COLORATION. Body color slightly paler than male. Antenna shorter than male, dark yellow. Legs paler than male, tibiae and tarsi dark yellow. Abdominal tergites each with three stripes, middle stripe brown, lateral stripes brownish black, abdominal 7–8 segments yellowish brown, 8th segment dark brown. Junction of each 3–9 segments brownish black (Fig. 77).

OVIPOSITOR. Tergite 9 yellowish brown, tergite 10 yellow. Cercus dark yellow, slightly up-turned, outer margin without rough serration (Fig. 78).

### Distribution

China (Tibet).

### Remarks

The new species is similar to *T. (V.) theowaldana* Alexander, 1964 from Assam, India, but the latter differs in the following characters: basal abdominal tergites yellow; gonocoxite ends sharp and not hooked; tergite 9 with a pair of larger and elongate lobes. The species may form a new species group,



$\frac{84|85}{86}$



**Figs 84–86.** 84. *Tipula (Vestiplex) bucera* sp. nov., mating. 85. Habitat of 80K, Muotuo, Tibet, China. 86. Habitat of Yigong, Bomi, Tibet, China.

perhaps together with *T. (V.) theowaldana*. However, we have not examined the specimens of the latter species and can therefore not say with certainty if these two species share characteristics that would separate them from existing species groups.

## Discussion

Starkevich (2012) divided the subgenus *Vestiplex* into 7 species groups in his revisionary study of the global fauna. The species diversity of *Vestiplex* is particularly high in northern India, the Tibetan Plateau and the Hengduan Mountains, with more than 90 species currently known (Oosterbroek 2021). We added six new species to the fauna of Tibet, and placed *T. (V.) magatama* sp. nov. and *T. (V.) uncinella* sp. nov. into the *T. (V.) deserrata* group; *T. (V.) nayogabuensis* sp. nov. into the *T. (V.) divisotergata* group, *T. (V.) bucera* sp. nov. into the *T. (V.) himalayensis* group; and placed *T. (V.) platyphylla* sp. nov. into the *T. (V.) subtincta* group. But we could not place *T. (V.) motuoensis*, which has an inner dististyle similar to that of *T. (V.) theowaldana* from India (Assam), in an existing species group. We hope to examine the specimens of *T. (V.) theowaldana* in the future to determine whether *T. (V.) theowaldana* and *T. (V.) motuoensis* can be placed in an existing species group.

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