



Genus *Chimarra* Stephens, 1829 (Insecta: Trichoptera: Philopotamidae) from Suntalekhola Biodiversity Camp, Neora Valley, National Park, West Bengal

Manpreet Singh Pandher

Zoological Survey of India, New Alipore, Kolkata - 700053, West Bengal, India;
Email: mpandher.iari@gmail.com

Abstract

This paper deals with the diversity of the genus *Chimarra* Stephens, 1829 collected by the light trap from Suntalekhola Biodiversity Camp. Seven species of the genus *Chimarra*, viz. *C. biungulata* Kimmins, 1964, *C. fenestrata* Kimmins, 1964, *C. nigra* Kimmins, 1964, *C. nepalensis* Kimmins, 1964, *C. sikkimensis* Pandher & Saini, 2012, *C. rifati* Pandher & Saini, 2012 and *C. aberrans* Martynov, 1935 are recorded from this single locality in one night light trap collection. Further, presently reported *C. nepalensis* and *C. fenestrata* form its first record from India and West Bengal as well. Apart from that, *C. nigra*, *C. rifati* and *C. sikkimensis* constitute first state records for West Bengal. We also consider *C. dibangensis* Pandher & Saini, 2013 and *C. reyangensis* Ghosh & Chaudhury, 1999 as synonyms of *C. biungulata* Kimmins, 1964 on the basis of resemblance of the male genitalia examined during this study.

Keywords: Caddisflies. New Record, Species, Synonym

Introduction

Established in the year 1986, after the name of river Neora, the Neora Valley National Park is a region of rich biodiversity and located in the district of Darjeeling (West Bengal). This National Park falls in the catchment zone of the River Neora. The whole forest plantation is traversed by mountain streams and mainly comprises tropical and temperate vegetation. The park is known for the virgin forest ecosystem and its exceptionally unique biodiversity. At the North, the Neora Valley National Park shares its boundary with the forests of Sikkim and Bhutan. Due to wide range of altitude variation, i.e., from 30 m of altitude up to 3200 m amsl, the climatic condition of the National Park changes from tropical to temperate or even sub-alpine in some extreme Northern reaches. It reveals a rich diversity of habitat as the area encompasses the catchments and watershed of the River Neora along with its tributaries.

Chimarra is the most diverse genus in the Oriental Region. Recently in terms of species number it has surpassed genus *Rhyacophila* (Morse, 2020; Morse, personal communication). The diversity of this genus

can be accounted from the number of species which were described in the last 30 years (200 species). Indian sub-continent, being a part of oriental region also supports about 53 species (Kaur *et al.*, 2020). What accounts for such a large diversity of this genus is the specialized male genitalic appendages and that also in the shape and structure of the tergum X of male genitalia (Blahnik, 1998). From Darjeeling, Martynov (1935) and Ghosh & Chaudhury (1999) described three new *Chimarra* species which forms the only available literature from this geographic area.

Material and Methods

The Neora Valley National Park is situated along the 27.0824° N, 88.7007° E coordinates. Light trap collection was done at the Suntalekhola Biodiversity Camp (27°00.789'N, 88°47.094'E, alt. 700 m) during the month of September 2018. The specimens were directly killed and well-preserved in 70% ethyl alcohol. All the collection data pertaining to each specimen were recorded. Family-level identification was done by observing various morphological characters like antennae, labial palps, setal

warts, number of spurs on legs, maculation and venation of wings. Terminology for genitalic structures follows that of Blahník *et al.* (2009). For species-level identification, the male genitalia were observed. To undertake this, the genitalia from one of the male specimens were dissected and immersed in 10% KOH solution overnight. After clearing, the genitalia were put in solution of ethyl alcohol (80%) with a drop of glycerol for observation. The final drawings were rendered by ocular grid fitted in one eyepiece of a radical-zoom stereoscopic microscope (max. magnification 160X). After they were illustrated, the genitalia were shifted to a glass vial along with the rest of the specimen for each species designed for storage. The inking of the final illustrations was done with Rotring Black ink. All the specimens were deposited at the National Zoological Collection of Zoological Survey of India (ZSI), Kolkata.

Results

Seven species (27 specimens) of the genus *Chimarra* Stephens, 1829 were collected by light trap.

1. *Chimarra sikkimensis* Pandher & Saini, 2012 (Figs. 1-5)

2012. *Chimarra sikkimensis* Pandher & Saini, *Zootaxa*, **3478**: 320.

Material examined: India: West Bengal; Neora valley National Park, Suntalekhola Biodiversity Camp (W.B), 700 m, 27°00.789'N, 88°47.094'E, 27-ix-2018, 3♂♂, Pathania, P.C. & Pandher, M.S. (ZSI).

Diagnosis: The male genitalia appendages of *C. sikkimensis* are similar to the following species reported from Thailand viz. *Chimarra rama* Malicky & Chantaramongkol 1993b, *C. devva* Malicky & Chantaramongkol 1993b, *C. shiva* Malicky & Chantaramongkol 1993b, *C. atara* Malicky & Chantaramongkol 1993b, and *C. momma* Malicky & Chantaramongkol 1993b. In lateral view, segment IX is produced anteroventrally in all these species. Besides this, in the outline, the lateral lobes of tergum X of *C. sikkimensis* and *C. rama* are alike in lateral view but the inferior appendages differs characteristically (which are wide and apically quadrate in *C. sikkimensis* but slender and apically sharp in *C. rama*) as well as pin-head-like (apically) mesal

lobe of tergum X in *C. sikkimensis*, but curved posterad in *C. rama*. The phallic apparatus of *C. sikkimensis* in ventral view bears two sickle-shaped apical endothelial spines and in lateral view 4 asymmetrical spines, while in *C. rama*. Only 2 asymmetrical endothelial spines are visible. This species was earlier described from Sikkim and as well as reported from Uttarakhand (Pandher & Saini, 2012) and its recent collection from the state of West Bengal suggests its further distribution in the Himalayan belt.

Distribution: India: Sikkim, West Bengal and Uttarakhand.

2. *Chimarra rifati* Pandher & Saini, 2012 (Figs. 6-10)

2012. *Chimarra rifati* Pandher & Saini, *Zootaxa*, **3478**: 324

Material examined: India: West Bengal; Neora valley National Park, Suntalekhola Biodiversity Camp (W.B), 700 m, 27°00.789'N, 88°47.094'E, 27-ix-2018, 1♂, Pathania, P.C. & Pandher, M.S. (ZSI).

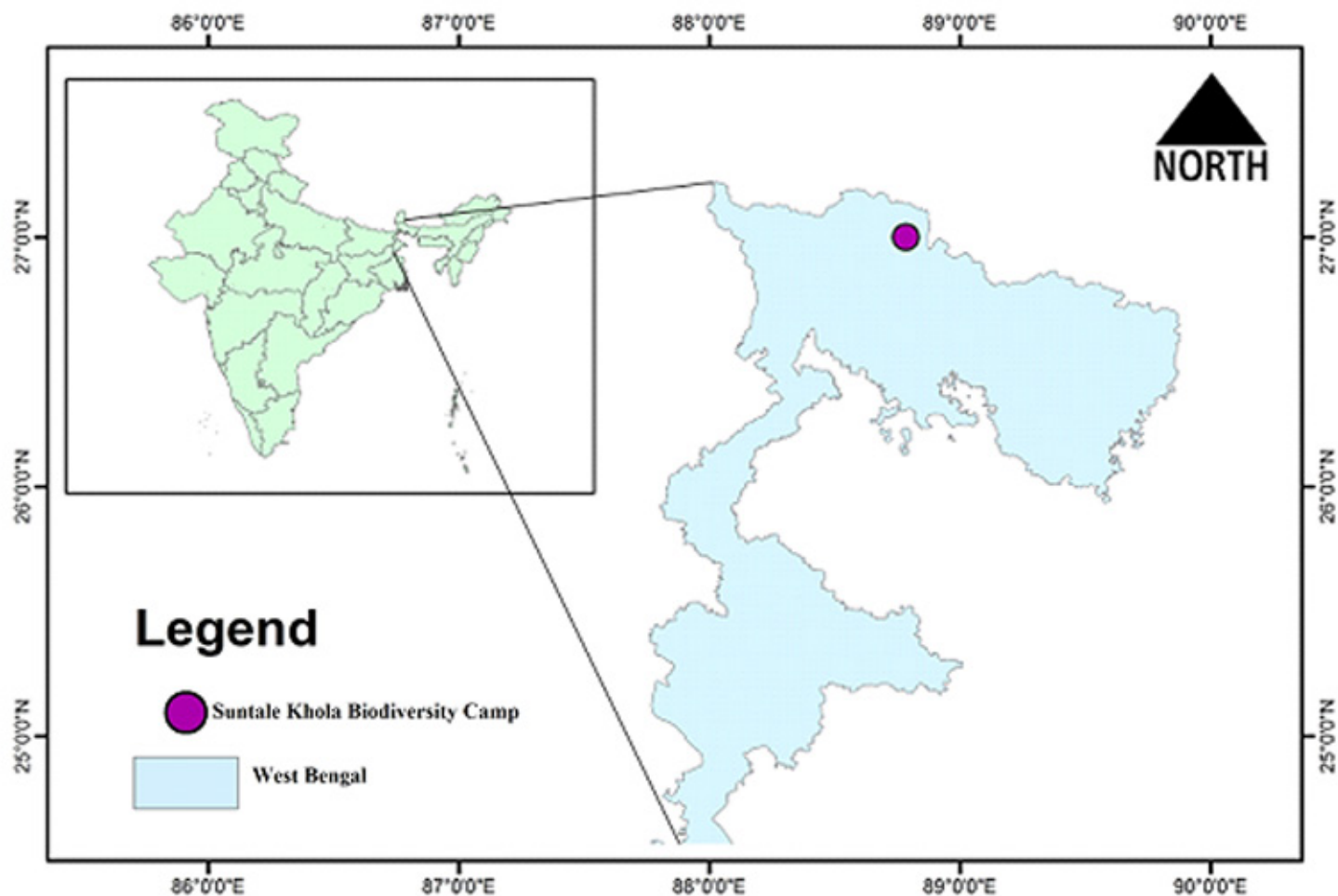
Diagnosis: In lateral view, the outline of segment IX and the inferior appendages with long hairs, this species resembles 3 Bhutanese species (*Chimarra semiramis* Malicky 2007, *C. pontos* Malicky 2007, *C. oreithyia* Malicky 2007); 2 species from Thailand (*C. scopulifera* Kimmins, 1957, *C. lahuorum* Malicky & Chantaramongkol, 1989), a Vietnamese species (*C. haimuoi* Malicky 1995). But, in dorsal view of the male genitalia, it is closer to *C. scopulifera*. However, in *C. rifati* in lateral view, there is present a small postero-ventral process, lateral lobes of tergum X are curved postventrad, sclerotized as well as mesal lobes of tergum X are narrow and digitate (in dorsal view) whereas, in *C. scopulifera* posteroventral process is broad, sclerotized lateral lobes of tergum X are straight and directed posterad (in lateral view) and the mesal lobes of tergum X are broad at the base makes *C. rifati* a distinct species.

Distribution: India: (Sikkim and West Bengal).

3. *Chimarra nepalensis* Kimmins, 1964 (Figs. 11-15)

1964. *Chimarra nepalensis* Kimmins, *Bull. Brit. Mus. (Nat. Hist.) Entomol.*, **15**: 39.

Material examined: India: West Bengal Neora valley National Park, Suntalekhola Biodiversity Camp (W.B), 700 m, 27°00.789'N, 88°47.094'E, 27-ix-2018, 3♂♂, 1♀, Pathania, P.C. & Pandher, M.S. (ZSI).



Map 1. Location of collection site in West Bengal.

Diagnosis: As per the observations of Kimmins (1964) in the original description of *C. nepalensis*, it is similar to the *C. khasia* Kimmins, 1957. Further, *C. nepalensis* is similar to *C. fenestrata* Kimmins, 1964 and *C. pupi* Pandher & Saini, 2012. It is more similar to *C. fenestrata* in the shape of male genitalia. But in *C. nepalensis* the membranous mesal lobes of tergum X are much extended, almost reaching beyond 2/3 of the sclerotized lateral lobes of tergum X whereas, the membranous mesal lobes of tergum X are short and reaching almost to the middle of the sclerotized lateral lobes of tergum X in *C. fenestrata*.

Distribution: Nepal and India (West Bengal).

4. *Chimarra fenestrata* Kimmins, 1964 (Figs. 16-20)

1964. *Chimarra fenestrata* Kimmins, *Bull. Brit. Mus. (Nat. Hist.) Entomol.*, **15**: 41.

Material examined: India: West Bengal Neora valley National Park, Suntalekhola Biodiversity Camp (W.B), 700 m, 27°00.789'N, 88°47.094'E, 27-ix-2018, 5♂♂, 3♀♀, Pathania, P.C. & Pandher, M.S. (ZSI).

Diagnosis: The male genitalic appendages of this species are similar to that of *Chimarra khasia* Kimmins, 1964 as well as *C. nepalensis* Kimmins, 1964. However, segment IX with postero-lateral margin rounded (pointed in the *C. nepalensis*) and the lateral lobes of tergum X are longer and pointed as compared to the *C. nepalensis*.

Distribution: Nepal and India (West Bengal).

5. *Chimarra biungulata* Kimmins, 1964 (Figs. 21-25)

1964. *Chimarra biungulata* Kimmins, *Bull. Brit. Mus. (Nat. Hist.) Entomol.*, **15**: 42.

1999. *Chimarra reyangensis* Ghosh & Chaudhary, *Fauna of West Bengal, State fauna Series*, 3(8): 4.
 2013. *Chimarra dibangensis* Pandher & Saini, *Acta Zool. Acad. Sci. Hung.*, 59(3): 271

Material examined: India: West Bengal, Neora valley National Park, Suntalekhola Biodiversity Camp (W.B), 700 m, 27°00.789'N, 88°47.094'E, 27-ix-2018, 7♂♂, 2♀♀, Pathania & Pandher, (ZSI).

Additional material: *Chimarra dibangensis*: India: Arunachal Pradesh, Roing, 800m, 2-v-2010, 1♂, Pandher, M.S. and Parey, S.H. (NPC).

Chimarra reyangensis: India: West Bengal, Darjeeling, Reyang, F. R. H., 275 m; 25-iii-1973, 1♂, Sharma, H.S. & party (ZSI).

Diagnosis: The male genitalic structures of *Chimarra biungulata* in having well-developed postero-ventral process on sternum VIII, are similar to *Chimarra exapia* Malicky & Chantaramongkol, 1993b and *C. atria* Malicky & Chantaramongkol, 1993b both reported from Thailand. But in lateral view, inferior appendages are dorsally directed in *C. biungulata* and two sensilla one basal and another apical one are present on the lateral lobe of tergum X, whereas no such sensillae occurs in the related species. Furthermore, the substantial variances are evident in these species in the form of phallus, the number and shape of endothecal spines.

Distribution: Nepal and India (Arunachal Pradesh and West Bengal).

Remarks: *Chimarra biungulata* was described by Kimmins (1964) from Nepal, while Gosh & Chaudhary (1999) described a new species *C. reyangensis* from Darjeeling, West Bengal which seems to be an erroneous treatment. Similarly Pandher & Saini (2013) described *C. dibangensis* from Arunachal Pradesh and mistook it as a new species. The author happened to compare the types of *C. reyangensis* and *C. dibangensis* as well as freshly collected specimens from Neora Valley. All these agree in the morphological characters as well as in the shape of male genitalia with that of the *C. biungulata*. Hence, *C. reyangensis* Gosh & Chaudhary (1999) and *C. dibangensis* Pandher & Saini (2013) are hereby treated as synonym of *C. biungulata*.

6. *Chimarra aberrans* Martynov, 1935 (Figs. 26-28)

1935. *Chimarra aberrans* Martynov, *Rec. Indian Mus.*, 38: 126.

Material examined: India: West Bengal, Neora valley National Park, Suntalekhola Biodiversity Camp (W.B), 700 m, 27°00.789'N, 88°47.094'E, 27-ix-2018, 1♂, Pathania, P.C. & Pandher, M.S. (ZSI).

Diagnosis: *Chimarra aberrans* is a widely distributed species and found throughout India. This species was described by Martynov (1935) from Darjeeling, West Bengal. Later on it was reported from many other localities of India.

Distribution: Nepal; India (Himachal Pradesh, Uttarakhand and West Bengal).

7. *Chimarra nigra* Kimmins, 1964 (Figs. 29-33)

1964. *Chimarra nigra* Kimmins, *Bull. Brit. Mus. (Nat. Hist.) Entomol.*, 15: 42

Material examined: India: West Bengal, Neora valley National Park, Suntalekhola Biodiversity Camp (W.B), 700 m, 27°00.789'N, 88°47.094'E, 27-ix-2018, 1♂, Pathania, P.C. & Pandher, M.S. (ZSI).

Diagnosis: The male genitalia of this species are similar to *Chimarra berenike* Malicky, 1998 and *C. argeia* Malicky 1997 in the form of segment IX in lateral view. But it is a distinct species, due to narrow and small lateral lobe of tergum X, and the inferior appendage with rounded apex in lateral view.

Distribution: Nepal; India (Sikkim & West Bengal).

Discussion

Seven species of the genus *Chimarra*, viz. *C. biungulata* Kimmins, *C. fenestrata* Kimmins, *C. nigra* Kimmins, *C. nepalensis* Kimmins, *C. sikkimensis* Pandher & Saini, *C. rifati* Pandher & Saini and *C. aberrans* Martynov are recorded from this single locality (Suntalekhola Biodiversity Camp, Neora valley National Park, West Bengal) in one night light trap collection. Further, *C. nepalensis* Kimmins and *C. fenestrata* Kimmins are reported for the first time from India (West Bengal). *C. nigra* Kimmins, *C. rifati* Pandher & Saini and

C. sikkimensis Pandher & Saini constitute first state records for West Bengal state.

Based on the morphological features and the shape and the form of genitalic appendages *C. reyangensis* described from West Bengal by Ghosh & Chaudhary (1999) as well as *C. dibangensis* described from Arunachal Pradesh by Pandher & Saini (2013) are treated hereby as junior synonym of *C. biungulata* Kimmins, 1964 described from Nepal. The author happened to compare the type species of both of the species and found that they agree in morphological characters with that of the characteristics of the *C. biungulata* as described by Kimmins (1964). With this report the range of this species extends to India in West Bengal and Arunachal Pradesh.

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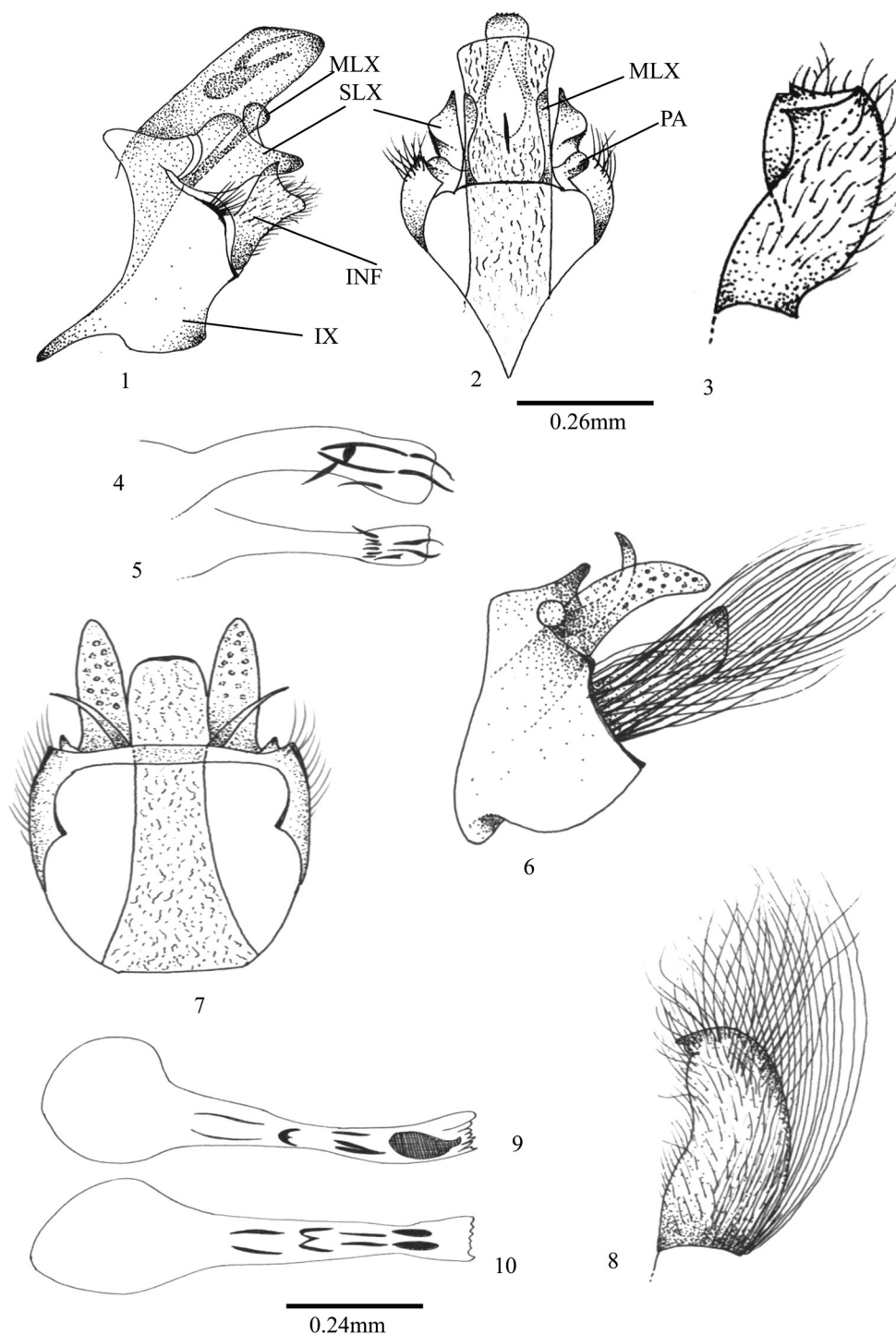


Plate 1. Figures 1-10. *Chimarra* spp. Male genitalia. 1-5. *Chimarra sikkimensis*. 1. Lateral view, 2. Dorsal view, 3. Inferior appendage Ventral view, 4. Phallic apparatus lateral view, 5. Phallic apparatus ventral view. 6-10. *C. rifati*. 6. Lateral view, 7. Dorsal view, 8. Inferior appendage Ventral view, 9. Phallic apparatus lateral view, 10. Phallic apparatus ventral view. (INF-Inferior appendage; MLX-Mesal Lobe of Tergum X; PA-Preanal appendage; SLX- Sclerotized Lateral lobe of Tergum X; IX-Segment IX).

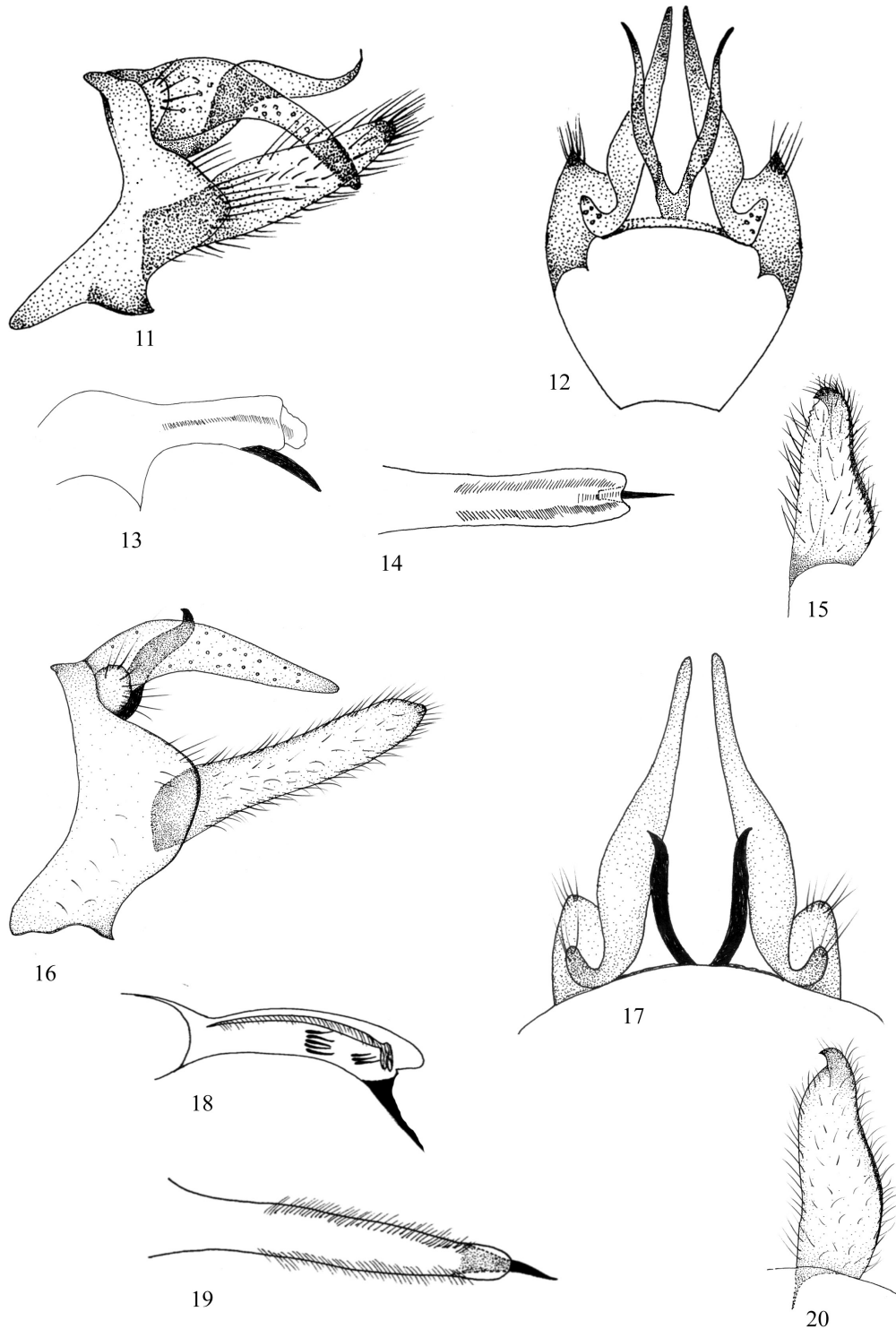


Plate 2. Figures 11-20. *Chimarra* spp. Male genitalia. 11-15. *Chimarra nepalensis*. 11. Lateral view, 12. Dorsal view, 13. Phallic apparatus lateral view, 14. Phallic apparatus ventral view, 15. Inferior appendage Ventral view. 16-20. *C. fenestrata*. 16. Lateral view, 17. Dorsal view, 18. Phallic apparatus lateral view, 19. Phallic apparatus ventral view, 20. Inferior appendage Ventral view.

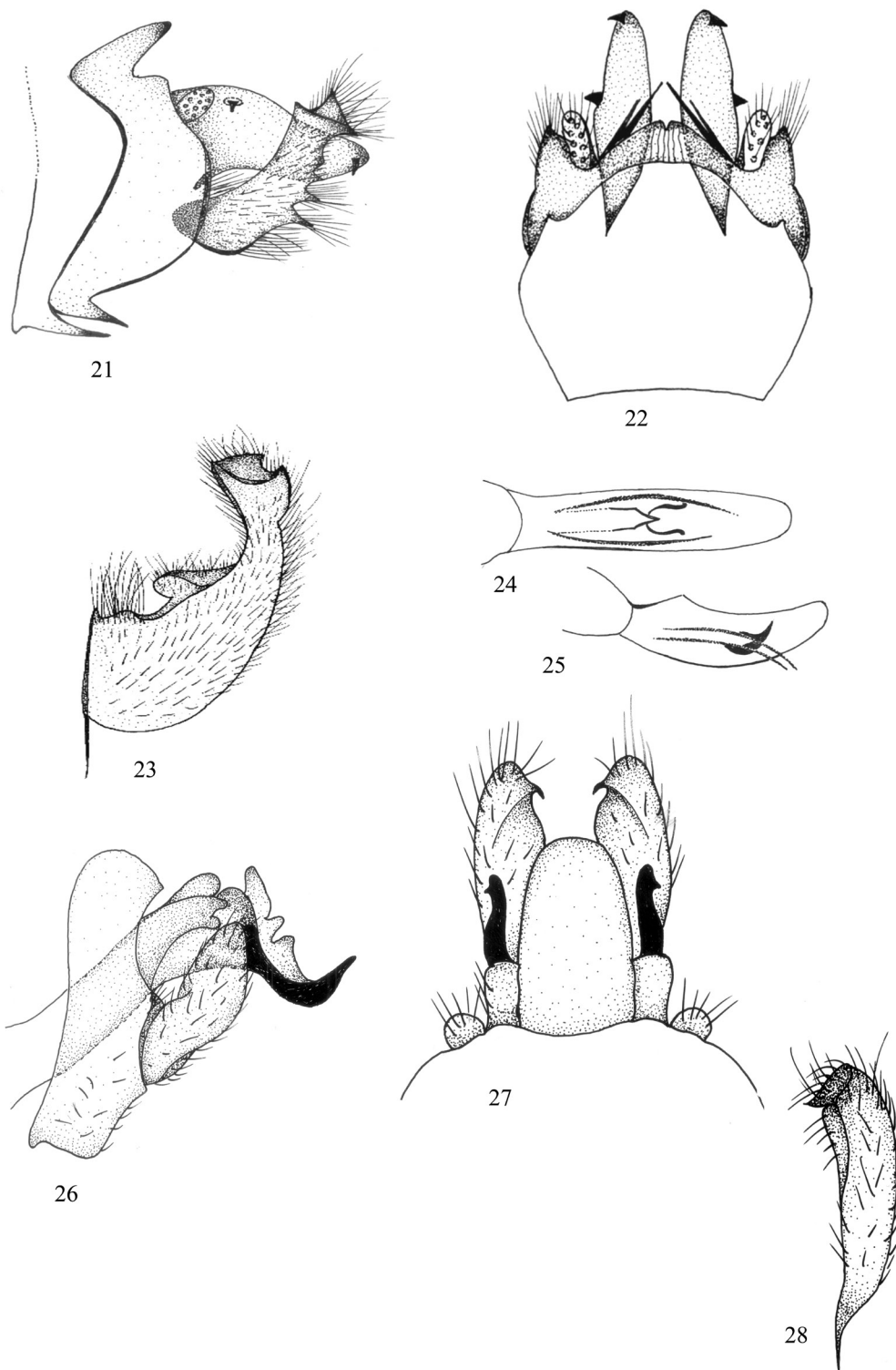
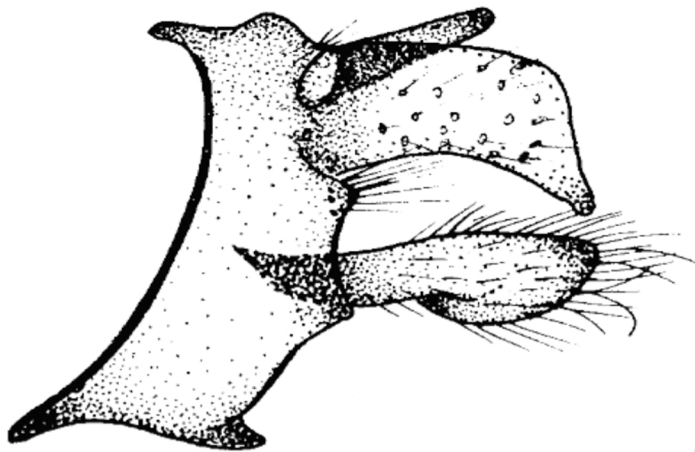
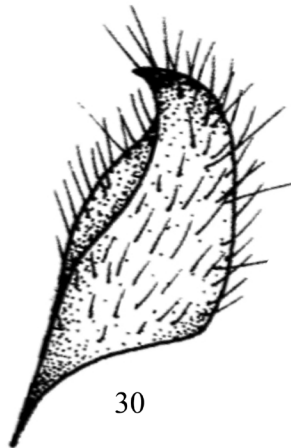


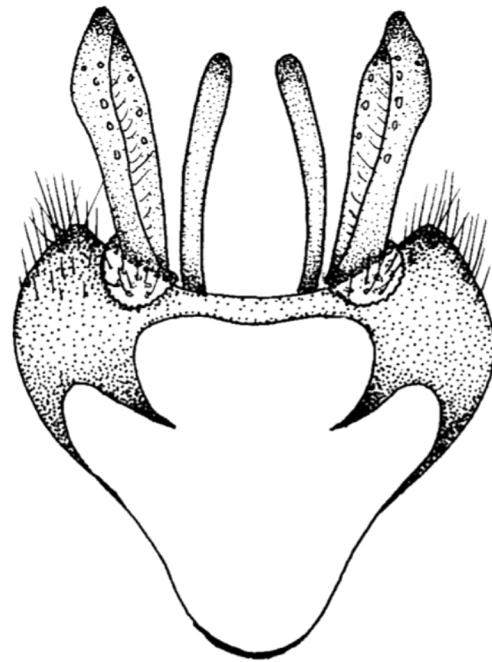
Plate 3. Figures 21-28. *Chimarra* spp. Male genitalia. 21-25. *Chimarra biungulata*. 21. Lateral view, 22. Dorsal view, 23. Inferior appendage Ventral view, 24. Phallic apparatus ventral view, 25. Phallic apparatus lateral view. 26-28. *C. aberrans*. 26. Lateral view, 27. Dorsal view, 28. Inferior appendage Ventral view.



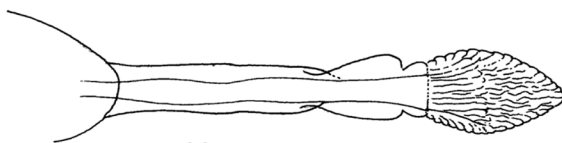
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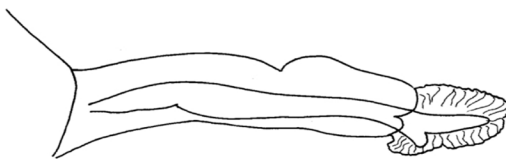
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Plate 4. Figures 29-33. *Chimarra* spp. Male genitalia. 29-33. *Chimarra biungulata*. 29. Lateral view, 30. Inferior appendage Ventral view, 31. Dorsal view, 32. Phallic apparatus ventral view, 33. Phallic apparatus lateral view.

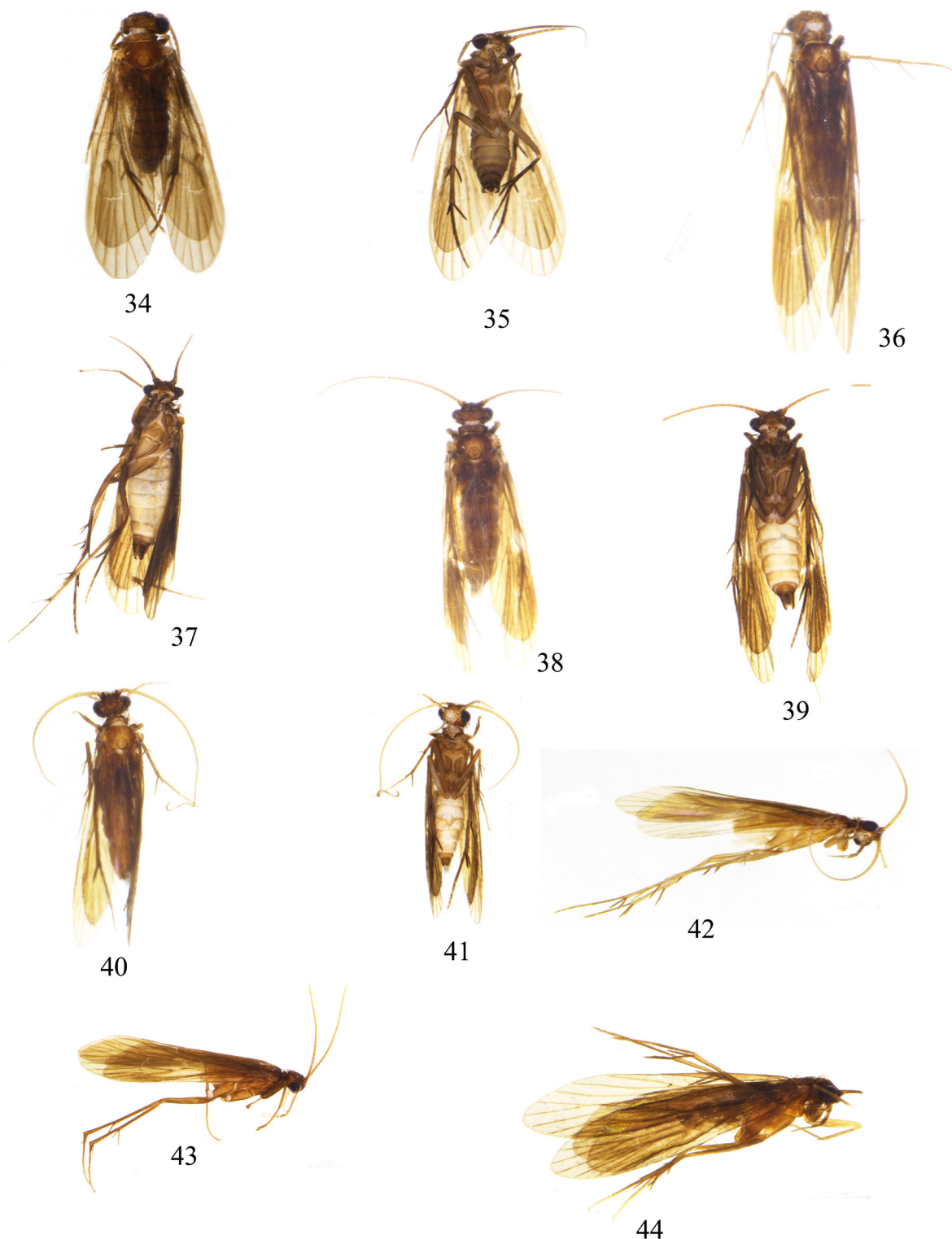


Plate 5. Figures 34-44. *Chimarra* spp. Adult. 34-35. *C. biungulata*. 34. Dorsal view, 35. Ventral view. 36-37. *C. fenestrata*. 36. Dorsal view, 37. Ventral view. 38-39. *C. nepalensis*. 38. Dorsal view, 39. Ventral view. 40-41. *C. sikkimensis*. 40. Dorsal view, 41. Ventral view. 42. *C. nigra*, lateral view. 43. *C. rifati*, lateral view. 44. *C. aberrans*, lateral view.