

THREE NEW SPECIES OF GENUS *CHIMARRA* STEPHENS
(INSECTA: TRICHOPTERA) FROM INDIAN HIMALAYA

PANDHER, M. S. and SAINI, M. S.

Department of Zoology & Environmental Sciences, Punjabi University, Patiala, India
E-mail: mpandher.iari@gmail.com

This paper is a contribution to the knowledge of the Indian fauna of the genus *Chimarra* Stephens. Here we describe and illustrate three new species from the Indian Himalaya: *Chimarra dentata* sp. n., *C. recurvata* sp. n. (both from Sikkim) and *C. dibangensis* sp. n. from Arunachal Pradesh. The males of these species are distinguishable from each other and from the previously described species by consistent variation in the structure of the inferior appendages, tergite X and the phallic apparatus. With these new additions, the genus is now represented by 40 species in India.

Keywords: Chimarrinae, Sikkim, Arunachal Pradesh, Himalaya, India.

INTRODUCTION

After *Rhyacophila* Pictet, 1834 (Rhyacophilidae) *Chimarra* Stephens, 1829 is the second largest caddisfly genus in terms of species diversity and is known from all biogeographical regions except Antarctica. The genus is represented by about 736 species in the World and 310 species are recorded from the Oriental region.

Most of the Oriental species of *Chimarra* were described in the past 21 years i.e. MALICKY (1979, 1989, 1993, 1994, 1995, 1997, 1998, 2000, 2006, 2007, 2008, 2009, 2010, and 2011) described 162 species. Works co-authored by Malicky and others, in which many new species for science and first national species records were made include those of Sun and MALICKY (2002), MALICKY and CHANTARAMONGKOL (1989, 1993a, b, 2003) and MALICKY *et al.* (2004). Other works describing Oriental species of *Chimarra* include those of BANKS (1913, 1931, 1937), BLAHNIK *et al.* (2009, 2012), GHOSH and CHAUDHURY (1999), HAGEN (1858, 1859), HWANG (1957), JACQUEMART (1979), KIMMINS (1955, 1957, 1964), MARTYNOV (1935), MELNITSKY (2005), MEY (1990, 1995, 1998a, b, 2003, 2006), MOSELY (1942), NAVAS (1922, 1932a, b), OLÁH (1993), OLÁH and MALICKY (2010), SAINI *et al.* (2010, 2011a, b), JOHANSON and OLÁH (2012), PANDHER and SAINI (2012a, b), SCHMID (1958, 1960), SUN (2007), ULMER (1905, 1906, 1907, 1915, 1930, 1951), WANG *et al.* (1998), and YANG *et al.* (2001). These species were described from Nepal, China, Cambodia, Thailand, Indonesia (Ambon, Bali, Irian Jaya, Java, Kalimantan, Lombok, Sulawesi, Sumatra), Vietnam, Bhutan, Malaysia (Sabah), Pakistan, Philippines, Sri Lanka and India (Himalaya, Western Ghats,

Andaman and Nicobar Island). Immature stages of this genus were described by HOANG and BAE (2008) from Vietnam.

Currently the 4 subgenera *Chimarra*, *Chimarrita* Blahnik, 1997, *Curgia* Walker, 1860 and *Otarrha* Blahnik, 2002 (BLAHNIK 1998, 2002) are recognized in the genus *Chimarra*. The latter 3 subgenera occur only in the Neotropical Region, whereas the subgenus *Chimarra* occurs worldwide and is especially abundant in tropical regions, and also the only subgenus of the subfamily Chimarrinae represented in India.

So far 37 species of this genus have been recorded from India. Among these previously described species, 29 have been reported from the Himalayan region alone. Contributors to these species include; KIMMINS (1957, 5 species), MARTYNOV (1935, 4 species), GHOSH and CHAUDHARY (1999, 2 species), SAINI *et al.* (2010, 2011a, b, 8 species) and PANDHER and SAINI (2012a, b, 10 species). Four species occurring in mountain springs of the Western Ghats (Maharashtra and Karnataka) were presented by NAVAS (1932, 3 species) and KIMMINS (1957, 1 species) and 4 species are reported from tropical rain forests of Andaman and Nicobar Island by MALICKY (1979, 2 species; 1997, 2 species). *Chimarra aberrans* Martynov occurs in all regions of India.

MATERIALS AND METHODS

Most of the *Chimarra* specimens covered in this study were collected by M. S. Pandher and S. H. Parey in 2009–2010 (April–October), using light traps with ultraviolet or mercury-vapour bulbs or a 22 W circline ultraviolet, fluorescent (BL) tube (Bioquip Products, USA) powered by 12 V rechargeable battery. Traps were placed near the edge of high altitude streams in the Himalayan region of India for 1–4 hours beginning at dusk. The specimens collected were preserved in 70% ethyl alcohol with a drop of glycerol.

Various morphological characters such as labial palps, antennae, setal warts, legs, wing maculation and venation, and genitalic structures were examined. Terminology for *Chimarra* genitalia and wings follows that of BLAHNIK (1998) and BLAHNIK *et al.* (2009). The abdomens were put in 10% KOH solution overnight for maceration. Some specimens were also cleared in lactic acid according to the method described by BLAHNIK *et al.* (2007). The genitalia were put in a solution of 80% ethyl alcohol with a drop of glycerol for examination. Illustrations were prepared with a radical zoom stereoscopic binocular microscope (maximum magnification of 120×) fitted with an ocular grid in one eyepiece. The inking of the final drawings was done with Rotring black ink. After illustration, the genitalia were transferred to a glass vial together with the rest of the specimen in 80% ethanol. The illustrations were scanned at 600 dpi greyscale, and mounted onto plates in Adobe© Photoshop© 10.

The types of the new species have been deposited in the National Pusa Collection (NPC), Indian Agricultural Research Institute, New Delhi.

TAXONOMY

***Chimarra dentata* sp. n.**
(Figs 1–5)

Description – Adult male; color in alcohol light brown, head and thorax dark brown. Length from tip of head to apex of folded forewings 8 mm; length of maxillary palps 1.70 mm, 3rd segment longer than 2nd, length of 5th segment almost equal to 3rd segment; labial palps 0.70 mm. Forewing length 6.75 mm; discoidal cell length more than double its width; Rs curved, thickened; cross vein *m* proximal to cross veins *s* and *r-m*; 2A looped to 1A. Hind wing 5 mm long.

Male genitalia (Figs 1–5) – Tergum IX short, wide dorsally, produced anterodorsally; anteroventral margin roundly produced, posterolateral margin sinuously produced; posteroventral process absent. Preanal appendages short, rounded, setose, obliquely placed in lateral view. Inferior appendages longer than tergum X, bearing tuft of long setae in lateral view; directed posterodorsally, wide basal and ventral margins narrowing towards pointed apex in lateral view; in ventral view uniformly wide, mesally with 2 pointed, teeth-like structures preapically. Tergum X with sclerotized lateral lobes and separate projecting membranous mesal lobes; each lateral lobe long, narrow at base, wide medially, produced ventrally in lateral view; in dorsal view, resembling snake head like, bearing numerous sensilla; each mesal lobe directed posterodorsally, digitate, small than lateral lobe, about half the length of lateral lobe. Phallobase globular, sclerotized; endotheca, tubular, long, bearing granular area preapically, length not discernable; with 5 asymmetrical preapical spines visible in lateral view; phallostremal sclerite complex composed of ring and rod structures, forked prong-like in ventral view.

Diagnosis – In the shape of sclerotized lateral lobes in dorsal view and the phallus in lateral view *Chimarra dentata* sp. n. is similar to *C. haimuoi* Malicky, 1995. However, in lateral view the segment IX is slightly produced on posterolateral margin, sclerotized lateral lobe of tergum X wide apically in lateral view and the inferior appendage with 2 sharp dent like structures on mesal surface apically in *C. dentata* sets this species aside from *C. haimuoi*.

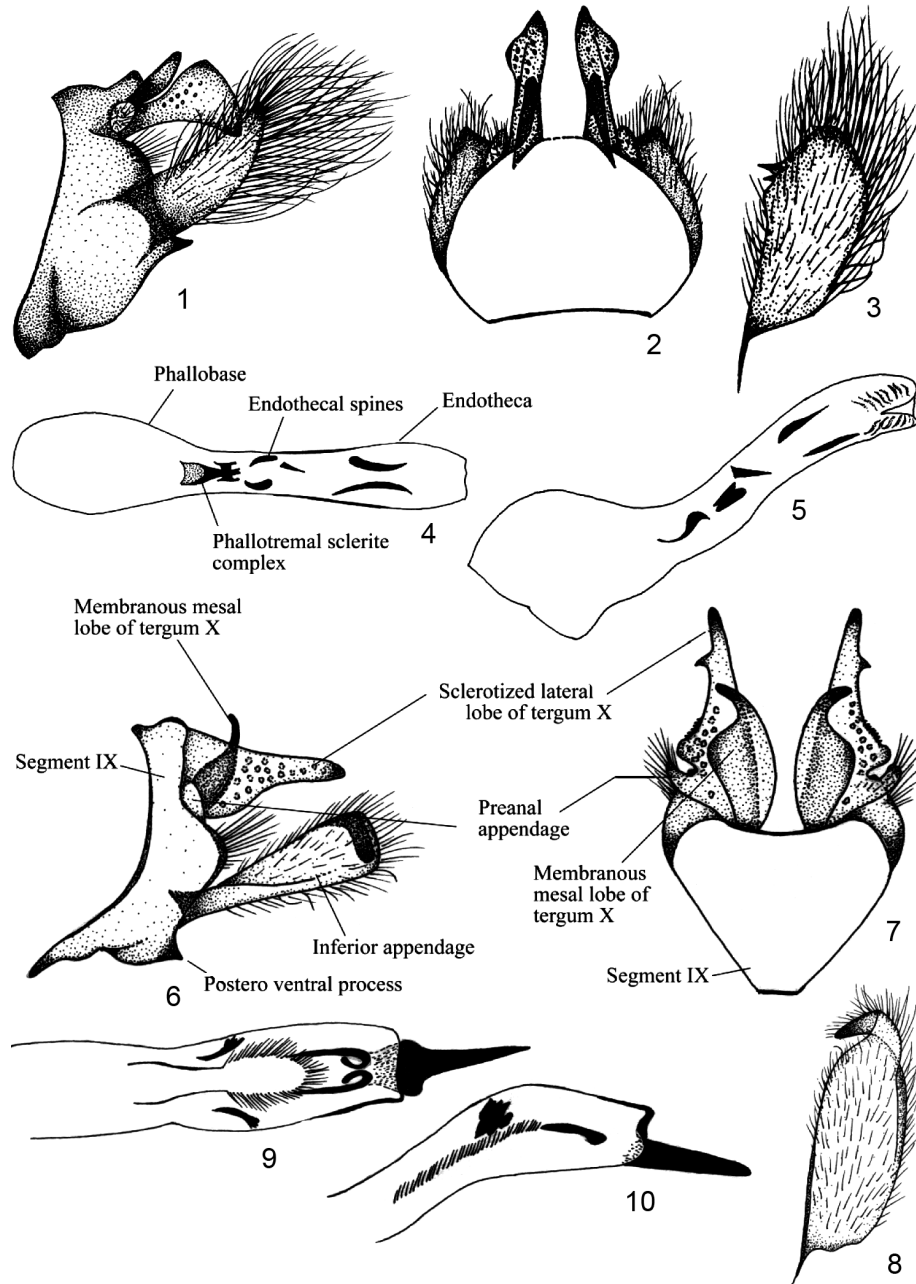
Material – Holotype male, India: Sikkim, Chungthang, 1800 m, 15-ix-2009, Pandher & Parey (NPC). Paratype: 1 female, collection data same as of holotype.

Distribution – India: Sikkim.

Etymology – This species is named on the basis of presence of two sharp dents on the mesal surface of each inferior appendage.

***Chimarra recurvata* sp. n.**
(Figs 6–10)

Description: Adult male; color in alcohol, dark brown, antenna yellow, forewings light brown, dorsum of head dark. Length from tip of head to apex of folded wing 6.50 mm;



Figs 1–10. *Chimarra* species, male genitalia. 1–5 = *C. dentata* sp. n.: 1 = left lateral view, 2 = dorsal view, 3 = ventral view of right inferior appendage, 4 = phallus ventral view, 5 = phallus left lateral view. 6–10 = *C. recurvata* sp. n.: 6 = left lateral view, 7 = dorsal view, 8 = ventral view of right inferior appendage, 9 = phallus ventral view, 10 = phallus lateral view.

antenna 3.50 mm, maxillary palps about 1.90 mm, length of 3rd segment of maxillary palps sub-equal to length of 5th, more than 1.75 times length of 2nd segment; labial palps 0.70 mm long. Length of forewings about 5 mm; venation: Rs curved, thickened, discoidal cell about 2.5 times longer than wide; cross vein *m* in close proximity of *s* and *r-m* cross veins; 2A obsolete, looped to 1A; hind wings broad; 4 mm long.

Male genitalia (Figs 6–10) – Tergum IX antero-dorsally reduced, pointed; anterior margin concave; produced antero-ventrally, postero-lateral margin produced; posteroventral process present. Preanal appendages setose, semicircular in lateral view. Inferior appendages each, slightly longer than tergum X, in lateral view directed postero-dorsally, narrow at base, widening gradually towards quadrate apex; in ventral view uniformly wide, somewhat curved mesad sub-apically. Tergum X with sclerotized lateral lobes and separate mesal lobes; each lateral lobe wedge shaped, broad basally, narrowing towards pointed apex, with many sensilla in lateral view; in dorsal view diverging, with small tooth-like structure on lateral side, basally wide and serrate along outer margin; mesal lobe directed dorsally, basally broad, pointed apically in lateral view; in dorsal view, narrow at base, broad medially, curved outward apically. Phallobase globular and sclerotized. Endotheca tubular, looping forwards in ventral view, length not discernable, long spine-like structure apically on ventral side in lateral view, a pair of curved spines visible preapically in ventral view, necklace-like arrangement of small spine visible in ventral view, a pair of lateral spines visible in ventral view.

Diagnosis – The male genitalia of this species is similar to those of *Chimarra nepalensis* Kimmins, 1964. However, the new species is distinguished by having segment IX more strongly produced anteroventrally and has long pointed postventral process, sclerotized lateral lobe of tergum X long, divergent and with small tooth-like structure on the lateral margin in dorsal view distinguish this species from *C. nepalensis*.

Material – Holotype male, India: Sikkim, Singhik, 1700 m, 12-v-2009, Pandher & Parey (NPC). Paratypes: 2 males, 2 females, collection data same as of holotype.

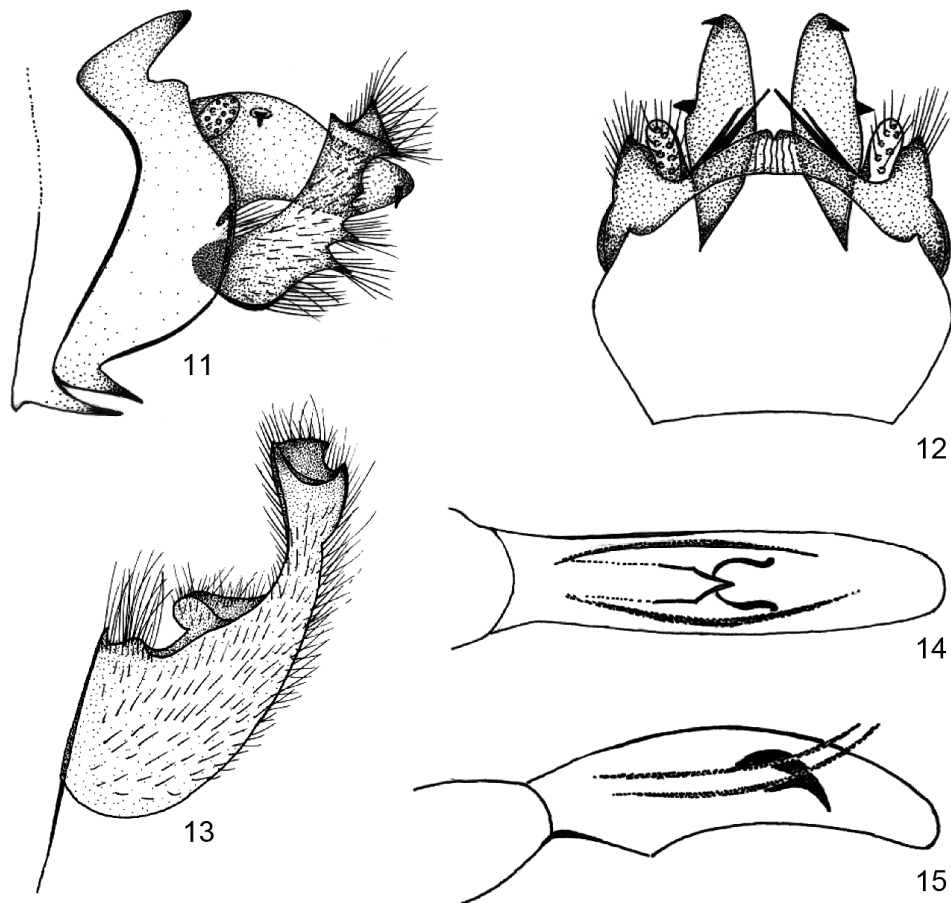
Distribution – India: Sikkim.

Etymology – The species name pertains to apically recurved inferior appendages in ventral view.

Chimarra dibangensis sp. n. (Figs 11–15)

Description: Adult male; color in alcohol brown, wings pale hyaline, antenna dark brown, head dorsum dark brown, legs pale yellowish. Length from tip of head to apex of folded forewing 5.25 mm; maxillary palp 1.25 mm long, 3rd segment about 1.5 times longer than 2nd segment, sub equal in the length to 5th segment; labial palp 0.50 mm. Forewing length 4 mm; venation: Rs curved, thickened, discoidal cell long, more than twice its width; cross vein *m* in close proximity of *s* and *r-m* cross veins, 2A looped to 1A; hind wing about 3 mm long.

Male genitalia (Figs 11–15) – Tergum IX pointed posterodorsally, reduced; anterior margin concave; anteroventral margin slightly produced; posterolateral margin convex; posteroventral process well developed, pointed. Preanal appendages each rounded, setose in lateral view; globose in dorsal view. Inferior appendages, each almost equal to tergum X; in lateral view dorsally inflected basoventrally, almost uniformly wide, with serrate ventral margin; in ventral view, wide basally with median lobe on mesal surface, curved, pointed apicomésally. Tergum X with lateral sclerotized lobes and separate mesal lobes; each lateral lobe broad basally, downwardly curved medially, each bearing 2 sensilla, one baso medially and another apically in lateral view; wedge-shaped in dorsal view; each mesal lobe digitate, bifid at apex, small than lateral lobes. Phallobase, rounded, and sclerotized. Endotheca tubular, length not discernable, produced ventrally near base in lateral view, with two lateral rows of comb like spines; phallosomal complex visible in ventral view, with well developed ring and rod structure.



Figs 11–15. *C. dibangensis* sp. n., male genitalia: 11 = left lateral view, 12 = dorsal view, 13 = ventral view of right inferior appendage, 14 = phallus ventral view, 15 = phallus left lateral view.

Diagnosis – In possession of well developed posteroventral process on sternum VIII, this species is similar to *Chimarra exapia* Malicky et Chantaramongkol, 1993 and *C. atria* Malicky et Chantaramongkol, 1993 both reported from Thailand. However, *C. dibangensis* sp. n. is distinguished from these species by the presence of dorsally directed inferior appendage in lateral view; in lateral view the lateral lobe of tergum X has two sensilla one basal and another apical one. These sensillae are not present in the related species. Moreover, there are considerable differences visible in the phallus, and the shape and number of endothecal spines in all the three species.

Material – Holotype, male, India: Arunachal Pradesh, Roing, 800 m, 2-v-2010, Pandher & Parey (NPC). Paratype: 2 females, collection data same as of holotype.

Distribution – India : Arunachal Pradesh.

Etymology – The species name is derived from the district: “Lower Dibang valley” in which type locality falls.

*

Acknowledgements – Dr. H. Malicky (Lunz am See, Austria) and Dr. J. C. Morse (Clemson University, USA) kindly supported us with relevant literature and valuable suggestions. We are grateful to Dr. V. V. Ramamurthy, National Coordinator, Network Project on Insect Biosystematics, Indian Agricultural Research Institute, Government of India, New Delhi (Grant Number NPIB-21-17) for providing funds for this study. Necessary laboratory facilities were provided by the Department of Zoology and Environmental Sciences, Punjabi University, Patiala. Thanks are also due to various forest officials, especially Mrs. U. G. Lachungpa., Senior Research Officer Wildlife Sikkim; Principal Chief Conservator of Forests & Chief Conservator of Forests and District Forest Officer, Arunachal Pradesh for providing necessary facilities during expeditions.

REFERENCES

- BANKS, N. (1913) On a collection of neuropteroid insects from the Philippine Islands. *Proceedings of the Entomological Society of Washington* **15**: 170–180.
- BANKS, N. (1931) Bornean neuropteroid insects. *Journal of the Malay Museum* **16**: 421–426.
- BANKS, N. (1937) Philippine neuropteroid insects. *Philippine Journal of Science* **63**: 125–174.
- BLAHNIK, R. J. (1997) Systematics of Chimarrita, a new subgenus of Chimarra (Trichoptera: Philopotamidae). *Systematic Entomology* **22**: 199–243.
- BLAHNIK, R. J. (1998) A revision of the Neotropical species of the genus Chimarra, subgenus Chimarra (Trichoptera: Philopotamidae). *Memoirs of the American Entomological Institute* **59**: 1–318.
- BLAHNIK, R. J. & HOLZENTHAL, R. W. (2004) Collection and curation of Trichoptera, with an emphasis on pinned material. *Nectopsyche, Neotropical Trichoptera Newsletter* **1**: 820. <http://www.entomology.umn.edu/museum/links/news.html> (accessed on 16 July 2012).

- BLAHNIK, R. J., HOLZENTHAL, R. W. & PRATHER, A. (2007) The lactic acid method for clearing Trichoptera genitalia. Pp. 9–14. In: BUENO-SORIA, J., BARBA-ALVAREZ, R. & ARMITAGE, B. (eds): *Proceedings of the XIIIth International Symposium on Trichoptera*. The Caddis Press, Columbus, Ohio, USA.
- BLAHNIK, R. J., HOLZENTHAL, R. W. & HUISMAN, J. (2009) Chimarra of Sabah and Sarawak, northern Borneo (Trichoptera: Philopotamidae). *Tijdschrift voor Entomologie* **152**: 109–166.
- BLAHNIK, R. J., AREFINA-ARMITAGE, T. I. & ARMITAGE, B. J. (2012) The genus Chimarra Stephens (Trichoptera: Philopotamidae) in Vietnam. *Insecta Mundi* **229**: 1–25.
- CHANTARAMONGKOL, P. & MALICKY, H. (1989) Some Chimarra (Trichoptera: Philopotamidae) from Thailand. Studies on caddisflies from Thailand, No. 2. *Aquatic Insects* **11**: 223–240.
- GHOSH, S. K. & CHAUDHURY, M. (1999) *State Fauna Series 3: Fauna of West Bengal, Insecta (Trichoptera, Thysanoptera, Neuroptera, Hymenoptera, and Anoplura)*. Zoological Survey of India **8**: 1–25.
- HAGEN, H. A. (1858) Synopsis der Neuroptera Ceylons. *Verhandlungen der kaiserlich-königlichen zoologischen-botanischen Gesellschaft in Wien* **8**: 471–488.
- HAGEN, H. A. (1859) Synopsis der Neuroptera Ceylons (Pars II). *Verhandlungen der kaiserlich-königlichen zoologischen-botanischen Gesellschaft in Wien* **9**: 199–212.
- HOANG, D. H. & BAE, Y. J. (2008) Larvae of Vietnamese Chimarra Stephens (Trichoptera: Philopotamidae). Pp. 40–48. In: WANG, X. H. (ed.): *Contemporary aquatic entomological study in East Asia. Proceedings of the 3rd International Symposium on Aquatic Entomology in East Asia (AESEA)*, Nankai University Press, Tianjin.
- HSU, L. P. & CHEN, C. S. (1996) Eleven new species of caddisflies from Taiwan (Insecta: Trichoptera). *Chinese Journal of Entomology* **16**: 125–135.
- HWANG, C. (1957) Descriptions of Chinese caddis flies (Trichoptera). *Acta entomologica sinica* **10**: 279–285.
- JACQUEMART, S. (1979) Deux trichopteres nouveaux de Thaïlande. *Bulletin de l'Institut Royal des Sciences Naturelles de Belgique, Entomologie* **51**: 1–5.
- JOHANSON, K. A. & OLÁH, J. (2012) Revision of the Fijian CHIMARRA (Trichoptera, Philopotamidae) with description of 24 new species. *Zootaxa* **3354**: 1–58.
- KIMMINS, D. E. (1955) Results of the Oxford University expedition to Sarawak, 1932. Order Trichoptera. *Sarawak Museum Journal* (new series) **6**: 374–442.
- KIMMINS, D. E. (1957) Entomological results from the Swedish expedition 1934 to Burma and British India, (Trichoptera) the genus Chimarra Stephens (Family: Philopotamidae). *Arkiv for Zoologi* **11**: 52–75.
- KIMMINS, D. E. (1964) On the Trichoptera of Nepal. *Bulletin of the British Museum (Natural History) Entomology* **15**: 33–55.
- LINNAEUS, C. (1767) *Systema Naturae per Regna tria Naturae, Secundum Classes, Ordines, Genera, Species, cum Characteribus, Differentiis, Synonymis, Locis. 12th ed., Vol. 1, Part 2. Laurentii Salvii, Holmiae [Stockholm]*, pp. 533–1327.
- MALICKY H. (1979) Neue Köcherfliegen (Trichoptera) von den Andamanen-Inseln. *Zeitschrift der Arbeitsgemeinschaft Österreichischer Entomologen* **30**: 97–109.
- MALICKY H. (1989) Köcherfliegen (Trichoptera) von Sumatra und Nias: Die Gattungen Chimarra (Philopotamidae) und Marilia (Odontoceridae), mit Nachträgen zu Rhyacophila (Rhyacophilidae). *Mitteilungen der Schweizerischen entomologischen Gesellschaft* **62**: 131–143.

- MALICKY, H. (1993) Neue asiatische Köcherfliegen (Trichoptera: Philopotamidae, Polycentropodidae, Psychomyidae, Ecnomidae, Hydropsychidae, Leptoceridae). *Linzer Biologische Beiträge* **25**: 1099–1136.
- MALICKY, H. (1994) Neue Trichopteren aus Nepal, Vietnam, China, von den Philippinen und vom Bismarck-Archipel (Trichoptera). *Entomologische Berichte Luzern* **31**: 163–172.
- MALICKY, H. (1995) Neue Köcherfliegen (Trichoptera, Insecta) aus Vietnam. *Linzer Biologische Beiträge* **27**: 851–885.
- MALICKY, H. (1997) Weitere neue Köcherfliegen-Arten (Trichoptera) aus Asien. *Linzer Biologische Beiträge* **29**: 217–238.
- MALICKY, H. (1998) Köcherfliegen (Trichoptera) von Java und Sumatra, mit Revision einiger Ulmer-Typen aus dem Hamburger Museum. *Linzer Biologische Beiträge* **30**: 795–814.
- MALICKY, H. (2000) Einige neue Köcherfliegen aus Sabah, Nepal, Indien und China (Trichoptera: Rhyacophilidae, Hydrobiosidae, Philopotamidae, Polycentropodidae, Ecnomidae, Psychomyiidae, Hydropsychidae, Brachycentridae, Odontoceridae, Molanidae). *Braueria* **27**: 32–39.
- MALICKY, H. (2006) Caddisflies from Bardia National Park, Nepal, with a preliminary survey of Nepalese species (Insecta, Trichoptera). *Entomofauna (Ansfelden)* **27**: 241–264.
- MALICKY, H. (2007) Köcherfliegen aus Bhutan (Insecta, Trichoptera). *Linzer Biologische Beiträge* **39**: 475–517.
- MALICKY, H. (2008) Köcherfliegen (Insecta, Trichoptera) aus der Umgebung von Malinau (Kalimantan, Borneo, Indonesien). *Linzer Biologische Beiträge* **40**: 833–879.
- MALICKY, H. (2009) Beiträge zur Kenntnis asiatischer Trichopteren. *Braueria* **36**: 11–58.
- MALICKY, H. (2010) Neue Trichopteren aus Europa und Asien. *Braueria* **37**: 43–48.
- MALICKY, H. (2011) Neue Trichopteren aus Europa und Asien. *Braueria* **38**: 23–43.
- MALICKY, H. & CHANTARAMONGKOL, P. (1989) Beschreibung von neuen Köcherfliegen (Trichoptera) aus Thailand und Burma. Arbeiten über thailändische Köcherfliegen Nr. 6. *Entomologische Berichte Luzern* **22**: 117–126.
- MALICKY, H. & CHANTARAMONGKOL, P. (1993a) Neue Trichopteren aus Thailand. Teil 1: Rhyacophilidae, Hydrobiosidae, Philopotamidae, Polycentropodidae, Ecnomidae, Psychomyiidae, Arctopsychidae, Hydropsychidae. *Linzer Biologische Beiträge* **25**: 433–487.
- MALICKY, H. & CHANTARAMONGKOL, P. (1993b) Neue Trichopteren aus Thailand. Teil 2: Rhyacophilidae, Philopotamidae, Polycentropodidae, Ecnomidae, Psychomyiidae, Xiphocentronidae, Helicopsychidae, Odontoceridae. *Linzer Biologische Beiträge* **25**: 1137–1187.
- MALICKY, H. & CHANTARAMONGKOL, P. (2003) Vierzehn neue Köcherfliegen aus Thailand (Insecta, Trichoptera). (35. Arbeit über thailändische Köcherfliegen). *Linzer Biologische Beiträge*, **35**: 915–925.
- MALICKY, H., CHANTARAMONGKOL, P., BUNLUE, P., CHANGTHONG, N., NAWVONG, J., NUNTAKWANG, A., PROMMI, T., THAMSENANUPAP, P. & THAPANYA, D. (2004) 27 neue Köcherfliegen aus Thailand (Insecta, Trichoptera). (36. Arbeit über thailändische Köcherfliegen). *Linzer Biologische Beiträge* **36**: 287–304.
- MARTYNOV, A. V. (1935) On a collection of Trichoptera from the Indian Museum I. *Records of the Indian Museum* **38**: 239–306.
- MELNITSKY, S. I. (2005) Two new species of Chimarra (Trichoptera: Philopotamidae) from Nepal. *Braueria* **32**: 16.
- MEY, W. (1990) Neue Köcherfliegen von den Philippinen (Trichoptera). *Opuscula Zoologica Fluminensia* **57**: 1–19.
- Mey, W. (1995) Beitrag zur Kenntnis der Köcherfliegenfauna der Philippinen, I. (Trichoptera). *Deutsche entomologische Zeitschrift für Naturforschung* **42**: 191–209.

- MEY, W. (1998a) Contribution to the knowledge of the caddisfly fauna of the Philippines, III (Insecta: Trichoptera). *Entomofauna* **19**: 1–32.
- MEY, W. (1998b) Die Köcherfliegenfauna des Fan Si Pan Massivs in Nord-Vietnam. 3. Beschreibung weiterer neuer Arten (Trichoptera). *Opuscula Zoologica Fluminensia* **165**: 1–17.
- MEY, W. (2003) Contribution to the knowledge of the caddisfly fauna of the Philippines, V (Insecta, Trichoptera). *Insecta Koreana* **20**: 425–452.
- Mey, W. (2006) Notes on the caddisfly fauna of Lake Matano in Central Sulawesi (Insecta, Trichoptera). *Beiträge zur Entomologie* **56**: 199–212.
- MORSE, J. C. (2013) Trichoptera World checklist. Available from <http://entweb.clemson.edu/database/trichopt/index.htm> (accessed 2 Jan, 2013).
- MOSELY, M. E. (1942) Chinese Trichoptera: A collection made by Mr. M. S. Yang in Foochow. *Transactions of the Royal Entomological Society of London* **92**: 343–362.
- NAVÁS, L. (1922) Neue Trichopteren. *Konowia* **1**: 37–38.
- NAVÁS, L. (1932a) Communicationes entomológicas. 14. Insectos de la India. 4th serie (I). *Revista de la Academia de Ciencias Exactas Fisicas Quimicas y Naturales de Zaragoza* **15**: 11–41.
- NAVÁS, L. (1932b) Tricopteros (familia Filopotamidos). *Broteria, Ciencias Naturais* **1**: 118–119.
- OLÁH, J. (1993) Seven new Trichoptera from the Gombak River system, Malaysia. *Folia entomologica hungarica* **54**: 93–100.
- OLÁH, J. & MALICKY, H. (2010) New species and new species records of Trichoptera from Vietnam. *Braueria* **37**: 13–42.
- PANDHER, M. S. & SAINI, M. S. (2012a) Three new species of the genus Chimarra Stephens, 1829 (Trichoptera: Philopotamidae) from the Indian Himalayas. *Polish Journal of Entomology* **81**: 63–72.
- PANDHER, M. S. & SAINI, M. S. (2012b) Seven new species of the genus Chimarra Stephens (Trichoptera: Philopotamidae) from India. *Zootaxa* **3478**: 313–329.
- RAMBUR, J. P. (1842) Neuroptères. *Historie Naturelle* **1**: 1–534.
- SAINI, M. S., PAREY, S. H., PANDHER, M. S. & BAJWA, P. (2010) Three new species of caddisfly genus Chimarra from Indian Himalaya (Trichoptera: Philopotamidae). *Bionotes* **12**: 86–88.
- SAINI, M. S., PANDHER, M. S. & BAJWA, P. (2011a) Addition of two new species to genus Chimarra Stephens (Trichoptera: Philopotamidae) from Sikkim (India). *Halteres* **3**: 11–15.
- SAINI, M. S., PAREY, H. S. & PANDHER, M. S. (2011b) Three new species of genus Chimarra Stephens (Trichoptera: Philopotamidae) from the Indian Himalayas. *Biosystematica* **5**: 17–24.
- SCHMID, F. (1958) Trichoptères de Ceylan. *Archiv für Hydrobiologie* **54**: 1–173.
- SCHMID, F. (1960) Trichoptères du Pakistan. III (Hydroptilidae, Philopotamidae, Polycentropodidae). *Tijdschrift voor Entomologie* **103**: 83–109.
- STEPHENS, J. F. (1829) *A systematic catalogue of British insects: being an attempt to arrange all the hitherto discovered indigenous insects in accordance with their natural affinities. Containing also the references to every English writer on entomology, and to the principal foreign authors. With all the published British genera to the present time. Part 1. Insecta Mandibulata.* Baldwin and Cradock, London, xxxiv+416 pp. [Trichoptera pp. 316–323]
- SUN, C. & MALICKY, H. (2002) 22 new species of Philopotamidae Trichoptera from China. *Linzer Biologische Beiträge* **34**: 521–540.
- SUN, C. (2007) Descriptions of three new species of Philopotamidae from China. *Braueria* **34**: 19–20.

- ULMER, G. (1905) Zur Kenntniss aussereuropäischer Trichopteren. (Neuer Trichoptern des Hamburger und Stettiner Museums und des zoologischen Instituts in Halle, nebst Beschreibungen einiger Typen Kolenati's und Burmeister's.). *Stettiner Entomologische Zeitung* **66**: 1–119.
- ULMER, G. (1906) Neuer Beitrag zur kenntnis aussereuropäischer Trichopteren. *Notes from the Leyden Museum* **28**: 1–116.
- ULMER, G. (1907) Trichopteren. *Collections Zoologiques du Baron Edm. de Selys Longchamps* **6** (1): 1–102.
- ULMER, G. (1915) Trichopteren des Ostens besonders von Ceylon und Neu-Guinea. *Deutsche entomologische Zeitschrift* **1915**: 41–75.
- ULMER, G. (1930) Trichopteren von den Philippinen und von den Sunda-Inseln. *Treubia* **11**: 373–498.
- ULMER, G. (1951) Köcherfliegen (Trichopteren) von den Sunda-Inseln. Teil I. *Archiv für Hydrobiologie, Supplement* **19**: 1–528.
- Wang, B.-X., SUN, C., YANG, L. & LENG, K. (1998) Trichoptera. Pp. 151–161. In: WU, H. (ed.): *Insects of Longwangshan Nature Reserve*. Beijing, China Forestry Publishing House.
- YANG, L., SUN, C. & YANG, W. (2001) Trichoptera of Tianmu Mountain. Pp. 505–519. In: WU, H. (ed.): *Insects of Tianmu Mountain Nature Reserve*. Hang Zhou, China Forestry Publishing House.

Revised version received October 1, 2012, accepted May 27, 2013, published September 30, 2013