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## THREE NEW SPECIES OF THE GENUS *KISAURA* (TRICHOPTERA, PHILOPOTAMIDAE) FROM INDIAN HIMALAYA

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**Three New Species of the Genus *Kisaura* (Trichoptera, Philopotamidae) from Indian Himalaya.** Saini M. S., Pandher M. S., Ramamurthy V. V. — *Kisaura malickyi* sp. n., *K. bhagati* sp. n. from Uttarakhand, and *K. kanchenjungaensis* sp. n. from Sikkim are described and illustrated in this paper.

Key words: Trichoptera, Philopotamidae, Oriental Region, Himalayan region, India.

**Три новых вида рода *Kisaura* (Trichoptera, Philopotamidae) из Индийских Гималаев.** Санин М. С., Пандхер М. С., Рамамурти В. В. — Иллюстрированное описание *Kisaura malickyi* sp. n. и *K. bhagati* sp. n. из Уттаракханда и *K. kanchenjungaensis* sp. n. из Сиккима.

Ключевые слова: Trichoptera, Philopotamidae, Ориентальная область, Гималайский регион, Индия.

### Introduction

The genus *Kisaura* Ross, 1956 was originally established by as a subgenus of the genus *Sortosa* Navas, 1918 (actually *Dolophilodes* Ulmer (Kuhara 1999), based on *Sortosa obrussa* Ross (1956). Malicky (1993 b, 1995), Mey (1996), Sun et al. (2001), and Sun, Malicky, (2002) considered it a separate genus, though Kuhara (1999) kept it as subgenus of *Dolophilodes*.

In addition to the characters specified by Ross (1956), species of the genus can also be distinguished by the variation in the shape and length of lateral spiniform processes of tergum X and the black comb-like setae on apical segment of inferior appendage.

Up to date *Kisaura* Ross includes about 56 species all over the world, most of them are confined to the Oriental and Palaearctic Regions (Morse, 2012). 36 species of this genus occur only in the Oriental Region, and for this reason, it was thought to have originated in the Oriental Region (Ross, 1956). Twenty of 56 species were transferred to *Kisaura* from *Dolophilodes* Ulmer. Most of the recent additions to this genus are made by Malicky with co-workers (Malicky, 1993 a, 1993 b, 1995, 2007, 2009; Malicky, Chantaramongkol 1993 a, 1993 b; Sun, Malicky 2002; Olah, Malicky, 2010), who added 18 species from Thailand, Bhutan, China, Laos and Vietnam to this genus. Recently, this genus was reported this genus for the first time from India with description of six new species from Indian Himalaya (Pandher, Saini 2011).

The biology of the species in the genus is poorly known (Hur, Morse 2006). A more thorough study and complete diagnosis of all previously known and newly described species is required, along with a study of the larval stages and a well supported phylogenetic analysis, to understand the origin and dispersal of *Kisaura* to other parts of Eastern Asia.

### Material and methods

Adult *Kisaura* were collected by light traps (mercury vapour bulb and UV) near streams of high altitude on the Himalayan belt of India. The specimens were preserved in 70 % ethyl alcohol with a drop of glycerol added. Pertinent collection and locality data were recorded.

The male genitalia were removed from the specimens and put in 10 % KOH solution overnight. After this treatment the genitalia were put in 80 % ethyl alcohol with a drop of glycerol and observed for morphological characters. The drawings of various aspects were done with the aid of zoom stereoscopic binocular microscope (with maximum magnification of 160×) fitted with an ocular grid in one eye piece. The final drawings

were rendered in black ink. The illustrations were scanned at 600 dpi grayscale, and mounted onto plates in Adobe© Photoshop© 7.0. The genitalic terminology follows that of Ross (1956) and Hur, Morse (2006). Type specimens are deposited in the Punjabi University Patiala Museum (PUPM), Department of Zoology and Environmental Sciences, Punjabi University, Patiala.

### *Kisaura* Ross

Ross, 1956: 27

Type species: *Sortosa obrussa* Ross 1956: 57 (by original designation).

Diagnosis. Spurs: 2, 4, 4. Fore- and hind wings with primitive venation except fork I variable: it may be near or considerably beyond sectorial cross vein  $s$ , or  $R_2$  may be atrophied; 2A of forewing incomplete (Ross, 1956). Male genitalia with pair of lateral processes between Xth tergite and preanal appendages; inferior appendages simple, with mesoventral plate developed between two segments; apical segment of inferior appendage with diagnostic longitudinal row of spine-like setae on its inside mesal surface.

### *Kisaura malickyi* Pandher, sp. n. (fig. 1–4, 15–16)

Material examined. Holotype  $\sigma$ , India, Uttarakhand, Shynachatti, 2200 m, 30.98°N, 78.44°E, 27.09.2008, Pandher et Parey, (PUPM). Paratype: 1  $\sigma$ , collection data same as of holotype.

Description. Adult male; length of forewing about 5 mm, hind wing about 4.25 mm long;. Body uniformly fuscous and covered with inconspicuous, sparse fulvous pubescence while wings are yellowish. Antenna 5 mm long; maxillary palp 1.25 mm long, segment 3 slightly longer than segment 2, segment 5 subequals to segments 1–4 together; labial palp 0.70 mm long. Forewing with fork I absent; discoidal cell elongate, more

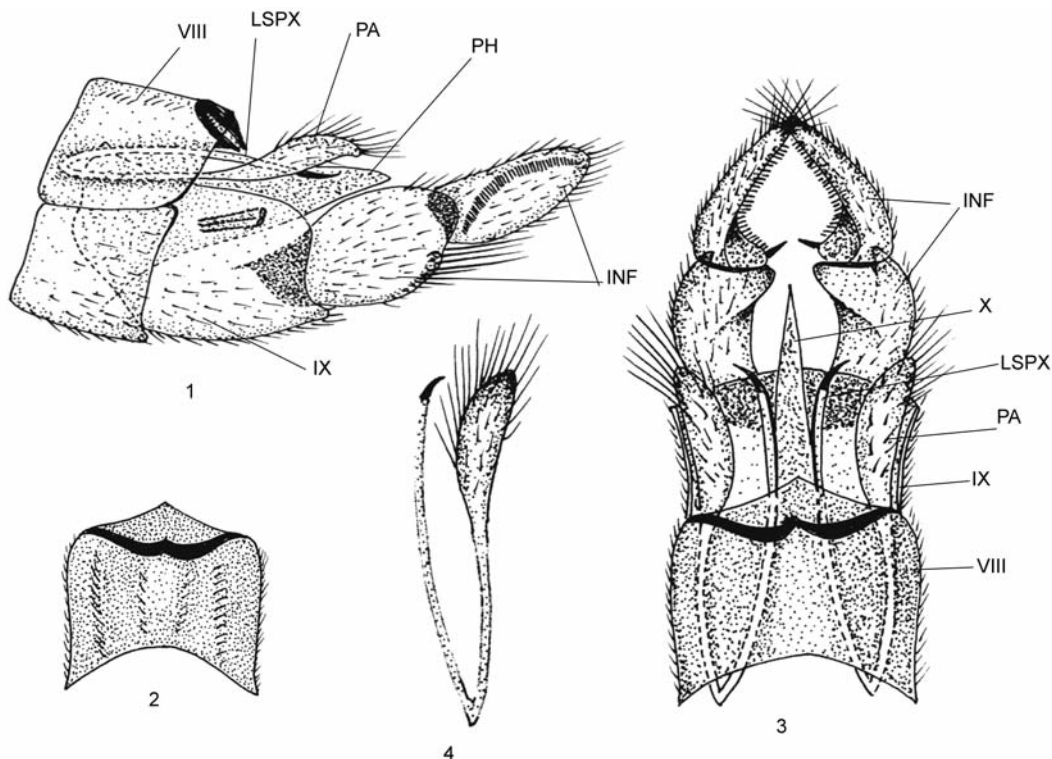


Fig. 1–4. Male genitalia. *Kisaura malickyi* sp. n.: 1 — left lateral view; 2 — dorsal view of VIII tergite; 3 — dorsal view; 4 — dorsal view of preanal appendage.

Fig. 1–4. Гениталии самца. *Kisaura malickyi* sp. n.: 1 — вид слева; 2 — VIII тергит, вид сверху; 3 — вид сверху; 4 — преанальный вырост, вид сверху.

than twice its width; veins Sc, R, and Cu thickened; pterostigma prominent. Hind wing with fork-I absent (fig. 15–16).

Male genitalia (fig. 1–4). Sternite VIII with reduced ventral process, tergite VIII with distal margin medially pointed. Segment IX almost pentagonal in lateral view, antero-laterally with small median prominence, posteroventrally with small process. Inferior appendages, each 2-segmented. Basal joint oval in lateral view, with two lobes, inferior lobe with tuft of long setae. Distal joint almost equals to basal one in length, in lateral view elongate with a narrow apex, comb-like spines arch-shaped in dorsal view inner face with a stout spine at base. Segment X membranous, extending almost to distal margin of basal joint of inferior appendage in dorsal view, at base on each side arise lateral spiniform process, with articulated spinelet at apex, reaching to distal margin of segment IX. Each preanal appendage is clavate, almost equals to lateral spiniform process in length. Phallus membranous, intimately surrounded by segment X and pointed apically.

**Distribution.** India: Uttarakhand.

**Diagnosis.** This species is allied to *Kisaura cina* (Malicky and Chantaramongkol 1993 a) reported from Thailand in the shape of preanal appendages and lateral spiniform process. However, in *K. malickyi* the tergite VIII with distal margin medially pointed in dorsal view and lateral spiniform processes almost equal to the length of preanal appendages in dorsal view whereas in *K. cina* tergite VIII is not pointed medially (smooth distally) and lateral spiniform process are longer than the preanal appendages in dorsal view.

**Etymology.** This species is named in honour of Dr. Hans Malicky who has devoted his whole life to the caddisfly systematics.

***Kisaura bhagati* Pandher, sp. n.** (fig. 5–8, 13–14)

**Material examined.** Holotype ♂: India, Uttarakhand, Holi, 1600 m, 32.57°N, 76.27°E, 16.09.2008 (Pandher et Parey) (PUPM). Paratypes: 2 ♂, collection data same as of holotype (PUPM).

**Description.** Adult male. Length of forewing 5.5–6.25 mm, length of hindwing 5 mm. Body uniformly fulvous and covered with inconspicuous, sparse fulvous pubescence. Antenna 5 mm long. Maxillary palp 1.75 mm long, segment 3 longer than segment 2, segment 5 is the longest; labial palp 0.80 mm long. Forewing with fork-I absent, discoidal cell elongate (about 0.75 mm long), more than 2.25 times its width. Hind wing with fork I absent (fig. 13–14).

Male genitalia (fig. 5–8). Sternite VIII without ventral process, tergite VIII in dorsal view with posterior margin rounded. Segment IX pentagonal in lateral view, antero-laterally with small median prominence, posteroventrally with small process. Inferior appendages 2-segmented; basal joint laterally with basal 1/3 narrow, and then somewhat widened, so that other portions more or less quadrilateral, posterior margin truncated; distal joint slightly shorter than basal joint, posterodorsal directed, in lateral view, its base broader than rounded apex, the belt of comb-like spines arch-shaped, in dorsal view with a strong spine at base. Segment X membranous, extending to distal margin of basal joint of inferior appendage, bifid medially; lateral spiniform processes with articulated spinelet at each apex, reaching almost to distal margin of segment IX and convergent to sub-apex. Each preanal appendage equals to lateral spiniform processes in length, with apex rounded and inner and outer margins serrated in dorsal view. Phallus membranous, intimately surrounded by segment X and pointed apically.

**Distribution.** India: Uttarakhand.

**Diagnosis.** The male genitalia of this new species closely resembles those of *K. cina* (Malicky et Chantaramongkol, 1993 a) from Thailand and *K. malickyi* sp. n. in the shape of preanal appendages and lateral spiniform process in lateral view. However it is more close to *K. malickyi* sp. n. in the shape and length of preanal appendages and lateral spiniform process (preanal appendages almost equal to lateral spiniform processes

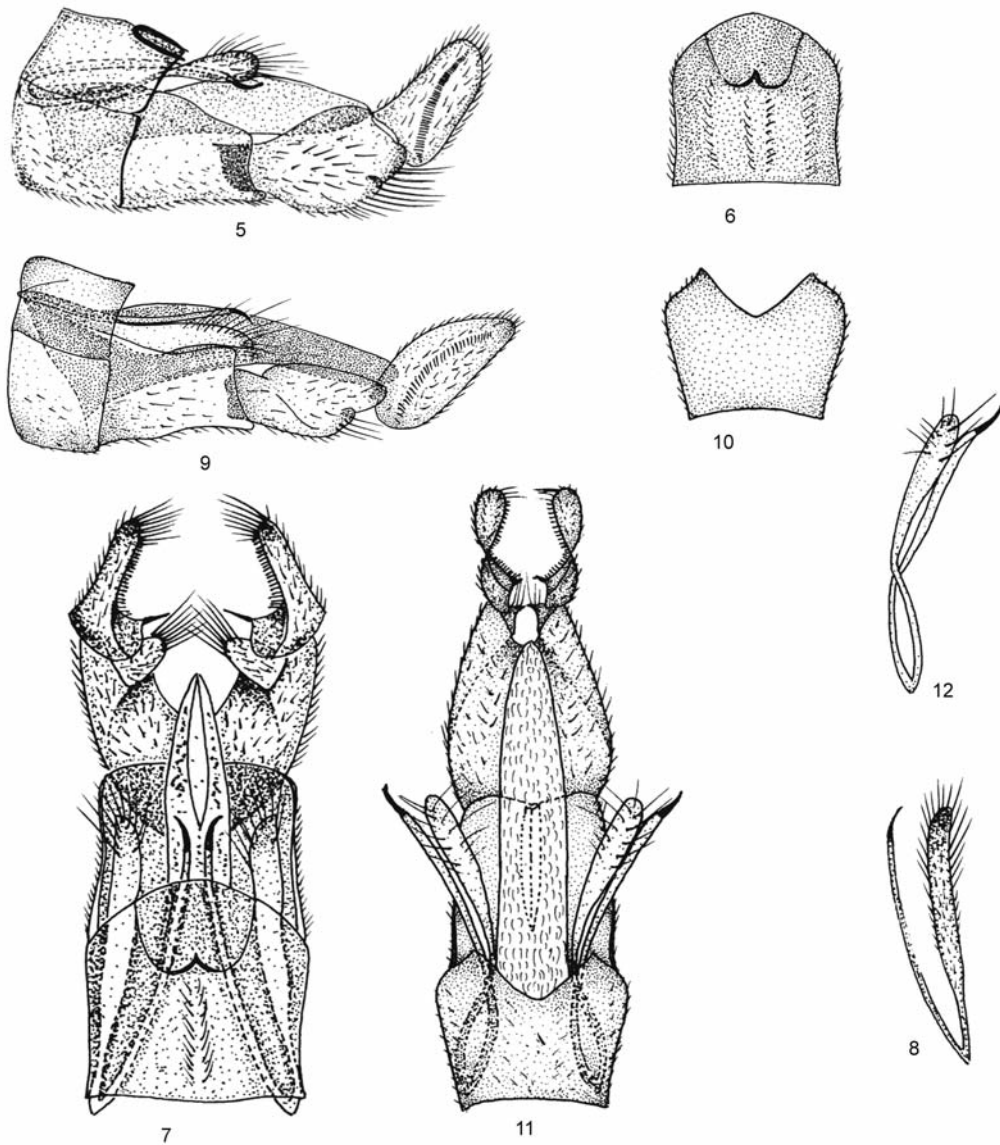


Fig. 5–12. Male genitalia. 5–8. *Kisaura bhagati* sp. n.: 5 — left lateral view; 6 — dorsal view of VIII tergite; 7 — dorsal view; 8 — dorsal view of preanal appendage. 9–12. *K. kanchenjungaensis* sp. n.: 9 — left lateral view; 10 — dorsal view of VIII tergite; 11 — dorsal view; 12 — dorsal view of preanal appendage (IX — segment 9, VIII — segment 8, X — segment 10, PA — preanal appendages, LSPX — lateral spiniform process of tergum X, PH — phallus, INF — inferior appendages).

Fig. 5–12. Гениталии самца. 5–8. *Kisaura bhagati* sp. n.: 5 — вид слева; 6 — VIII тергит, вид сверху; 7 — вид сверху; 8 — преанальный вырост, вид сверху. 9–12. *K. kanchenjungaensis* sp. n.: 9 — вид слева; 10 — VIII тергит, вид сверху; 11 — вид сверху; 12 — преанальный вырост, вид сверху (IX — 9-й сегмент, VIII — 8-й сегмент, X — 10-й сегмент, PA — преанальный вырост, LSPX — латеральный шиповидный отросток 10-го тергита, PH — фаллос, INF — нижние отростки).

in dorsal view). But in *K. bhagati* segment X is longer in lateral view, tergite VIII with rounded distal margin and apically rounded preanal appendage whereas, segment X shorter, tergite VIII with distal margin medially produced and apically clavate preanal appendage in *K. malickyi*.

**Etymology.** This species is named in honour of a great patriot Bhagat Singh whose Martyrdom day is celebrated on 23 March.

***Kisaura kanchenjungaensis* Pandher, sp. n.** (fig. 9–12, 17–18)

Material examined. Holotype ♂: India, Sikkim, Yaksum, 2200 m, 27.37°N, 88.73°E, 8.05.2009 (Pandher et Parey), (PUPM). Paratypes: 2 ♂, collection data same as of holotype, (PUPM).

Description. Adult male (in alcohol). Forewing length 5.25 mm, hind wing length about 4mm. Body light brown, dorsum of head dark, legs pale, wings hyaline. Maxillary palp 1.25 mm, segment 3 slightly longer than segment 2, segment 5 is the longest; labial palp short, 0.50 mm long. Discoidal cell of fore wing long, twice its width; fork I absent. Hind wing with fork I absent (fig. 17–18).

Male genitalia (fig. 9–12). Tergite VIII with shallow V-shaped indentation in dorsal view. In lateral view segment IX long, anterodorsally produced; posterolaterally quadrate. Inferior appendages 2-segmented; basal joint little longer and stouter than apical one, broad at base, narrow towards apex in lateral view, having two lobes, out of which inferior lobe with tuft of long setae; distal joint with curved row of comb-like spines on mesal surface; in dorsal view directed upright and oval in outline. Tergum X membranous reaching up to distal margin of basal joint of inferior appendages, lateral spiniform process with spinelet at apex, recurved caudoventrad and then posterad in lateral view,

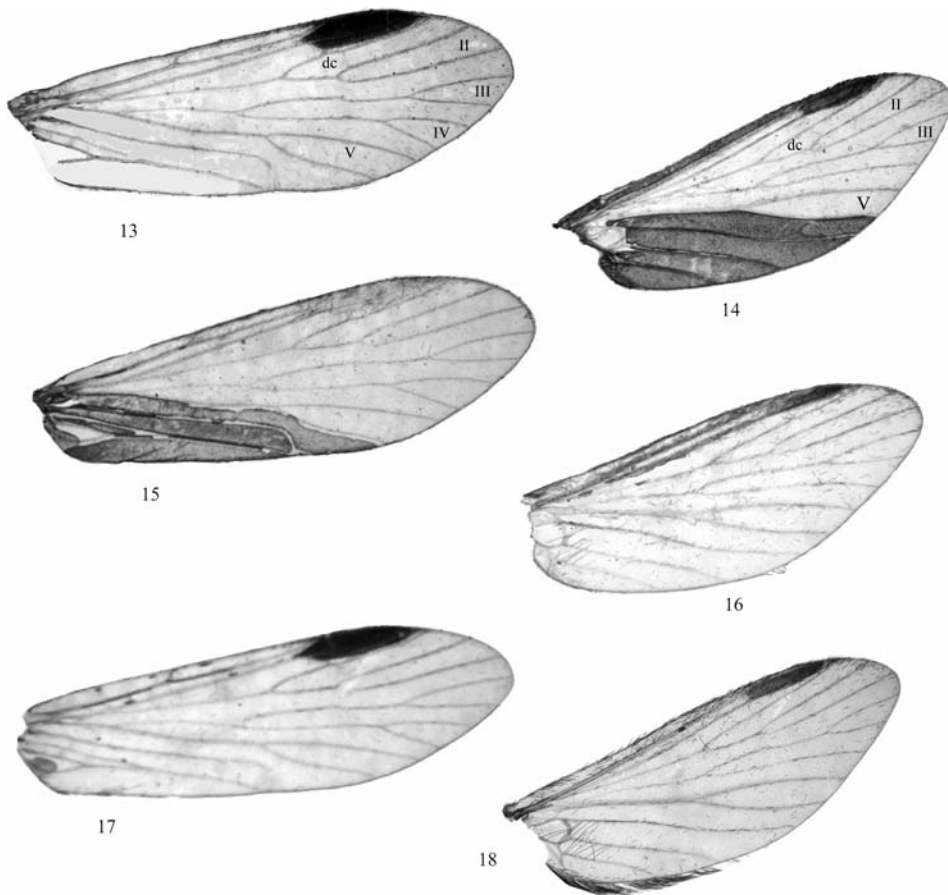


Fig. 13–18. Wing venation. 13–14. *Kisaura bhagati* sp. n.: 13 — forewing; 14 — Hind wing. 15–16. *K. malickyi* sp. n.: 15 — forewing; 16 — Hind wing. 17–18. *K. kanchenjungaensis* sp. n.: 17 — forewing; 18 — hind-wing (dc — discoidal cell; II, III, IV, V — fork 2, 3, 4 and 5).

Fig. 13–18. Жилкование крыла. 13–14. *Kisaura bhagati* sp. n.: 13 — переднее крыло; 14 — заднее крыло. 15–16. *K. malickyi* sp. n.: 15 — переднее крыло; 16 — заднее крыло. 17–18. *K. kanchenjungaensis* sp. n.: 17 — переднее крыло; 18 — заднее крыло (dc — дискоидальная ячейка; II, III, IV, V — 2, 3, 4 и 5-я развилки).

reaching almost to apex of segment IX. Each preanal appendage as long as segment IX, clavate in lateral view; divergent and truncate in dorsal view. Phallus membranous surrounded by tergum X.

**Diagnosis.** With respect to the shape of inferior appendages in lateral view this species is very close to *Kisaura euphemos* Sun and Malicky, 2002 from China. However, in *K. kanchenjungaensis* sp. n. the lateral spiniform processes of tergum X are small, and of same length as preanal appendages whereas, the lateral spiniform processes are much longer in *K. euphemos*. Moreover, tergite VIII is with v shaped medial invagination in dorsal view, segment IX broad and long in lateral view (almost twice its width) in *K. kanchenjungaensis* but in *K. euphemos* tergite VIII produced medially, segment IX as broad as long in lateral view.

**Distribution.** India: Sikkim.

**Etymology.** This species is named after Kanchenjunga peak located in Sikkim.

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