Two new species and 2 first records of the genus *Lepidostoma* Rambur, 1842 (Trichoptera: Lepidostomatidae) from the Indian Himalayas

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**Abstract:** Two new species of the genus *Lepidostoma* Rambur, 1842 from the Indian Himalayas are described and illustrated, namely *Lepidostoma curvaturn* sp. nov. from Tato (Arunachal Pradesh) and *Lepidostoma mechukaense* sp. nov. from Mechuka (Arunachal Pradesh). *Lepidostoma liber* Malicky, 2007 from Loomla (Arunachal Pradesh) and *Lepidostoma simplex* Kimmins, 1964 from Pithoragarh (Uttarakhand) are first reported from India. With this addition of these 4 species, the genus *Lepidostoma* is now represented by 45 species from India.

**Key words:** Description, diagnosis, caddisfly, Arunachal Pradesh, Uttarakhand

1. **Introduction**

The family Lepidostomatidae is widely distributed throughout the northern hemisphere and extends southwards to Panama, New Guinea, and the Afrotropical region. It was originally described by Ulmer (1903) as a subfamily of Sericostomatidae. It is divided into 2 subfamilies: Lepidostomatinae Ulmer, 1903 and Theliopsychinae Weaver, 1993. Subfamily Lepidostomatinae is represented by 2 genera in India, *Lepidostoma* Rambur, 1842 and *Paraphlegopteryx* Ulmer, 1907. The subfamily Theliopsychinae contains a single genus from this region, *Zephyropsyche* Weaver, 1993. Ross (1944) synonymized nearly all of the Nearctic lepidostomatid genera within *Lepidostoma*. Weaver (1988) provided a synopsis of the then-known North American species and a review of the world species (Weaver, 2002), where he synonymized several genera with this genus, formerly separated by secondary sexual characters of the male. With a long list of 63 synonyms under this genus, Weaver (2002) divided it into 4 large species branches based on the general types of male forewing venation that differ primarily in the anal region. These branches include the monophyletic *Lepidostoma vernale* branch, the nonmonophyletic *L. podagrum* branch, the nonmonophyletic *L. ferox* branch, and the monophyletic *L. hirtum* branch (Weaver, 2002). The Indian species of genus *Lepidostoma* fall under 2 branches: the *L. ferox* branch and the *L. hirtum* branch.

In India, this genus is represented by 41 species. Of these 41 species, 17 species of *Lepidostoma* have been described by Mosely (1939, 1941, 1949a, 1949b, 1949c); 5 species by Martynov (1936); 2 species each by Malicky (1979, 2003), McLachlan (1871, 1878), Ulmer (1905, 1906), and Weaver (1989, 2002); and 1 species by Navás (1932). One species originally described from Thailand has also been reported from India (Assam) (Nuntakwang et al., 2007). One species, *Lepidostoma palmipes* Ito, 1986, originally described from Nepal, has also been reported from India (Yang and Weaver, 2002). Saini and Parey (2011) described 4 new species of this genus in India. Parey and Saini (2012) again described 4 new species of this genus from the Indian Himalayas.

2. **Materials and methods**

Specimens examined in this study were primarily collected using a 1-W UV (ultraviolet or “black”) light powered by a sealed rechargeable 12-V battery. Traps were placed near the edges of some high altitude streams for 1–3 h beginning at dusk. The caddisfly material so collected was killed and preserved in 70% ethyl alcohol with a drop of glycerin added. To make detailed studies, the male genitalia were removed with the help of fine-tipped forceps and were treated with the lactic acid procedure described by Blahnik et al. (2007). The genitalic terminology corresponds with that of Weaver (1988). The type specimens are deposited in the Museum of the Department of Zoology, Punjabi University, Patiala, India.

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3. Results

Genus Lepidostoma Rambur, 1842

Type species: Lepidostoma squamulosum Rambur, 1842: 493–494 (designated by Ross, 1944).

Lepidostoma curvatum sp. nov. (as shown in Figures 1–6)

Male in alcohol brown, head densely covered with dark brown hairs. Antennal scapes (Figure 5) each 2.4 mm (n = 1) long, with a single basal process. Maxillary palps (Figure 5) each 0.96 mm (n = 1), 2-segmented, basal segment longer than distal segment, both segments curved upward into c-shaped structure; distal segment hidden by long tuft of setae. Forewings each with venation (Figure 6), pseudocell as long as anal groove.

Male genitalia (as shown in Figures 1–4): Segment IX annular, rounded in middle of posteroventral and posterodorsal margins (Figures 1 and 2); anterolateral and posterolateral margins nearly straight, parallel in lateral view (Figure 3). Segment X deeply and widely excised at its center, forming pair of plates, each plate broad at its base with dorsomesal process slightly longer and pointed, whereas dorsomesal process with rounded apex, both apices bearing long setae (Figure 1); laterally segment X rounded, its upper surface with irregular bumps bearing long setae, dorsolateral process of segment X triangular, projecting from center of this segment (Figure 3). Inferior appendages each rectangular, apices branched, branches nearly equal in length, basodorsal process of each inferior appendage nearly cylindrical, apex slightly enlarged, apically pointed. Phallicata apically dilated and phallobase truncate in lateral view; 2 parameres long, nearly straight, and subparallel, nearly as long as phallicata.

Diagnosis: The new species is a species of the Lepidostoma ferox branch (Weaver, 2002), with an anal groove and pseudocell in the male forewing. The male of this species resembles that of Lepidostoma assimense (Mosely, 1949b), but it can be differentiated from the latter by having the single basal process of each antenna very short and adjacent to the eye (longer and one-third distance from the eye of L. assimense); the male forewing vein Cu1 is separate from the fold of Cu2 from the wing base (these veins are combined in a fold from the wing base in L. assimense); segment X is longer than in L. assimense and its dorsolateral processes are pointed (rounded in L. assimense).

Female: Unknown.

Etymology: This species name pertains to the distinctly curved basal segment of each maxillary palp.

Material examined: Holotype male INDIA: Arunachal Pradesh; Tato, 3200 m, 28-iv-2010, collector Sajad H Parey. Holotype deposited in the Museum of Zoology and Environmental Sciences, Punjabi University, Patiala, India.

Lepidostoma mechukaense sp. nov. (as shown in Figures 7–11)

Male in alcohol brown. Antennal scapes (Figure 11) each 1.4 mm (n = 1), with tiny dorsal projection at mid-length. Maxillary palps each (Figure 11) 0.98 mm (n = 1), 2-segmented, basal segment 3× longer than distal one. Length of each forewing 7.8 mm (n = 1), venation similar as in L. curvatum.

Male genitalia (as shown in Figures 7–10): Segment IX annular, posterodorsally extraordinarily bulged, acute at its center, sides somewhat triangular in dorsal view (Figure 7); anterolateral and posterolateral margins concave in lateral view (Figure 9); posteroventrally truncate in ventral view (Figure 8). Segment X excised at its center forming 2 pairs of processes; dorsolateral processes triangular and dorsomesal processes rounded in dorsal and lateral views (Figures 7 and 9), apex of each process bearing setae, dorsomesal and dorsolateral processes separated from each other by wide space, dorsomesal processes close together (Figure 7); in lateral view segment X broad at base and notched at tip, dorsolateral processes each slender, triangular (Figure 9). Inferior appendages each single-segmented and cylindrical near base, abruptly narrowed in slender apically blunt apicodorsal process slightly longer than second process, basodorsal process digitate in lateral view (Figure 9). Phallus with phallobase dilated, phallicata cylindrical, parameres absent.

Diagnosis: Also a species in the L. ferox branch (Weaver, 2002), the male of this species resembles that of Lepidostoma betteni (Martynov, 1936), but it can be differentiated from the latter by having scapes straight (scapes curved in Lepidostoma betteni); maxillary palps each 2-segmented, first segment straight and second apically slightly curved (maxillary palp apparently single-segmented and curved upwards in Lepidostoma betteni); segment IX triangular near sides in dorsal view (segment IX rounded near sides in dorsal view in Lepidostoma betteni); segment X narrowly excised near center in dorsal view (segment X broadly excised near center in Lepidostoma betteni); dorsolateral process of segment X acutely produced (dorsolateral process of segment X slightly triangular of Lepidostoma betteni); basodorsal process digitate in lateral view (basodorsal process slender in lateral view in Lepidostoma betteni).

Female: Unknown.

Etymology: This species is named after its type locality.

Material examined: Holotype male INDIA: Arunachal Pradesh: Mechuka, 3600 m, 29-iv-2010, collector Sajad H Parey. Holotype deposited in the Museum of Zoology and Environmental Sciences, Punjabi University, Patiala, India.

New species records for India:

Lepidostoma liber Malicky: (Description and figures by Malicky 2007, p. 490, plate 11).
Figure 1. *Lepidostoma curvatum* sp. nov., male genitalia; dorsal view. IF = inferior appendage, X = segment X, IX = segment IX.

Figure 2. *Lepidostoma curvatum* sp. nov., male genitalia; ventral view. P = paramere; PH = phallicata.

Figure 3. *Lepidostoma curvatum* sp. nov., male genitalia; left lateral view. BDP = basodorsal process of an inferior appendage.

Figure 4. *Lepidostoma curvatum* sp. nov., male genitalia, phallic apparatus; left lateral view. P = paramere; PH = phallicata.

Figure 5. *Lepidostoma curvatum* sp. nov., head, antennal scape, and palps; right lateral view. S = antennal scape; MP = maxillary palp; LP = labial palp.

Figure 6. *Lepidostoma curvatum* sp. nov., right forewing; dorsal view. 1, 2, 5 = apical cells 1, 2, and 5.
Material examined: India 2 males: Arunachal Pradesh, Loomla, 07-x-2010, collector Sajad H Parey.


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