New records of two Himalayan Liverworts in the Western Ghats

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ABSTRACT

The liverworts *Chiloscyphus campanulatus* Steph. and *Heteroscyphus flaccidus* (Mitt.) A. Srivast. & S.C. Srivast. so far known to be endemic to Himalaya, are added here to the liverwort flora of Peninsular India from the Indira Gandhi National Park, Anamalais, in the Western Ghats. Brief descriptions with figures and photo plates are provided.

Keywords: Western Ghats, Anamalais, *Chiloscyphus campanulatus*, *Heteroscyphus flaccidus*

INTRODUCTION

The Anamalais, situated in the Western Ghats of Tamil Nadu, lies between 10° 13´ - 10° 33´ N and 79° 49´ - 77° 21´ E and has an area of c. 8000 km². It lies in the southern part of the Nilgiri Biosphere Reserve and is separated from it by the Palghat gap in the North. Anamalais is considered as one of the micro-endemic centres of plant species among the 25 in India.

The Indira Gandhi National Park is located in the Anamalais and is bounded by the Nilgiri Biosphere Reserve in the North, the Palani Hills in the East and the Parambikulam Wildlife Sanctuary in the West. In South it is bounded by the Eravikulam National Park and Chinnar Wildlife Sanctuary in Kerala. The National Park is well-explored for phanerogams since the mid 19th century by both European and Indian botanists. As far as bryological studies are concerned, this area remained unexplored until surveys were initiated by the authors a couple of years back. As a result, the moss *Trichostomum hyalinoblastum* (Broth.) Broth., an endemic species was rediscovered by Daniels & al. (2013). Recently, the liverworts *Chiloscyphus campanulatus* Steph. and *Heteroscyphus flaccidus* (Mitt.) A. Srivast. & S.C. Srivast., thought to be endemic to Himalaya, were discovered and are added here to the liverwort flora of Peninsular India from the Indira Gandhi National Park. Brief descriptions with figures and photo plates are provided. The specimens are housed at SCCN.

Plants 1 - 3 cm long and 1 - 1.2 mm wide, prostrate, greenish. Stems 0.16 - 0.18 × 0.13 - 0.15 mm in cross section, 7 - 10-celled across; cells homogenous, 12 - 28 × 14 - 30 µm, thin-walled, minutely thickened at corners. Rhizoids clustered at underleaf base. Leaves closely imbricate, alternate, slightly obliquely spreading, flat, 0.3 - 0.5 × 0.25 - 0.45 mm, ovate-oblong, sometimes subquadrate to slightly rectangular, entire, obtuse, truncate-rotundate or reulate at apex; cells thin-walled, with minute, triradiate trigones; marginal cells towards apex 20 - 32 × 18 - 24 µm, quadrate to rounded-quadrangle or subquadrangle; median

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**Fig -1:** *Chiloscyphus campanulatus* Steph.: A. Plant (Ventral view); B. Cross section of stem; C. Leaves; D. Marginal leaf cells towards apex; E. Median leaf cells; F. Median leaf cells with oil bodies; G. Basal leaf cells; H. Underleaves (Drawn from Kariyappa & Sreebha 9861 p.p.)
Plate 1: *Chiloscyphus campanulatus* Steph.: A. Habitat; B & C. Plants; D. Cross section of stem; E & F. Leaves; G. Marginal leaf cell towards apex; H & I. Median leaf cells with oil bodies; J. Basal leaf cells; K & L. Underleaves (From Kariyappa & Sreebha 9861).
Fig -2: Heteroscyphus flaccidus (Mitt.) A. Srivast. & S.C. Srivast.: A. Portion of plant; B. Portion of plant in dorsal view showing connate condition of leaf bases; C. Cross section of stem; D. Leaves; E. Marginal leaf cells towards apex; F. Median leaf cells with oil bodies; G. Median leaf cells; H. Basal leaf cells; I. Underleaves; J & K. Underleaf apices with hyaline papillae (Drawn from Kariyappa & Sreebha 9893 p.p.).

cells 32 - 40 × 20 - 28 µm, polygonal; basal cells 36 - 40 × 24 - 28 µm, polygonal; oil bodies 2 - 5 per cell, 12 - 20 × 8 - 10 µm, fusiform to elongate-ovoid, granular-segmented. Underleaves free, 0.24 - 0.3 × 0.16 - 0.2 mm, oblong, 2-lobed for 1/2 to 2/3; lobes parallel to slightly diverging, with a narrow sinus and a hyaline papilla at apex, one-toothed on either side; teeth 1- or 2-celled, with a hyaline papilla at apex. Sporogonium not seen.

Habitat: Terricolous, in evergreen forests, c. 1300 m.


Specimens examined: Western Ghats: Tamil Nadu, Coimbatore Dist., on the way to Valparai, at 28th hair pin bend, c. 1250 m, 4.2.2015, K.C. Kariyappa & R. Sreebha
Plate -2: *Heteroscyphus flaccidus* Steph.: A. Habitat; B & C. Plants; D. Cross section of stem; E & F. Leaves; G. Marginal leaf cells towards apex; H. Median leaf cells; I. Median leaf cells with oil bodies; J. Basal leaf cells; K & L. Underleaves; M. Underleaf apex with hyaline papilla (From *Kariyappa & Sreebha* 9893 p.p.).

**Notes:** *Chiloscyphus campanulatus* was found growing with the mosses *Fissidens ceylonensis* Dozy & Molk. and *F. crispulus* Brid. var. *robinsonii* (Broth.) Z. Ivats. & Z.H. Li. It is closely allied to *Chiloscyphus himalayensis* Steph. but can be readily distinguished from the latter by the presence of campanulate perianth when fertile. When sterile, both species could hardly be differentiated. However, the oil bodies in *C. campanulatus* are much larger, fusiform to elongate-ovoid and granular-segmented whereas in *C. himalayensis* they are ovoid or globose and finely segmented *(vide* Singh & Singh, 2009). *Chiloscyphus campanulatus* could also be confused with *Notoscyphus* Corda when sterile, but the latter is characterized by thick-walled leaf cells with bulging or confluent trigones and heterogenous stem cells in cross section. On the contrary, in *C. campanulatus* the leaf cells are thin-walled, with minute trigones and the stem cells are homogenous in cross section.


Plants 2 - 6 cm long and 1.8 - 2.3 mm wide, prostrate, fragile, often laterally compressed, olive-green. Stems 0.2 - 0.24 × 0.16 - 0.2 mm in cross section, 9 - 10-celled across, not dorso-ventrally flattened; cortex 1 - 2-layered, faintly thickened; cells homogenous, 12 - 32 × 10 - 28 µm, quadrate to rounded-quadrangle or quadrangle-hexagonal, thin-walled. Leaves closely imbricate, opposite, united dorsally at antical ends and ventrally with adjoining underleaf base, 1.2 - 1.6 × 0.8 - 1.2 mm, triangular to ovate-oblong, almost straight at antical margin, arched at postical margin, entire, acute, sometimes shortly bifid, rarely retuse; cells rounded-hexagonal, except marginal ones which are quadrate to subquadrangle, thin-walled, with nodulose trigones; marginal cells towards apex 20 - 30 × 24 - 32 µm; median cells 38 - 44 × 36 - 48 µm; basal cells 38 - 48 × 36 - 50 µm; oil bodies 2 - 6 per cell, 10 - 12 × 6 - 8 µm, ovoid, minutely granular-segmented. Underleaves slightly imbricate, 0.6 - 1 × 0.8 - 1.4 mm, cordate, rarely orbicular, irregularly toothed at margin, 2-lobed at apex; lobes parallel to diverging, with a broad sinus, toothed at margin, with hyaline papillae at tooth apex or margin. Rhizoids clustered at underleaf base. Sporogonium not seen.

**Habitat:** Rupicolous in montane evergreen forests, 1200 - 1500 m.

**Distribution:** Nepal and India: Eastern Himalaya (Darjeeling and Sikkim *vide* Srivastava & Srivastava, 2002) and W. Ghats of Tamil Nadu (Coimbatore), rare.

**Specimens examined:** Western Ghats: Tamil Nadu, Coimbatore Dist., on the way to Valparai, Umaiyan-dimudukku, c. 1300 m, 4.2.2015, K.C. Kariyappa & R. Sreebha 9893 p.p.; at 37th hair pin bend, c. 1300 m, 5.2.2015, K.C. Kariyappa & R. Sreebha 10042.

**Notes:** *Heteroscyphus flaccidus* was found growing with the liverwort *Lopholejeunea nigricans* (Lindenb.) Schiffn. It is closely allied to *Heteroscyphus perfoliatus* (Mont.) Schiffn., another species frequently met with in the W. Ghats. However, *H. perfoliatus* can be distinguished from the former in the stem being dorso-ventrally flattened in cross section and the cell walls distinctly thickened. For a detailed key with other related species, please refer to Srivastava and Srivastava (2002).

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**REFERENCES**

