

RESEARCH ARTICLE

Plagiochila subtropica Stephani (Plagiochilaceae, marchantiophyta) new to Western Himalayas

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Abstract

Plagiochila subtropica Stephani has recently been collected and identified from Gairsain, Garhwal region of Uttarakhand which turned out to be a new addition to the Hepatic flora of Western Himalayas. The species is well known to form characteristic diffused patches on tree trunks. The lateral lobes are prominently flattened, triangular-ovate, falcate, and irregularly dentate with a wider base. Asexual reproduction by fragmenting leaves as well as by producing leafy propagules from the ventral leaf surface. Earlier the species was reported and described from Eastern Himalayas and Western Ghats of the country. The present report shows the rare occurrence of the species *P. subtropica* with an extended distributional range in Western Himalayas. A detailed taxonomic illustrated account based on Western Himalayan plants is being provided.

Keywords: Epiphytic, Hepatic flora, Garhwal region, New record, Western Himalayas.

Introduction

Plagiochila (Dumort.) Dumort is a large, chaotic genus among leafy liverworts with about 1600 species listed in the 'Index Hepaticarum' from all over the world (Geissler and Bischler 1989, So and Grolle 2000). The genus has been divided variously into subgenus and sections, from time to time (Lindenberg 1839-1844, Mitten 1861, Schiffner 1893-95, Stephani 1901-1906, 1917-1924, Inoue 1965, So 2001, Rawat and Srivastava 2007). While describing *Plagiochila* in China, So (2001) recognized 14 sections of *Plagiochila*: *Carringtoniae* Inoue, *Zonatae* Carl, *Dendroideae* Gott., *Lindend.* et Nees, *Caducilobae* Inoue, *Subtropicae* Carl, *Cobanae* Carl, *Tayloriae* Carl, *Ciliatae* Schiffn., *Poeltiae* Inoue, *Firmae* Carl, *Cardotiae*

Inoue, *Contiguae* Carl, *Choachinae* Spruce, *Plagiochila* (Nees) Nees (see also Rawat and Srivastava 2007). In Asia, 480 species were reported, out of which 132 species were recognized valid (So and Grolle 2000). Singh et al. (2016) reported 82 taxa from India, out of which 60 taxa were from the Eastern Himalayas, 42 taxa from south India and 25 taxa from the Western Himalayas (Parihar 1961-62, Dixit 1995, Rawat and Srivastava 2007, Asthana and Bharti 2021).

The presently reported *Plagiochila subtropica* is a well-known species of section *Subtropicae* Carl. The members of this section are characterized by pale to deep brown plants, closely imbricate, oblong-ovate to triangular-ovate leaves, predominantly terminal branching and asexual reproduction usually by fragmenting leaves (Inoue 1984, Grolle and So 1999). From Western Himalayas 25 taxa belonging to 10 different sections of the genus *Plagiochila* have been reported so far (Söderström et al. 2015, Söderström et al. 2016, Ellis et al. 2018a, 2018b, Asthana and Bharti 2021).

During the course of bryo-exploratory study in and around the Gairsain region of Garhwal Himalayas, Uttarakhand, we encountered an epiphytic species of *Plagiochila* which was subsequently recognized as *P. subtropica*. Earlier this species was known from Eastern Himalayas (Assam, Sikkim) and Western Ghats (Nilgiri Hills) (Srivastava et al. 2006). From Western Himalayan sector the species is being reported for the first time. The scanty population in rare occurrence of this propaguliferous leafy liverwort (*P. subtropica*) was found restricted as an epiphyte

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of Oak trees growing in north facing site of the forest at Bhararisain (Gairsain). A detailed taxonomic description with photographs of diagnostic characters of the species has been provided.

Materials and Methods

While analyzing the collection of bryophytes made from Gairsain region of Garhwal Himalayas, we encountered an interesting, epiphytic leafy liverwort belonging to the family plagioclilaceae. For microscopic observations, temporary slides were prepared in 30% glycerin and permanent slides in gum chloral mounting medium (Watson 1955). Microphotographs of diagnostic gametophytic characters of the plants were taken. The identification work was performed with the help of available literature as well as the species was further compared with the Taiwanese specimen of *P. subtropica* which was made accessible by Dr. Gerhard Winter of Germany.

The collected specimen *Plagiochila subtropica* which is deposited in cryptogamic section of Botanical survey of India, northern region centre, Dehradun. For the sake of validity of the specimen, with Accession number1019

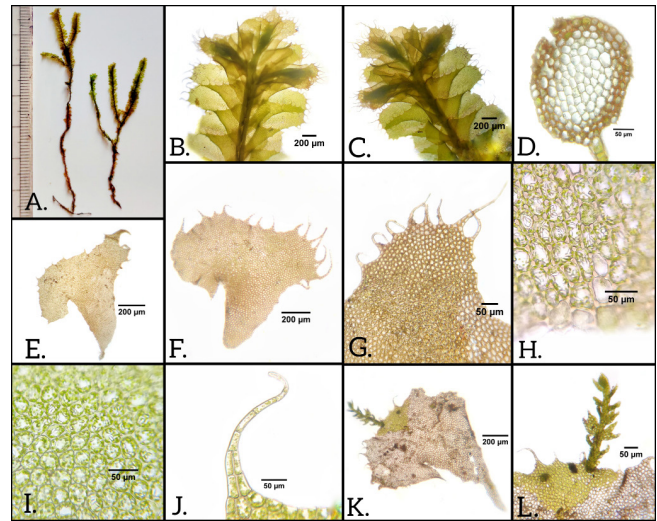
Observations

Taxonomic Treatment

Plagiochila subtropica Steph

P. subtropica St., *Bull. Soc. Roy. Bot. Belgique* (1899) 38, Mem. 46. 1900; M.L. So in *Syst. Bot. Monog.* 60: 93. 2001.

Plants light brown, in diffused patches; shoots upto 3-5cm long, 2-3.5mm wide arising from the creeping rhizome. The terminal shoots pseudo-dichotomously branched. Stem 15-18 cells across the diameter, differentiated thick-walled, light brown, 3 layered cortical cells, medullary cells thin-walled, 24-30×15-18µm. Leaves, fragile, closely imbricate, obliquely inserted, horizontally spreading, completely covering dorsal stem surface, ventral stem surface entirely hidden, flattened, triangular-ovate, falcate, wide at the base, 2.8- 3mm long, 2- 2.8mm wide, dorsal margin of leaves strongly arched, base long decurrent, irregularly toothed from base to apex, teeth short to long with 3-4 cells long ciliate, curved teeth. Due to the caducous nature of leaves, cilia may not always be visible, especially when all of the leaves have lost their distal portions. However, a close examination of the shoot apex can turn up a few developing teeth-bearing leaflets. Terminal leaf cells 25-50×12-14.8µm with long ciliate and falcate teeth upto 37- 68µm. Median cells 33-37×25µm, basal cells 40-51×18-25µm, trigones conspicuous, triangular to nodulose. Underleaves absent. Plants generally sterile, sporiferous population of this taxon could not be located. However Asexual reproduction is recorded by fragmenting leaves as well as by producing leafy propagules from ventral leaf surface (Figure 1A-L).



Figures 1(A-L): *Plagiochila subtropica* Stephani A- Wet, subterranean rhizomatous shoots, B, C- Dorsal and ventral shoot tips, D- Stem cross-section, E, F- Triangular-ovate lateral lobes, G- Lobe margin with curved dentation, H- Basal cells with distinct triangular nodulose trigones, I- Median cells, J- Marginal cells of the lobe with falcate teeth, K- Propaguliferous lobe. L- Leafy propagule enlarged

Specimen Examined

Plagiochila subtropica Steph. India, Western Himalayas, Uttarakhand, Gairsain area of district Chamoli, 2200m, 30.0539° N, 79.2865° E, 212NG 08.06.2022, 308NG, 318NG 20.10.2022, N. Kohli, S.D. Tewari, M. Bhandari, S. Pant.

Habitat

Epiphytic on Oak trees, associated with mosses like *Anomodon minor* (Hedw.) Lindb., *Cryptoptodon flexuosus* (Harv.) Renaud & Cardot, *Pterobryopsis frondosa* (Mitt.) M. Fleisch., *Struckia argentata* (Mitt.) Müll. Hal., and liverworts viz. *Metzgeria himalayensis* Kash., *Frullania retusa* Mitt., and *Ptychanthus striatus* (Lehm. & Lindenb.) Nees,

Distribution

China (Yunnan), Taiwan, Thailand, Bhutan, Nepal, Eastern Himalayas and Western Ghats, new to Western Himalayas.

Ecology

Plants growing in scanty patches as an epiphytic population on Oak tree trunks of the north facing forest site at an elevation of 2200m is presently under the constant pressure of anthropogenic activities.

Discussion and Conclusion

A well-known species of *Plagiochila* of section *Subtropicae* *Plagiochila subtropica* was initially introduced in India from Assam (So 2001). Later Srivastava *et al.* in 2006 recorded this leafy liverwort from Western Ghats (Nilgiri hills). However, in recent years based on the phylogenetic studies of *P. subtropica* from Nepal was placed within the pantropical section *Vagae* Lindenb., and consequently section *Subtropicae* was synonymized under sect. *Vagae*, is possibly

the largest section of *Plagiochila* (Groth *et al.* 2004, Jamy *et al.* 2016). Based on the prominent characters viz. diffused patches on tree trunks, creeping rhizomatous shoot with terminally pseudo-dichotomous branching; flattened, triangular-ovate lateral lobes, irregularly toothed from base to apex; lobe marginal teeth short-long, ciliate and falcate at distal half, the species is recognized as *P. subtropica*. It is noteworthy to describe that, the propaguliferous plants of *P. subtropica* are being reported for the first time from India based on the collection made from the Garhwal region of Western Himalayas. The leaf fragments with propagules of *P. subtropica* were earlier reported and described by So 2001 from China. The presently documented uncommon species of *Plagiochila* (*P. subtropica*) from Garhwal region of Western Himalayas turn out to be a new record, indicating its expanded distributional range. It is highlight to note, that the present collection site (Oak forest) of this propaguliferous liverwort at Gairsain, Uttarakhand is not stable due to ongoing human activity, which is causing a decline in forest vegetation; as a result, documentation of this hepatic is required before it loses its original habitat.

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