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Addition of Some *Plagiochila* (Dumort.) Dumort. Species from Kumaon Himalayan Hills

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ABSTRACT

Five species of the genus Plagiochila (Dumort.) Dumortier. were identified from hepatic collections made in the Champawat and Pithoragarh districts of the Kumaon region, Western Himalaya. These include Plagiochila parvifolia Lindenb. (Sect. Subtropicae Carl.), P. secretifolia Mitt., P. chinensis Steph., P. nana Steph. (all Sect. Plagiochila Nees), and P. gollani Steph. (Sect. Contiguae Carl.). All taxa were critically examined using morphological characters. Among these, P. secretifolia Mitt. is noted here as a new finding for the Western Himalaya. The present study contributes to the knowledge of leafy hepatic diversity in the Kumaon region of the Western Himalaya.

Keywords: *Plagiochila, leafy hepatics, Kumaon region, Western Himalaya.*

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1. Introduction

The genus, *Plagiochila* (Dumort.) Dumortier is a large and complex genus having a greater degree of plasticity in plant size, shape of the leaf, and pattern of dentition. In addition, plants of the genus generally occur in a vegetative state, the fructification not being so common. As such, demarcating a species, largely based on vegetative features, in this genus is somewhat difficult. However, the recent monographic study on East Himalayan *Plagiochila* has eased this problem of identification [1]. Similarly, after making an exhaustive study and applying the latest synonymy rules, 132 species have been listed, reducing the number from 480 species described from Asian countries, including India [2].

A survey of different checklists on liverworts reveals that the number of *Plagiochila* species in Indian territory is quite variable: 109 [3], 125 [4], and 66 [5]. Talking about the region-wise distribution of *Plagiochila* species, while the East Himalayan form has been discussed and revised in the monographic work [1], the West Himalayan species have not been paid much attention. Besides the monumental work [6] on the liverworts of the Western Himalayas, which describes 161 species, and the recent work [7] describing 104 species from the Great Himalayan National Park in Himachal Pradesh, the other significant contributions were also made by various early workers [8-11]. In the present study, five species of *Plagiochila* (Dumort.) Dumort., namely *Plagiochila parvifolia* Lindenb. (Sect. *Subtropicae* Carl.), *P. secretifolia* Mitt., *P. chinensis* Steph., *P. nana* Steph. (all Sect. *Plagiochila* Nees), and *P. gollani* Steph. (Sect. *Contiguae* Carl.), were collected from the districts of Champawat (28°22' N; 80° 06' E) and Pithoragarh (39°39' N; 80° 09' E) in the Kumaon Region of the State of Uttarakhand. Among the studied taxa, *P. secretifolia* is recorded here as new to the Western Himalaya. However, in view of the fact that the Western Himalayan specimens of *Plagiochila* (Dumort.) Dumortier. have not received adequate description in most of the preceding works, these plants are being described with critical observation, besides providing ecological and distributional notes. A key for the identification of these species is also provided.

2. Methodology

Specimens were collected in the field and kept in sterile polythene bags. After collection, they were returned to the laboratory for identification of species and to study their taxonomy. The peridioles were sliced by hand and examined using a binocular microscope. The specimen is then identified according to the standard literature [1].

3. Taxonomic Description

Key to species:

1. Leaves broadly ovate to ovate-oblong, the ventral base usually strongly implicit and moderately to strongly decurrent.....2

1. Leaves oblong or triangular, the ventral base never ampliate and decurrent.....3

2. Plants are large, 4-6 cm long, frequently branched, leaves 2.0-2.2 mm long and 1.8-2.0 mm wide at base.....*P. gollani.*

2. Plants small, 1-2 cm long, simple or rarely branched; leaves 1.3-1.6 mm long and 1.0-1.5 mm wide.....*P. nana.*

3. Branching dichotomously; leaves triangular, closely imbricate, apex truncate or subrotundate....*P. parvifolia*

3. Branching lateral intercalary; leaves distant to slightly imbricate, apex never truncate.....4
4. Plants brownish green; rhizoids numerous, on ventral surface of the stem throughout leaves distant, ligulate-oblong, generally 1.6-1.8 mm, as long as wide.....*P. secretifolia.*
4. Plants yellowish green; rhizoids totally absent in aerial shoot; leaves subimbricate, generally 1.2-1.5 times as long as wide.....*P. chinensis*

Description

***Plagiochila secretifolia* Mitt.**

J. Proc. Linn. Soc., Bot. 5:98 (1861); Inoue, Journ Hattori Bot. Lab. 20: 93-95 (1958); So and Grolle, J. Bryol. 22: 25 (2000); So, Syst. Bot. Monogr. 60: 126 (2001). (Plate 1: Figures A-H).

Plants moderate to large in size, brownish-sized to large, brownish green, in turfs. Stem 3-6 cm long and 0.35-0.45 mm in diameter, with leaves 4.2-4.6 mm wide, deep brown, sparsely branched, branches intercalary; in cross-section, cortical cells in 3-4 layers, 12-18 x 8-12 m, cells of outermost ring a little larger than inner cortical cells, wall very thick, medullary cells large, 25-30 x 20-22 µm, walls thin, white, without trigones. Rhizoids numerous, on the ventral side of the stem throughout. Leaves distant, obliquely spreading, lingulate-oblong, 2.1-2.3 mm long and 1.2-1.5 mm wide, dorsal margin decurrent, almost straight, entire or with 1.5 teeth, the ventral margin frequently recurved, never with an implicit base, the margin provided with 18-24 teeth, the tooth 1-4 celled long and 1-2 cells in width at base, total number of teeth on leaf margin 25-45 x 16-25 µm. Marginal cells of the leaf 20-35 x 15-20 µm, medium cells 25-45 x 15-25 µm, basal cells 32-48 x 16-28 µm. Trigones are large, and bulging walls thin. Perianth terminal on main stem, long exserted, cylindrical, without a dorsal wing, always with 1 subfloral innovation.

Ecology and distribution:

The species grows on the moist soil along with the mosses genera *Entodon* and *Mnium* species.

Specimen examined:

Western Himalaya, Uttarakhand State, Kumaon region, District Champawat: 609, Hingla Devi Top, 1700 m, and deposited in the CMP Herbarium; located in the Botany department.

Type locality: Thailand and Nepal. In India -E. Him. (Senchall, Darjeeling): New to W. Himalaya.

The diagnostic features of the present species comprise, (i) brownish-green plants, (ii) distant, ligulate-oblong leaves, usually 1.6-1.8 times longer than wide, (iii) ventral margin of leaf frequently recurved but never with amplicate base, (iv) numerous rhizoids throughout the ventral side of the stem, and (v) cylindrical, longly exserted perianth, always with 1 sub floral innovation.

***Plagiochila parvifolia* Lindenb.**

Sp. Hepat. (Plagiochilafasc.1) 28 (1839); Grolle and So, The Bryologist 102 (1):72 (1992), So, Syst. Bot. Monogr. 60:90 (2001). (Plate 1: Figures I-O).

Plants are large, yellowish-brown to brown, in compact turfs. Stem 4.0-5.5 cm long and 0.22-0.28 mm in diameter, with leaves 3.6-4.0 mm wide, deep brown to blackish, frequently branched, branches dichotomous to sub-monopodial near the apex: in cross-section, cortical cells in 2-3 layers about 10-18 µm, outermost cells slightly shorter than inner cortical cells, walls very thick, the medullary cells 18-22 x 22-24 µm, walls thin, white. Rhizoids few, situated near the base of the stem. Leaves closely imbricate, obliquely spreading, longly decurrent on dorsal margin side, triangular, 2.2-2.4 mm long and 1.5-1.8 mm wide near the base; dorsal margin almost straight, slightly recurved, entire, or with 1(2) small tooth; the ventral margin reflexed, never decurrent, provided with teeth mostly in the distal half, teeth usually small to sometimes large, 1-8 celled long and 2-4 cells in width at the base, apex somewhat truncate to subrotundate. Marginal cells of the leaf 18-24 x 10-16 µm, median cells 28-32 x 20-24 µm, basal cells 30-36 x 22-28 µm, trigones very large, bulging, more prominent in basal cells, walls thin.

Ecology and Distribution:

The species grows in pure stands near the bases of the oak trees, *Quercus leucotrichophora* A.Camus.

Specimen examined:

Western Himalaya, Uttarakhand State, Kumaon region, District Champawat; 424, Abbott Mount, Lohaghat, 1850 m and deposited in the CMP Herbarium, located in the Botany department.

Type Locality: Burma, In India -E. Him (Sikkim Darjeeling). New record for Western Himalaya.

The diagnostic features of the present species comprise, (i) a large, yellowish-brown to brown plant, (ii) closely imbricate and obliquely spreading leaves with a truncate apex, (iii) dorsal margin of leafy longly decurrent and strongly recurved, and (iv) ventral margin reflexed, shorter than dorsal margin, never decurrent with small feet mostly in distal half.

***Plagiochila chinensis* Steph.**

Mem. Soc. Sci. Nat. Math. Cherbourg 29:223 (1894); Inoue, Bull. Nat. Sci. Mus. Tokyo 8(3): 389 (1965). (Plate 2: Figures A-J).

Plants are large, yellowish-green, in loose turfs. Stem 4.5-6.2 cm long and about 0.4 mm in diameter, with leaves 3.8-4.1 mm wide, brown, sparingly branched; in cross-section cortical cells in 2-3 layers, 20-30 µm, large, walls thin, trigones absent. Rhizoids are lacking entirely. Leaves approximate to sub-imbricate, rather transversely spreading, ovate-oblong, 1.8-2.0 mm long and 1.4-1.6 mm wide, the dorsal margin longly decurrent, with a few teeth near the apex, the ventral margin somewhat arching and slightly decurrent, never implicit, with small teeth, the number of teeth in each leaf 15-25. Marginal cells of the leaf 22-30 x 18-20 µm, trigones distinct, never bulging, wall thin; basal cells more or less equal to or slightly larger than median cells. The male inflorescence is terminal or intercalary; bracts in 5-7 pairs, ventricose, and smaller than vegetative leaves.

Ecology and distribution:

The species grows on soil, in association with *Thuidium* sp. and some other mosses.

Specimen examined:

Western Himalaya, Uttarakhand State, Kumaon region, District Champawat H-79/5 Abbott Mount, Lohaghat, 1980 m, and deposited in the CMP Herbarium, located in the Botany Department.

Type locality:
The diagnostic features of the present species comprise, (i) large-sized, yellowish-green plants, (ii) approximately sub-imbricate oblong leaves nearly 1.3-1.5 times longer than wide, (iii) absence of rhizoids in aerial shoots (iv) cell walls of marginal cells very thin, and (v) median cells 32-50 x 25-30 µm.

***Plagiochila gollani* Steph.**
Sp. Hepat. 2:368 (1906); Carl, Ann. Bryol. Suppl. 2:108 (1931); Inoue, Journ. Hattori Bot. Lab. 23:29 (1960) (Plate 3: Figures A-F).
Plant large, yellowish-green, in turfs. Stem 4-6 cm long and 0.28-0.31 mm in diameter, with leaves 4-5 mm wide, rhizomatous, deep brown, spreading to erect, rather frequently branched, branches monopodial; intercalary. Rhizoids are few, limited to the rhizomatous portion of the stem. Leaves imbricate, obliquely to somewhat widely spreading, decurrent dorsally, ovate to ovate triangular, 2.1-2.3 mm long and 1.7-2.0 mm wide at base dorsal margin nearly straight, entire or having 1-2 teeth, ventral margin overlapping with ampliate base, total number of teeth per leaf 7-12, the tooth 3-10 celled elongated and 2-4 cells in width at base, the apex narrowly truncate. Marginal cells of the leaf 20-28 x 12-18 µm, median cells 30-33 x 22 µm, trigones large, distinct, with thin wall; cuticle, smooth.

Ecology and Distribution:
The species grows on old and decaying bark in the basal region of the trunks of the oak tree, *Quercus leucotrichophora* A.Camus.

Specimen examined:
Western Himalaya, Uttarakhand State, Kumaon region, District Champawat region: H-79/4, Abbott Mount, Lohaghat, 1990 m, and deposited in the CMP Herbarium; located in the Botany Department.

Type locality: Mussoorie (Western Himalaya), Japan, Formosa, Thailand, and Nepal in India- E. Him. (Sikkim, Khasia, Bengal): W. Him. (Mussoorie, Shimla).
The diagnostic features of the present species comprise, (i) yellowish green plants, rather frequently branched, (ii) ovate or triangular-ovate leaves, usually with a stirring implicit base, (iii) contiguous to slightly imbricate leaves, nearly as long as wide, (iv) median cells of leaf 30-32 x 22-25 µm, with large, distinct trigones.

***Plagiochila nana* Steph.**
Sp. Hepat. 6:188 (1924); Inoue, Bull. Nat. Sci. Mus., Tokyo 8 (3): 389 (1965) (Plate 3: Figures J-M).
Plants are small, yellowish-green to pale, in mats. Stem 1.6-2.2 cm long, 0.20-0.25 mm in diameter, with leaves 2.6-3.2 mm wide, brown, occasionally branched; in cross section, cortical cells in two layers, 10-12 x 8-10 µm, walls thick, the medullary cells large, 25 x 20 µm, walls thin, without trigones. Rhizoids few, situated near base of the stem. Leaves sub-imbricate, obliquely to somewhat transversely spreading, ovate-oblong, 1.4-1.6 mm long and 1.0-1.6 mm wide, the dorsal margin decurrent, entire or with some teeth toward the apex, the ventral margin amplicate at the base, decurrent, provided with several smaller teeth, the apex rounded. Marginal cells of the leaf 18-22 x 10-15 µm, median cells 22-30 x 20-25 µm, trigones are large, prominent, bulging, wall thin.

Ecology and distribution:
The species grows on moist soil along with some *Pleurocarpous* mosses.

Specimen examined:
The Western Himalaya, Uttarakhand State, Kumaon region, District Champawat: 610, Hingla Devi Top, 1750 m, and deposited in the CMP Herbarium, located in the Botany Department.

Type Locality: Shimla (Western Himalaya) In India - E Him. (Sikkim); W.Him (Shimla).
The diagnostic features of the present species comprise, (i) small-sized plants, (ii) ovate-oblong leaves with an ampliate base and a ventral leaf margin longly decurrent, and (iii) leaves 1.2-1.4 times longer than wide.

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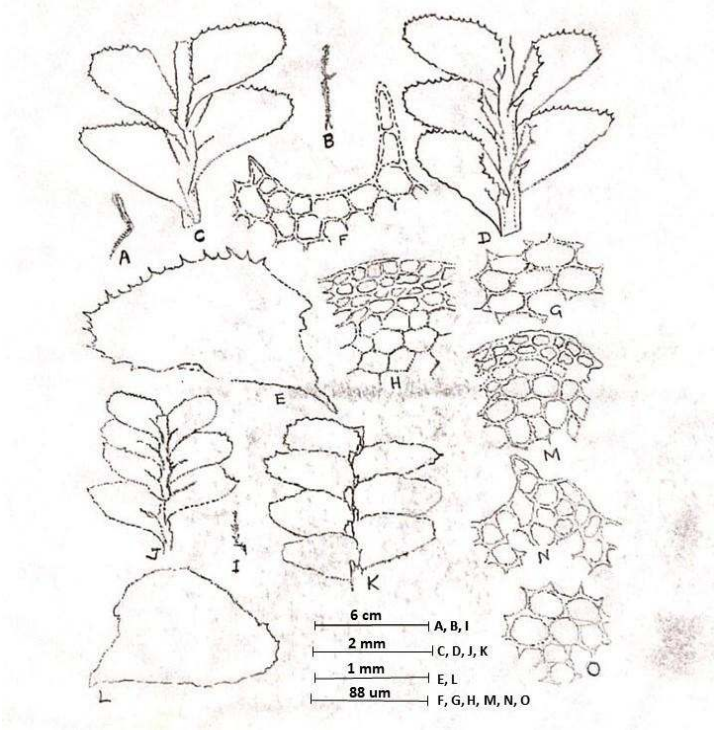

PLATE: 1
Figures A-H: Plagiochila secretifolia Mitt. A & B. Plant, habit; C. Plant part, dorsal view; D. Plant part, ventral view; E. leaf; F. Marginal cells and teeth of the leaf; G. Median cells of the leaf; H. Part of the stem, T.S.
Figures I-O: Plagiochila nana Steph. I. Plant, habit; J. Part of the plant, dorsal view; K. Part of the plant, ventral view; L. Leaf; M. Part of the stem; T.S. N. Marginal cells and teeth of the leaf; O. Median cells of the leaf.

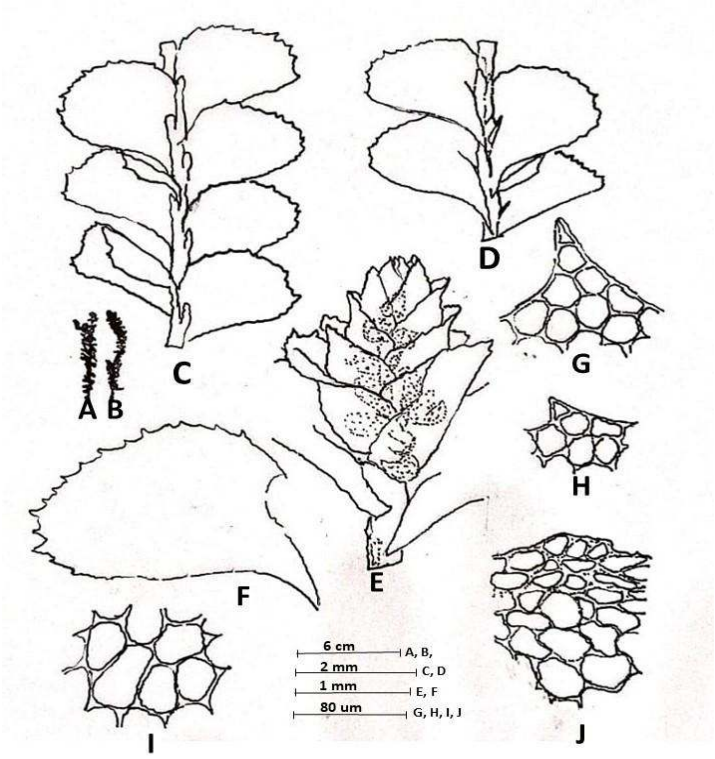

PLATE: 2

Figures A-J: Plagiochila chinensis Steph.: A & B Plant, habit; C. Plant part, dorsal view; D. Plant part, ventral view; E. Male inflorescence; F. Leaf; G. Marginal cells and teeth of the leaf; H. Median cells of the leaf; I. Central cell of the leaf; J. Part of the stem, T.S.

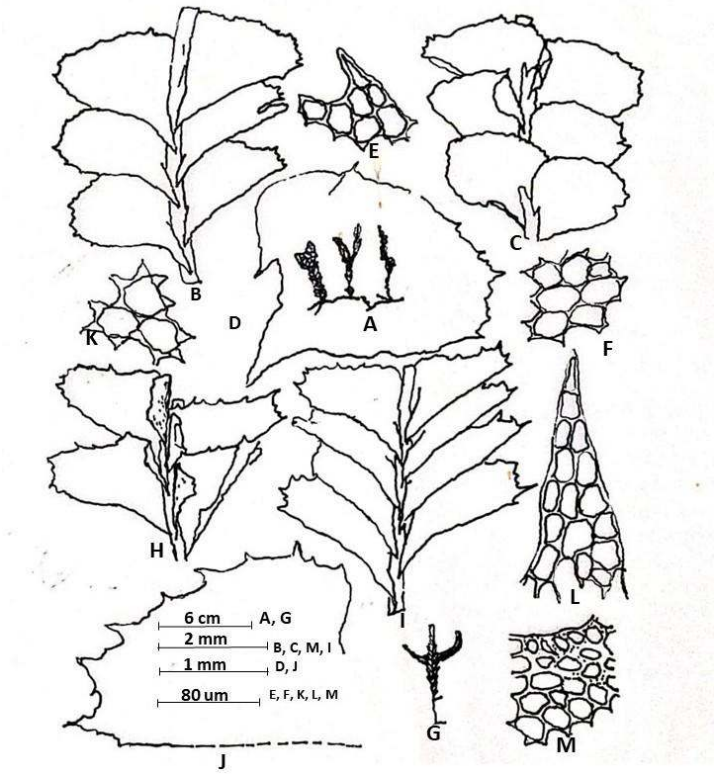

PLATE: 3

Figures A-F: Plagiochila gollani Steph. A. Plant, habit; B. Plant part, dorsal view; C. Plant part, ventral view; D. Leaf; E. Marginal cells and teeth of the leaf. F. Median cells of the leaf.
Figures G-M: Plagiochila parvifolia Lindenb. G. Plant, habit; H. Plant part, dorsal view; I. Plant part, ventral view; J. Leaf; K. Median cells of the leaf; L. Marginal cells and teeth of the leaf; M. Part of the stem, T.S.

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