



ISSN: 2348-1900

Plant Science Today

<http://horizonepublishing.com/journals/index.php/PST>



Research Communication

***Plagiochila parvivittata* Inoue var. *siangensis* var. nov. (Plagiochilaceae, Marchantiophyta) from Arunachal Pradesh, India**

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Article history

Received: 6 January 2015
Accepted: 12 January 2016
Published online: 25 March 2016

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Publisher

Horizon e-Publishing Group

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Abstract

Plagiochila parvivittata Inoue var. *siangensis* var. nov. is described from West Siang district in Arunachal Pradesh, Eastern Himalaya, India. The new taxon differs from the typical variety in larger length/breadth ratio of leaves with fewer marginal teeth, (0-) 2–3 teeth along the dorsal margin of leaves near apex, terminal cell of marginal teeth 4–12 (-18) times longer than wide and a very distinct vitta area with the cells measuring 75–114 × 15–21 µm in size.

Keywords

Plagiochila parvivittata Inoue var. *siangensis*; Arunachal Pradesh; Eastern Himalaya; India; new variety

Singh Deo, S. and D. K. Singh 2016. *Plagiochila parvivittata* Inoue var. *siangensis* var. nov. (Plagiochilaceae, Marchantiophyta) from Arunachal Pradesh, India. *Plant Science Today* 3(1): 63-67. <http://dx.doi.org/10.14719/pst.2016.3.1.185>

Introduction

Grolle and So (1999) established subsection *Caulimammillosae* Grolle & M.L.So within the section *Zonatae* Carl, to include species of the genus *Plagiochila* with mammillose stem surface, having a distinct unistratose layer of bulging, thin-walled, hyaline cortical cells forming hyaloderm, and included *Plagiochila aspericaulis* Grolle & M.L.So, *P. caulimammillosa* Grolle & M.L.So, *P. hyalodermica* Grolle & M.L.So and *P. parvivittata* Inoue in it. Recently, Singh and Singh (2011) recorded *P. hyalodermica* Grolle & M.L.So in Indian bryoflora from Sikkim in the Eastern Himalaya, which formed the first report of the subsection in India.

During the course of ongoing studies on liverworts and hornworts of the Eastern Himalaya, the authors came across another interesting taxon belonging to this subsection quite similar to *Plagiochila parvivittata* – a species hitherto known only from Bhutan and Nepal, in its overall

appearance. The Indian plants, however, differed consistently from *P. parvivittata* in larger length/breadth ratio of leaves with fewer marginal teeth, (0-) 2–3 teeth along the dorsal margin of leaves near apex, terminal cell of marginal teeth with larger length/breadth ratio and a very distinct vitta, and hence merit the status of a new taxon.

Materials and Methods

A critical morpho-taxonomic study on the Indian specimens of the genus *Plagiochila* collected from West Siang district of Arunachal Pradesh in Eastern Himalaya, which initially looked similar to *P. parvivittata*, and their comparison with the Type of the latter (*D.G. Long 8443*: Isotype) obtained on loan from Herbarium Haussknecht, Jena (JE) revealed the consistent differences in certain features of their leaves, and hence the taxonomic individuality of the two. Different morphological features were

were studied and photographed under bright field biological research microscope (Nikon eclipse 50i) and Stereo zoom binocular microscope (Olympus SZ 51), and the illustrations were made using drawing attachment. The Holotype and the Isotype of the new taxon have been deposited in the Cryptogamic section of the Central National Herbarium of the Botanical Survey of India, Howrah (CAL).

Taxonomic Description and Discussion

Plagiochila parvivittata Inoue var. *siangensis* Singh Deo & D.K.Singh, *var. nov.* (Figs. 1, 2)

Type: India, Eastern Himalaya, Arunachal Pradesh, West Siang district, Menchukha (between Zupuk and Damingla forests), 28°40'N, 94°03'E, c. 3300 m, 08.05.2011, S. Singh Deo, 50829A (Holotype and isotype: CAL).

Plants yellowish brown – dark brown in herbarium; shoots large, robust, 6–10 cm long, 3–5 mm wide including leaves, sparsely branched; branches lateral intercalary, restricted to the upper portion of the plants only. Stem elliptical in outline in transverse section, 400–590 × 320–430 µm, 16–28 cells across diameter; cortical cells in 3–4 layers; cells of the hyalodermis 13–29 × 13–28

Table 1. Comparative morphological account of different species of subsect. *Caulimammillosae* of the genus *Plagiochila*

Characteristics	<i>P. aspericaulis</i>	<i>P. caulimammillosa</i>	<i>P. hyalodermica</i>	<i>P. parvivittata</i> var. <i>parvivittata</i>	<i>P. parvivittata</i> var. <i>siangensis</i>
Shoot	1.0–1.2 cm long, 1.5–1.6 mm wide	5–6 cm long, 2.8–3.2 mm wide	2–2.2 cm long, 3.5–4.0 mm wide	3.5–6 cm long, 3–4.5 cm wide	6–10 cm long, 3–5 mm wide
Paraphyllia	1–3 celled	1–3 celled	absent	absent	absent
Stem	10–16 cells across in diameter, cortical cells in 3–4 layers	10–16 cells across diameter, cortical cells in 3–4 layers	9–10 cells across diameter, cortical cells in 3–4 layers	18–32 cells across diameter, cortical cells in 3–4 layers	16–28 cells across diameter, cortical cells in 3–4 layers
Hyalodermic cells	20–25 × 24–30 µm	20–22 × 20–24 µm	20 × 20–40 µm	14–25 (-31) × 12.5–25 µm	13–29 × 13–28 µm
Leaf shape and size	Broadly ovate to triangular-ovate, apex broadly rounded, 0.7–0.9 mm long, 0.6–0.7 mm wide	Broadly ovate to triangular-ovate, apex narrowly rounded, 2.0–2.1 mm long, 1.3–1.5 mm wide	Broadly ovate or triangularly ovate, apex subacute, 1.9–2.1 mm long, 1.1–1.2 mm wide	Broadly ovate or triangularly ovate, apex narrowly rounded, 2.8–3.2 mm long, 2.5–3.1 mm wide	Broadly ovate to triangular-ovate, apex narrowly rounded, 2.5–3.5 mm long, (1.1-) 1.5–2.6 mm wide
Leaf length/width ratio	1–1.15:1	1.1–1.3:1	1.6–1.7:1	0.9–1.1:1	(1.2-) 1.4–1.8 (-2.2):1
Dorsal margin of leaf	Entire, basal part recurved, base long decurrent	Entire, strongly revolute, recurved, base long decurrent	7–8 teeth along distal part, slightly recurved, base long decurrent	8–13 teeth present throughout or till mid region, recurved, base long decurrent	2–3 teeth near the apical region or entire, recurved, base long decurrent
Ventral margin of leaf	Hardly decurrent, slightly arched	Hardly decurrent, strongly arched	Hardly decurrent, slightly arched	Moderately decurrent, strongly arched	Moderately decurrent, strongly arched
Marginal teeth	6–10 per leaf, 1–3 (-4) cells long, 2–3 cells wide at base.	10–15 per leaf, 1–2 cells long, 1–2 cells wide at base.	20–22 per leaf, (1-) 2–4 cells long, (1-) 2–3 (-4) cells wide at base.	36–46 per leaf, 3–10 cells long, 1–4 cells wide at base.	(7-) 15–27 (-30) per leaf, (1-) 2–6 (-11) cells long, (1-) 2–4 (-5) cells wide at base.
Terminal cell of teeth	40 × 12 µm, l/b ratio approx. 4:1	28 × 16 µm, l/b ratio 2–4:1	88 × 20 µm, l/b ratio 4–5:1	41–64 × 8–12 µm, l/b ratio (3-) 5–8:1	48–84 × 4.5–12 µm, l/b ratio 4–12 (-18):1
Vitta cells	Vitta area well differentiated, cells 36–40 (-44) × 16–20 µm	Vitta area well differentiated, cells 60–80 (-100) × 20–24 (-30) µm	Vitta area well differentiated, cells 60–80 × 20 µm	Vitta area indistinct, cells 51–85 × 24–28 µm	Vitta area well differentiated, cells 75–114 × 15–21 µm
Perianth	Perianth campanulate	Perianth cylindrical	Perianth not known	Perianth not known	Perianth not known

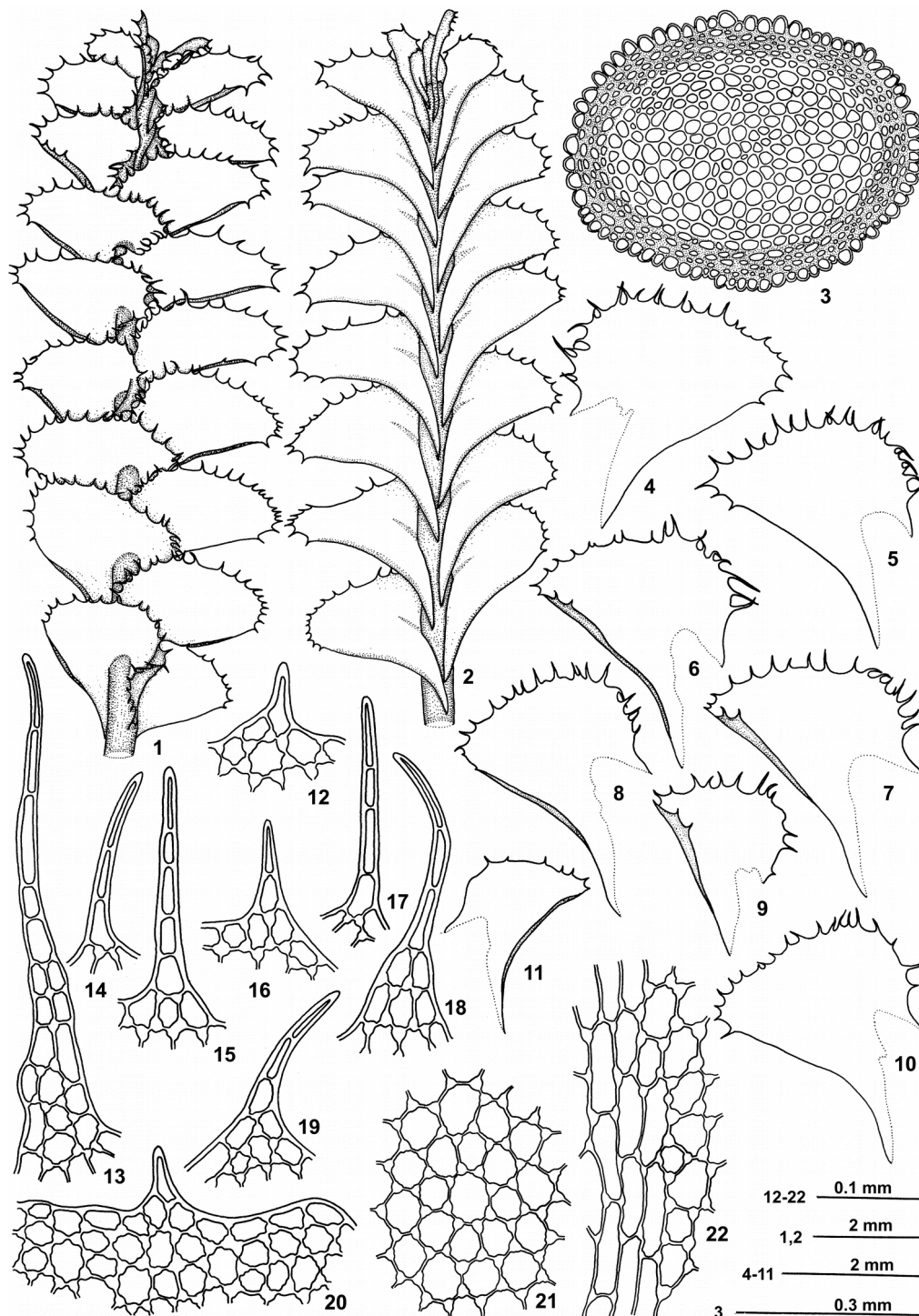


Fig. 1. *Plagiochila parvittata* Inoue var. *siangensis* Singh Deo & D.K.Singh (1) A portion of plant in ventral view. (2) A portion of plant in dorsal view. (3) Transverse section of the stem. (4–11) Leaves. (12–19) Teeth along margin of leaf. (20) Marginal leaf cells. (21) Median leaf cells. (22) Basal leaf cells (showing vitta). (All figures drawn by S. Singh Deo from S. Singh Deo 50829A).

µm, thin-walled, hyaline; inner cortical cells 5–10 × 8–24 µm, thick-walled, dark brown; medullary cells 18–43 × 14–42 µm, thin-walled – moderately thick-walled, light brown – yellowish. Paraphyllia absent. Rhizoids few, restricted to basal portion of shoots. Leaves imbricate, succubous, obliquely inserted, broadly ovate – triangular-ovate, 2.5–3.5 mm long, (1.1-) 1.5–2.6 mm wide at middle, length/width ratio (1.2-) 1.4–1.8 (-2.2):1, dorsal margin more or less straight, recurved, entire or

with 2–3 teeth near the apical region, base long decurrent, apex narrowly rounded, ventral margin strongly arched, dilated in basal region strongly dentate throughout, base moderately decurrent; marginal teeth spinose, (7-) 15–27 (-30) per leaf, (1-) 2–6 (-11) cells long, (1-) 2–4 (-5) cells wide at base, 2–5 cells uniseriate towards apex; terminal cell long, triangular, acuminate, 48–84 × 4.5–12 µm, length/breadth ratio 4–12 (-18):1; subterminal cells long, rectangulate, 36–60 × 6–18 µm; marginal cells

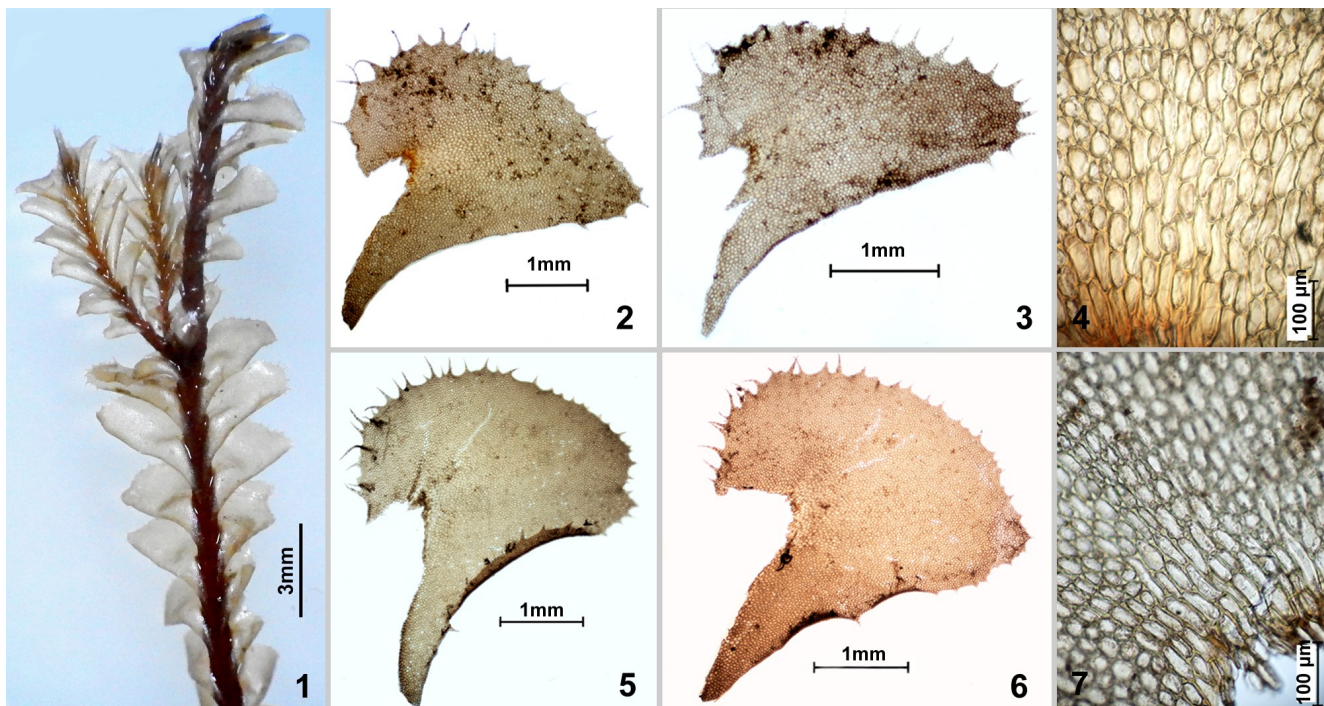


Fig. 2. *Plagiochila parvivittata* Inoue var. *siangensis* Singh Deo & D.K.Singh (1) A portion of plant in dorsal view. (2,3) Leaves. (4) Basal leaf cells (showing vitta). *Plagiochila parvivittata* Inoue var. *parvivittata* (5,6) Leaves. (7) Basal leaf cells (showing vitta) [Photomicrographs 1–4 from S. Singh Deo 50829A (CAL); 5–7 from D.G. Long 8443 (JE)].

near leaf apex quadrate –subquadrate, $12\text{--}24 \times 15\text{--}30 \mu\text{m}$, median leaf cells oval – suborbicular, $27\text{--}51 \times 27\text{--}45 \mu\text{m}$; vitta cells long, rectangular, $75\text{--}114 \times 15\text{--}21 \mu\text{m}$, cells thin-walled, trigones nodulose, bulging, intermediate thickenings absent, or occasionally present in basal region; surface smooth. Underleaves absent. Androecia and gynoecia not seen.

Habitat: Lignicolous, on fallen logs in moist and shady conditions in temperate – subalpine forests mostly dominated by *Rhododendron* in association with *Blepharostoma trichophyllum* (L.) Dumort. and *Hamatostrepta concinna* Váňa & D.G.Long.

Distribution: India [Eastern Himalaya (Arunachal Pradesh)], probably endemic.

Other specimens examined: Bhutan, Mongar District, Slope above Sengor, NW of Mongar, on mossy bank in moist *Abies densa/Rhododendron* forest, alt. 3500 m, D.G. Long 8443 (Isotype, JE).

Plagiochila parvivittata var. *siangensis* is characterized by 16–28 cells thick stem with mammillose surface, 3–4 layers of inner cortical cells (Fig. 1: 3); broadly ovate – triangular-ovate leaves with length/breadth ratio of (1.2–) 1.4–1.8 (–2.2):1 and 7–30 marginal teeth (Figs. 1: 4–11; Figs. 2: 2,3); dorsal margin of leaves entire or with only 2–3 teeth near apex (Figs. 1: 4–11; Figs. 2: 2,3); teeth (1–) 2–6 (–11) cells long, (1–) 2–4 (–5) cells wide at base, 2–5 cells uniseriate towards apex (Figs. 1: 12–

20); terminal cells long, narrow, triangular, acuminate, $48\text{--}84 \times 4.5\text{--}12 \mu\text{m}$, length/width ratio 4–12 (–18):1 (Figs. 1: 12–20); leaf cells thin-walled with nodulose, bulging trigones (Figs. 1: 20–22; Fig. 2: 4) and a very distinct vitta area (Figs. 1: 22; Fig. 2: 4).

Subsection *Caulimammilloseae* is comparatively new to the section *Zonatae* and is so far confined to Sino-Himalayan region (Bhutan, China, India and Nepal) only. Of the four species hitherto known under this subsection, *P. aspericaulis* is reported from China and Nepal, *P. caulimammillosa* is endemic to China, *P. hyalodermica* is known from China, Nepal and India, *P. parvivittata* from Bhutan and Nepal (Inoue, 1987; Grolle & So, 1997, 1998, 1999; So, 2001; Pradhan & Joshi, 2009; Singh & Singh, 2011), whereas *P. parvivittata* var. *siangensis* is probably endemic to India.

P. parvivittata var. *siangensis* can be distinguished from the typical variety in leaves with nearly half the length/breadth ratio, 0.9–1.1:1 and profusely dentate margin with 36–46 marginal teeth, dorsal margin with 8–13 teeth present throughout or till mid region, terminal cell of marginal teeth (3–) 5–8 times longer than wide and indistinct vitta area with smaller vitta cells, $51\text{--}85 \times 24\text{--}28 \mu\text{m}$ in the latter (Table 1). The present taxon can be easily distinguished from other representatives of subsection *Caulimammilloseae* on the basis of their comparative morphological accounts given in Table 1.

Authors' contributions

SSD worked out the specimens, carried out microscopic studies, prepared camera Lucida and photo-micrographic illustrations and draft description, and DKS coordinated the work, interpreted the results and confirmed the identity of the taxon after careful observation and evaluation of the morphological features of the new taxon as well as its allied species, drafted the discussion part, designed the submission and finalized the manuscript. Both the authors agreed to the final content of the manuscript.

Acknowledgements

The authors thank the Director, Botanical Survey of India for facilities and financial assistance to one of us (SSD) under 'Flora of India' project, Dr. H.-J. Zündorff, Curator, Herbarium Haussknecht, Jena (JE) for facilitating the study of Isotype of *Plagiochila parvivittata*, and the Chief Wildlife Warden, Arunachal Pradesh State Forest Department, for facilitating the exploration work.

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