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GENUS TUYAMAELLA S.HATT. (LEJEUNEACEAE) IN INDIA

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Tuyamaella S.Hatt, a small genus represented by six species and two varieties, is distributed in Asiatic and oceanic region (Zhu & So, 2000a, 2001). Of these, one species and two varieties are endemic to their respective countries, viz. *T. borneensis* Tixier (Indonesia), *T. molischii* (Schiffn.) S.Hatt. var. *brevistipa* P.C.Wu & P.J.Lin (China), *T. molischii* (Schiffn.) S.Hatt. var. *taiwanensis* R.L.Zhu & M.L.So (Taiwan), *T. hattorii* Tixier is restricted to Vietnam and Laos, *T. jackii* (Steph.) Tixier is restricted to Vietnam and Kampuchea. The remaining three species show an extended range of distribution, viz. *T. angulistipa* (Steph.) R.M.Schust. & Kachroo (China, Indonesia, Malaysia, Vietnam, Kampuchea, Papua New Guinea), *T. molischii* (Schiffn.) S.Hatt. var. *molischii* (China, Japan, Malaysia, Vietnam) and *T. serratistipa* S.Hatt. (Indonesia, Papua New Guinea, Philippines, Malaysia, New Caledonia) (Tixier, 1973; Zhu & So, 1998, 2000a, b, 2001). The earlier record of *T. angulistipa* (≡ *Pycnolejeunea angulistipa* Steph.) from India by Chopra (1943) based on Stephani's (1914) report from India Orientalis (Perak) appears to be erroneous. Perhaps for this reason the genus does not find any mention in the recent review on Indian Lejeuneaceae in India (Asthana, 2007).

During the course of studies on the epiphyllous liverworts of Eastern Himalaya, the authors came across an interesting collection belonging to family Lejeuneaceae from West Siang district of Arunachal Pradesh which differed from all the known taxa of the family from India. Subsequent morpho-taxonomic studies on the plants followed by review of relevant literature (Tixier, 1973; Zhu & So, 1998, 2000a, b, 2001) revealed them to be *Tuyamaella serratistipa* S. Hatt., a species so far known from Indonesia, Papua New Guinea, Philippines, Malaysia and New Caledonia (Zhu & So, 1998, 2000b).

DESCRIPTION

Tuyamaella serratistipa S.Hatt. in Bot. Mag. Tokyo 64: 118. 1951; R.L.Zhu & M.L.So in J. Bryol. 20: 456. 1998.

Plants yellowish brown in herbarium, closely appressed to the substratum; shoot 9 – 17 mm long, 1.8 – 2.4 mm wide. Stem triangular – rectangular in outline in transverse section, 100 – 117.5 x 82.5 – 87.5 μm, 4 cells across the diameter; cortical cells 7 in number, polygonal, 22.5 – 32.5 x 10 – 220 μm, thick-walled; medullary cells 3 in number, polygonal, 17.5 – 30 x 10 – 22.5 μm, thick-walled; ventral merophytes of stem 2 cells wide. Leaves imbricate, widely spreading; leaf lobe oblong-ovate, 1.1 – 1.3 mm long, 0.7 – 0.9 mm wide, apex rounded, margin irregular, apical and dorsal margin bordered by 1 – 3 rows of hyaline cells, ventral margin lacking such hyaline cells, dorsal margin strongly arched, ventral margin slightly arched; hyaline marginal leaf cells rectangular, 12.5 – 45 x 7.5 – 17.5 μm, walls thin, trigones and intermediate thickenings absent; median leaf cells hexagonal, 15 – 30 x 12.5 – 22.5 μm, walls thin with minute trigones, intermediate thickenings absent; basal leaf cells elongated, polygonal, 25. – 67.5 x 12.5 – 30 μm, walls slightly thick with large trigones, intermediate thickenings frequent; cuticle smooth; oil bodies not seen; leaf lobule inflated, 1/3 – 2/5 as long as the lobe, ovate, 0.44 – 0.52 mm long, 0.23 – 0.30 mm wide, bidentate; first tooth 3 – 4 cells long, 1 cell wide; second tooth 3 – 4 cells long, 2 – 3 cells wide at base, uniseriate above; hyaline papilla oblong, present at the inner surface of the base of first tooth; keel arched, smooth. Underleaves distant, obcordate, 2 – 3 times as wide as the stem, 0.28 – 0.35 mm long, 0.27 – 0.33 mm wide, bilobed to 1/4 underleaf length, margin entire, apex of lobes rounded – slightly truncate, sinus narrow. Rhizoids numerous, fasciculate at the base of underleaves. Gemmae not seen.

Monoecious. Androecia terminal on short lateral branches, rarely intercalary; male bracts in 3 – 5 pairs, densely imbricate; bract lobe oblong-ovate, 0.27 – 0.35 mm long, 0.17 – 0.23 mm wide, apex rounded – obtuse,

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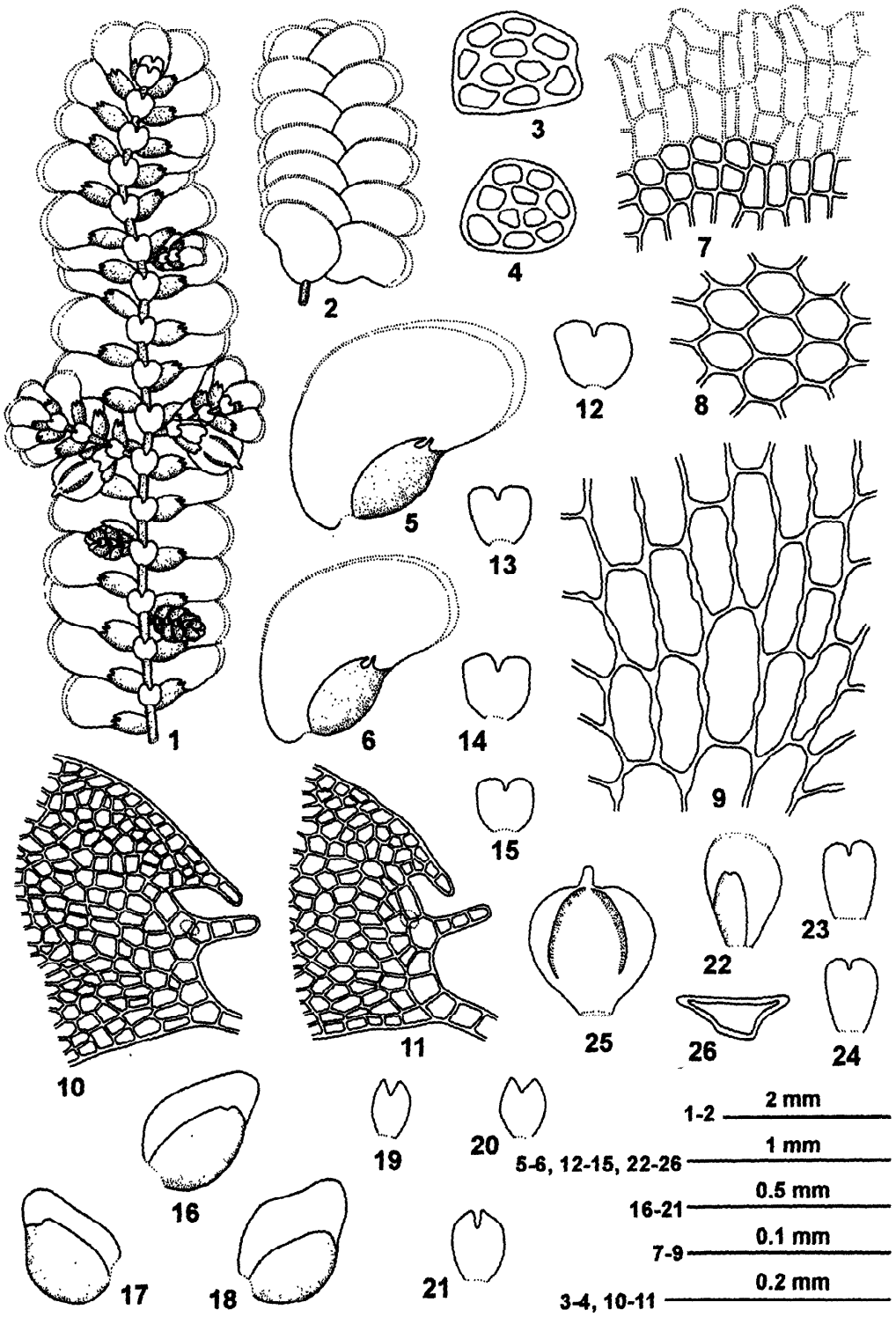

Figs. 1 – 26. *Tuyamaella serratistipa* S.Hatt. **1.** A portion of plant in ventral view (rhizoids not drawn); **2.** The same in dorsal view; **3, 4.** Transverse sections of stem; **5, 6.** Leaves; **7.** Apical leaf cells; **8.** Median leaf cells; **9.** Basal leaf cells; **10, 11.** Apices of leaf lobules; **12 – 15.** Underleaves; **16 – 18.** Male bracts; **19 – 21.** Male bracteoles; **22.** Female bract; **23, 24.** Female bracteoles; **25.** A perianth in ventral view; **26.** Transverse section of perianth.

margin entire; bract lobule strongly inflated, 2/3 – 3/4 as long as the bract lobe; male bracteoles 3 – 5, present throughout the androecium, 0.11 – 0.16 mm long, 0.07 – 0.13 mm wide. Gynoecia terminal on short lateral branches with a single sub-floral innovation; female bract lobe obovate, 0.6 – 0.9 mm long, 0.37 – 0.72 mm wide, apex rounded, margin entire, apical margin bordered by 1 – 3 rows of hyaline cells; bract lobule 1/3 – 2/3 as long as the bract lobe, apex bi-dentate, margin entire; female bracteole oblong-ovate, 0.43 – 0.47 mm long, 0.28 – 0.31 mm wide, bilobed to 1/6 – 1/5 of their length, margin entire, apex of lobes rounded, sinus narrow; perianth obovate, 0.70 – 0.77 mm long, 0.55 – 0.59 mm wide; keels 4 (2 lateral, 2 ventral), smooth; beak 4 – 5 cells long. Mature sporophyte not seen.

Habitat and ecology: Epiphyllous, forming compact patches on the leaves of *Phrynium* sp. in moist and shady places.

Specimen examined: India: Eastern Himalaya, Arunachal Pradesh, West Siang, on way to Bulli from Kaying, c. 1200 m, 04.12.1984, *D.K. Singh* 362/1984 (ASSAM, CAL).

Distribution: India (Arunachal Pradesh – present study), Indonesia, Papua New Guinea, Philippines, Malaysia, New Caledonia.

DISCUSSION

Tuyamaella serratistipa is characterized by oblong-ovate leaf lobes with rounded apices bordered by 1 – 3 rows of hyaline cells (Figs. 5 – 7); bidentate leaf lobules with first tooth 3 – 4 cells long, second tooth 3 – 4 cells long, 2 – 3 cells wide at base, uniseriate above (Figs. 10, 11); obcordate underleaves bilobed to 1/4 of its length with rounded – slightly truncate lobe apices (Figs. 12 – 15); obovate perianth with 4 smooth keels (Figs. 25, 26).

Indian plants of *T. serratistipa*, however, are slightly atypical as they lack *Allorgella*-type denticulations along the lateral margins of underleaves and the gemmae, and have 4–5 cells long perianth beak as compared to smaller, 2 – 3 cells long beak observed by Zhu and So (1998).

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