

**PTILIDIUM PULCHERRIMUM (G.WEBER) VAINIO (HEPATICAE:
PTILIDIACEAE) – AN ADDITION TO INDIAN BRYOFLORA**

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The genus *Ptilidium* Nees was recorded for the first time from India by Mitten (1861), who described two species, viz. *Ptilidium ciliare* (L.) Hampe, and *P. trichophyllum* Mitt. [now treated under a separate genus as *Blepharostoma trichophyllum* (L.) Dumort.] based on the specimens collected by Sir J.D. Hooker from Sikkim. In the present state of our knowledge the genus is represented world over by three species, viz. *P. ciliare* (L.) Hampe, *P. pulcherrimum* (G.Weber) Vainio and *P. californicum* (Austin) Pearson (Stotler & Crandall-Stotler, 2005), of which only *P. ciliare* was known from India (Mitten, 1861; Chopra, 1943; Parihar & al., 1994; Singh & al., 2008). In a recent exploration in North Sikkim, some interesting corticolous specimens of the genus were collected with undifferentiated stem cells, 3 - 4 (- 5)-lobed leaves with the dorsal lobe 6 - 10 cells wide at base and the dorsal sinus descending up to $\frac{2}{3}$ - $\frac{4}{5}$ of leaf length, hence distinct from *P. ciliare*. A subsequent literature review (Macvicar, 1926; Schuster, 1966; Paton, 1999) revealed it to be *Ptilidium pulcherrimum* (G.Weber) Vainio, earlier known from China, Japan, Europe and North America. The same has been described and illustrated here to facilitate its easy identification in Indian flora.

DESCRIPTION

***Ptilidium pulcherrimum* (G.Weber) Vainio, Meddeland. Soc. Faun. Fl. Fenn. 3: 88. 1878. *Jungermannia pulcherrima* G.Weber, Spic. fl. Goett. 150. 1778.** (Figs. 1 - 3)

Plants yellowish-brown to purplish-brown when fresh, reddish-brown in herbarium; shoot 12.0 - 24.0 mm long, 1.1 - 1.7 mm wide; branching regular, 1 - 2 (- 3)-pinnately branched, branches from the ventral half of the acroscopic end of the segment, thus replacing the ventral half of leaf; flagelliform branches absent. Stem elliptical in outline in transverse section, 0.16 - 0.20 × 0.26 - 0.34 mm, 10 - 14 cells wide laterally, 8 - 11 cells across dorso-ventrally; cells not well differentiated; cortical cells in one layer, slightly pigmented, subquadrate - rectangulate, 15.0 - 25.0 × 12.5 - 20.0 µm, light brown, thin-walled; medullary cells quadrate-subquadrate or irregularly polygonal, 17.5 - 37.5 × 10.0 - 25.0 µm, hyaline, thin-walled, trigones very minute or indistinct. Rhizoids few, restricted to under leaf base in older portion of the plant, hyaline. Leaves slightly-closely imbricate, obliquely spreading, strongly concave, erect and embracing the stem, rotund-quadrate, 0.45 - 0.75 mm long, 0.62 - 0.87 mm wide (without cilia), 0.87 - 1.2 mm long, 0.87 - 1.5 mm wide (with cilia), 3 - 4 (- 5)-lobed, sinus $\frac{2}{3}$ - $\frac{4}{5}$ of leaf length, lobes parallel - subparallel, first dorsal lobe with 8 - 12 cilia, 0.14 - 0.36 mm wide and 6 - 10 cells wide at base, cilia of dorsal lobe longer than basal width of the dorsal lobe; leaf lamina 9 - 16 cells long, 14 - 22 cells wide at middle; cilia numerous, much crowded, erect - suberect or incurved, 4 - 9 cells long, usually uniseriate, sometimes biseriate at base; cells of cilia rectangulate, 30.0 - 45.0 × 12.5 - 22.5 µm, uniformly thin-walled, except the transverse septa, where slightly bulging; apical leaf lobe cells subquadrate - polygonal, 20.0 - 32.5 × 15.0 - 27.5 µm, thin-walled; median leaf cells polygonal, 22.5 - 40.0 × 17.5 - 30.0 µm, thin-walled; basal leaf cells elongated, polygonal, 30.0 - 62.5 × 17.5 - 37.5 µm, thin-walled, trigones bulging, intermediate thickenings absent; cuticle smooth; oil-bodies grayish, 14 - 24 per leaf cell, ovoid - ellipsoidal, 3.0 - 5.0 × 2.0 - 3.0 µm or spherical, 2.0 - 3.0 µm in diameter, finely segmented. Leaves near branch-emergence rotund-quadrate, 0.50 - 0.62 mm long, 0.50 - 0.75 mm wide (without cilia), 0.75 - 1.0 mm long, 0.87 - 1.2 mm wide (with cilia); lamina 8 - 15 cells long, 10 - 18 cells wide at middle; 2 - 3 (- 4)-lobed, sinus $\frac{2}{3}$ - $\frac{4}{5}$ of leaf length, margin and leaf lobes similar to main stem leaves. Under leaves distant, appressed to the stem, free, attached broadly encircling the stem, rotund or reniform, 0.50 - 0.75 mm long, 0.40 - 0.50 mm wide (without cilia), 0.50 - 0.87 mm long,

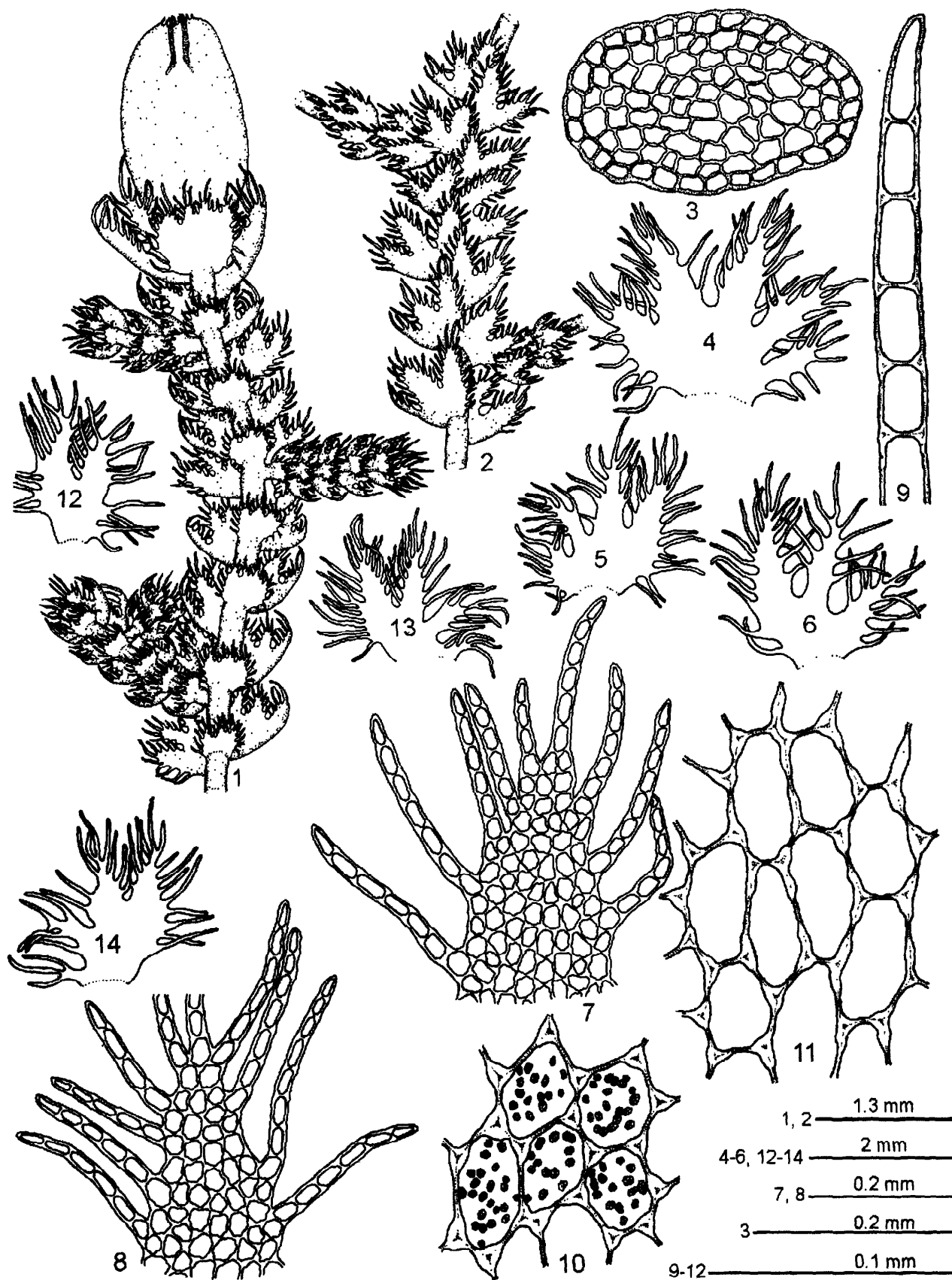


Fig. 1. *Ptilidium pulcherrimum* (G. Weber) Vainio: 1. A portion of plant bearing gynoeceal branch in ventral view (rhizoids not drawn); 2. A portion of vegetative plant in dorsal view; 3. Transverse section of stem; 4 - 6. Leaves; 7, 8. Dorsal leaf lobes; 9. Apical cells of cilia; 10. Median leaf cells showing oil-bodies; 11. Basal leaf cells; 12 - 14. Branch emergent leaves.

0.62 1.0 mm wide (with cilia), margin ciliate, 3-4-lobed to more or less $\frac{1}{2}$ of its length, ciliate; cilia irregularly crowded, erect - sub erect or incurved.

Dioecious (?). Male plants not seen. Gynoecia terminal on main shoot; bract subquadrate rotund, 1.2 - 1.5 mm long, 1.0 - 1.2 mm wide (without cilia), 1.5 - 1.8 mm long, 1.2 - 1.6 mm wide (with cilia); lamina 16 - 22 cells long, 15 - 27 cells wide at middle; 3 - 4-lobed, sinus $\frac{2}{3}$ - $\frac{3}{4}$ of bract length, margin and lobes similar to main stem leaves except copiously and long ciliate; bracteoles rotund or reniform, 1.1 - 1.5 mm long, 1.3 - 1.6 mm wide (without cilia), 1.2 - 1.6 mm long, 1.5 - 1.8 mm wide (with cilia), 3 - 4-lobed, sinus about $\frac{1}{2}$ of bracteole length, margin and lobes similar to main stem under leaves except copiously and long ciliate; perianth cylindrical - stoutly clavate, 2.8 - 3.2 mm long, 0.8 - 1.2 mm wide, 3-plicate; plicae prominent near mouth, obtuse rounded or ill-defined towards lower portion; mouth ciliate; seta fleshy; capsule reddish-brown, dehiscing into 4-valves; walls 4 - 5-stratose; cells of outer layer of capsule wall subquadrate-rectangulate, $32.5 - 45.5 \times 15.0 - 25.0 \mu\text{m}$, with nodular-thickenings on the alternate radial walls or sometimes with scattered incomplete thickenings; those of inner layer rectangulate, $50.0 - 75.0 \times 12.5 - 20.0 \mu\text{m}$, with usually complete or incomplete annular-semi-annular thickening bands. Spores reddish-brown, globose, $32.5 - 45.0 \mu\text{m}$ in diameter, finely tuberculate. Elaters reddish-brownish, $75.0 - 150.0 \mu\text{m}$ long, $7.5 - 10.0 \mu\text{m}$ wide, bispiral, with blunt apices.

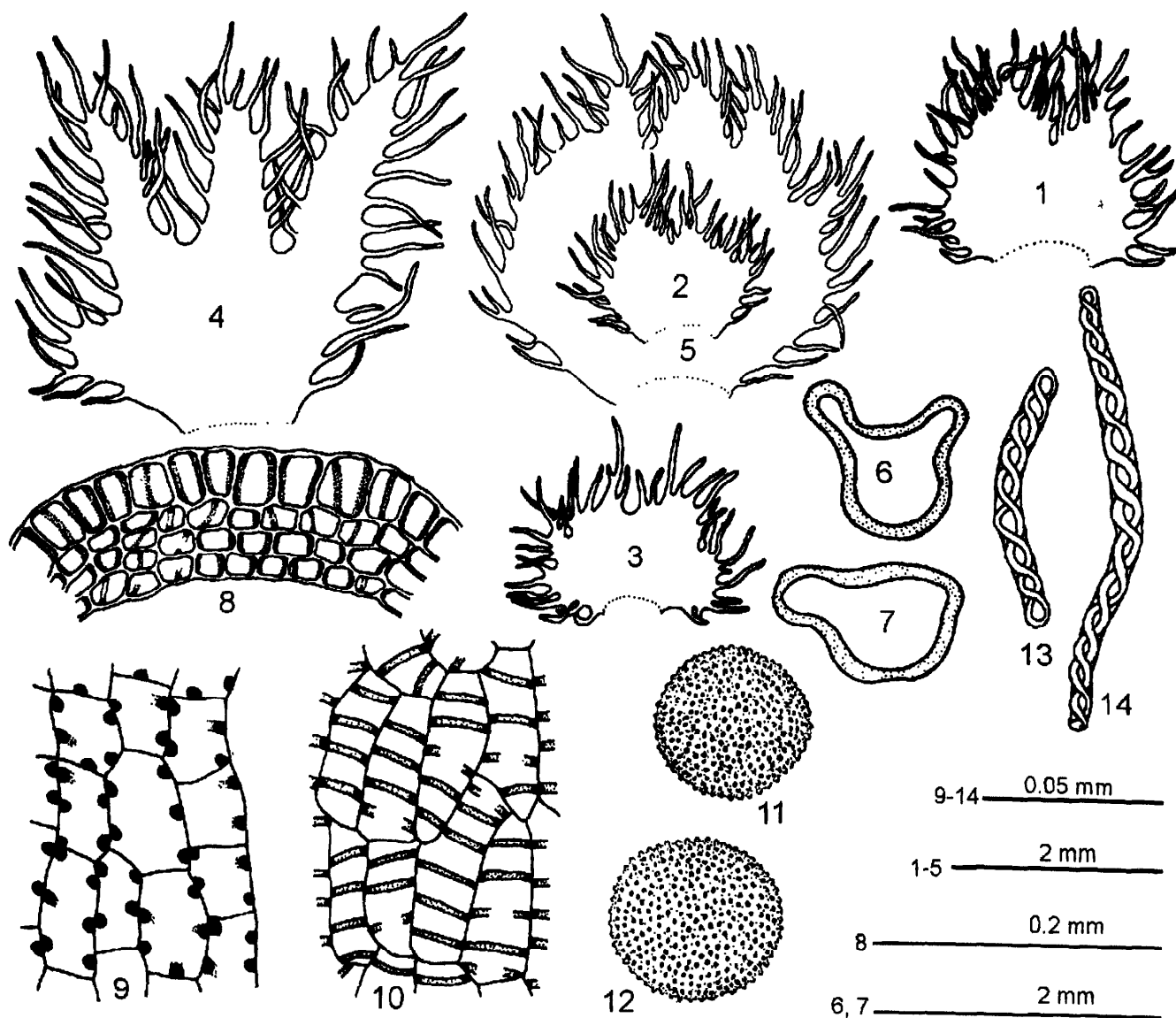


Fig. 2. *Ptilidium pulcherrimum* (G. Weber) Vainio: 1-3. Under leaves; 4. A female bract; 5. A female bracteole; 6, 7. Transverse section of perianth; 8. Transverse section of capsule wall; 9. Outer layer of capsule wall; 10. Inner layer of capsule wall; 11, 12. Spores; 13, 14. Elaters.

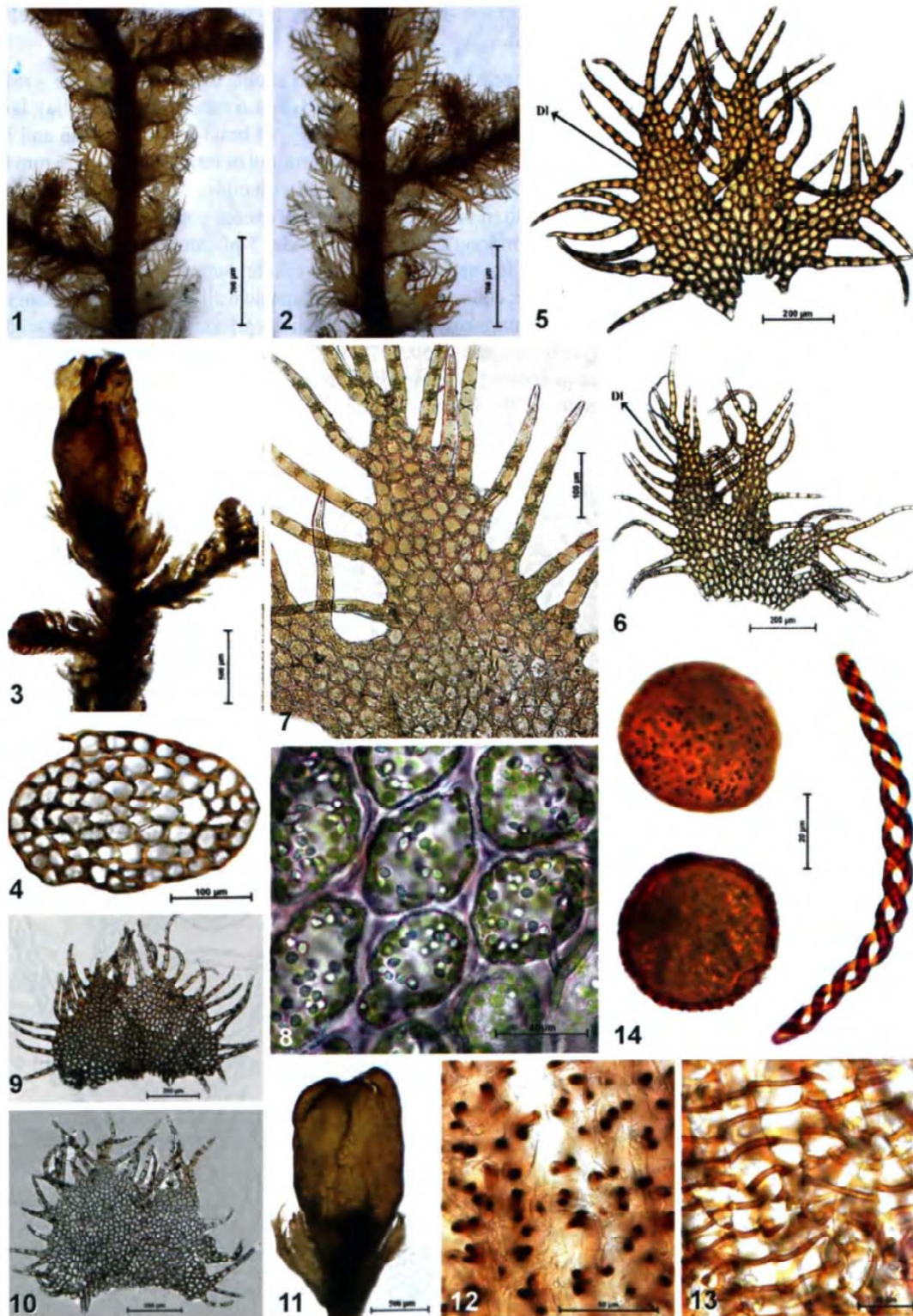


Fig. 3. *Ptilidium pulcherrimum* (G.Weber) Vainio: 1. A portion of plant in ventral view; 2. The same in dorsal view; 3. A portion of plant bearing gynoecial branch in ventral view; 4. Transverse section of stem; 5, 6. Leaves (dl: dorsal lobe); 7. Dorsal leaf lobes; 8. Median leaf cells showing oil-bodies; 9, 10. Underleaves; 11. A gynoecial branch; 12. Outer layer of capsule wall; 13. Inner layer of capsule wall; 14. Spores and elater.

Habitat: Corticolous, growing prostrately or ascending in thin straggling or dense mats on the bark of *Rhododendron setosum* D. Don in association with mosses in alpine forest.

Distribution: India [Eastern Himalaya (Sikkim-present study)], China, Japan, Europe, North America (Schuster, 1966; Piippo, 1990; Paton, 1999; Yamada & Iwatsuki, 2006).

Specimen examined: India: Eastern Himalaya, Sikkim, North district, 4 km from Shiva mandir towards Zero point, c. 4270 m, 20.05.2011, *D. Singh* 49097 (CAL).

Key to the species

- 1a. Cortical cells of stem smaller and walls thicker than medullary cells;
dorsal lobe of leaves 14 - 25 cells wide at base, dorsal sinus
descending up to 1/2 of leaf length; cilia equal to or sometimes
slightly smaller than the basal width of dorsal lobe ... *P. ciliare*
- 1b. Cortical and medullary cells of stem usually similar in size and
wall thickness; dorsal lobe of leaves 6 - 10 (- 12) cells wide at base,
dorsal sinus descending 2/3 - 4/5 of leaf length; cilia longer than
basal width of dorsal lobe ... 2
- 2a. Leaf margin densely ciliate; largest lobe (dorsal) of leaves with 6 - 12 cilia ... *P. pulcherrimum*
- 2b. Leaf margin entire to sparsely ciliate; largest lobe (dorsal) of
leaves with 0 - 2 (- 4) cilia ... *P. californicum*

DISCUSSION

P. pulcherrimum is characterized by dioecious (?) plants with 10 - 14 cells wide laterally, 8 - 11 cells across dorso-ventrally, undifferentiated stem cells (fig. 1: 3; 3: 4); imbricate, rotund-quadrate, 3 - 4 (- 5)-lobed leaves (fig. 1: 4 - 6; 3: 5, 6) with the dorsal lobe 6 - 10 cells wide at base and dorsal sinus descending $\frac{2}{3}$ - $\frac{4}{5}$ of leaf length (fig. 1: 4 - 6, 8, 9; 3: 5 - 7); rotund-quadrate, 2 - 3 (- 4)-lobed branch-emergent leaves (fig. 1: 12 - 14); rotund or reniform, 3 - 4-lobed under leaves with sinus descending up to $\frac{1}{2}$ of its length (fig. 2: 1 - 3; 3: 9, 10); cylindrical - stoutly clavate, perianth with 3 obtuse - rounded plicae (fig. 1: 1; 2: 6, 7; 3: 3, 11); 4 - 5-stratose capsule wall (fig. 2: 8); globose spores, 32.5 - 45.0 μ m in diameter, with finely tuberculate sporoderm pattern (fig. 2: 11, 12; 3: 14). Our plants fully conform with those described by Macvicar (1926), Schuster (1966) and Paton (1999), except that the depth of the sinus of under leaves, which is shallower in case of Indian plants as compared to $\frac{2}{3}$ - $\frac{3}{4}$ in case of American and European plants.

P. pulcherrimum is comparable with *P. ciliare* (L.) Hampe in having dioecious plants, cells of leaves with bulging trigones, number and nature of oil-bodies, shape and size of perianth, capsule wall thickenings and spore ornamentation. However, the former differs from the latter which has well differentiated stem with cortical cells smaller and more thick walled than medullary cells, dorsal lobe of leaves 14 - 25 cells wide at base with the dorsal sinus descending 1/2 of leaf length and the marginal cilia equal or slightly smaller to the basal width of dorsal lobe (Macvicar, 1926; Schuster, 1966; Paton, 1999).

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