

A REVISION OF THE MOSS GENUS, TRICHOSTOMOPSIS

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A broader geographic approach resulted some years ago in the realization that Trichostomopsis of North America and Barbula section Asteriscium of the southern hemisphere were the same. More recently, study has shown that the species concepts should also be broadened. Both Hilpert (1933) and Herzog (1952) recognized the congeneric nature of Asteriscium and Trichostomopsis, however, Asteriscium was the valid name at the sectional level and the prior use of the name for a genus of the Umbelliferae was not noted.

As recognized here, Trichostomopsis is a distinct genus related to Barbula, but it is distinguished by the very lax basal cells of the leaves, the bistratose upper leaf margins, the lack of an adaxial stereid band in the costa, and the scarcely twisted peristome teeth. I include five species that fall into two distinct groups. One group includes the type, T. umbrosa, and two closely related species of limited distribution. The second group of two species includes the variable T. australasiae which occurs throughout the range of the genus.

Trichostomopsis Card.

Barbula section Asteriscium C.Müll., Linnaea 42: 342. 1872.

type Barbula umbrosa C.Müll. = T. umbrosa (C.Müll.) H. Robinson.

Trichostomopsis Card., Rev. Bryol. 36: 73. 1909. type T. crispifolia Card. = T. umbrosa (C.Müll.) H. Robinson.

Asteriscium (C.Müll.) Hilpert, Beih. Bot. Centralbl. 50 (3): 618. 1935. hom. illeg. (preocc. Asteriscium Cham. & Schlecht. Linnaea 1: 254. 1826. Umbelliferae).

Plants small, caespitose with short erect stems. Leaves crowded, usually incurved or crisped when dry, spreading from a rather clasping base when moist, entire, lanceolate to oblong, short-acute to attenuate, channelled; margins slightly reflexed, bistratose in one or more rows in upper part; costa percurrent, with only abaxial stereid band; basal leaf cells usually very lax and hyaline; upper leaf cells rounded or quadrate, papillose or mamilllose, rarely smooth. Dioicous. Seta terminal, elongate; capsules oval to cylindrical, erect; peristome teeth divided nearly to base into two filiform papillose forks which are erect to slightly twisted; operculum conic-rostrate with spirally twisted cells.

Key to the species of Trichostomopsis

1. Cells of upper leaf lamina pluripappilose.
2. Leaf tip narrowly attenuate, cylindrical; upper leaf cells mostly 7-8 $\mu$  wide with very fine papillae T. curvipes
2. Leaf tip narrowly to broadly acute, channelled nearly to apex; upper leaf cells mostly 10-12 $\mu$  wide with large often C-shaped papillae T. australasiae
1. Cells of upper leaf lamina mamilliose or smooth.
3. Leaf base usually quadrate, with only a few rows of narrower marginal cells T. fayae
3. Leaf base usually ovate with many rows of very narrow marginal cells
4. Cells of upper leaf lamina mostly 9-14 $\mu$  wide. American plants T. umbrosa
4. Cells of upper leaf lamina mostly 7-8 $\mu$  wide. South African plants T. trivialis

Material seen indicates that the following five species should be recognized. There are a number of names associated with Barbula section Asteriscium for which I have seen only descriptions. Most if not all of these are likely to be synonyms of the five species recognized here.

Trichostomopsis umbrosa (C.Müll.) H.Robinson, comb. nov.

Barbula (Asteriscium) umbrosa C.Müll., Linnaea 42: 340. 1879.

Trichostomopsis crispifolia Card., Rev. Bryol. 36: 74. 1909.

Asteriscium flavisetum Herz., Feddes, Rep. Spec. Nov. Regn. Veg. 55: 18. 1952.

Barbula flaviseta (Herz.) Wijk & Marg., Taxon 7: 289. 1958.

Stems up to 1 cm high. Leaves strongly contorted when dry, spreading when moist, 1.5-3.5 mm long, narrowly lanceolate from an ovate base, sharply acute with usually a slightly attenuate tip (some California specimens with obtuse leaf tips); cells of upper leaf lamina rounded with somewhat thickened corners, mamilliose, mostly 9-14 $\mu$  wide, cells near margin often shorter than wide, row near costa often longer than wide; inner basal cells very lax, up to 50 x 20 $\mu$ , 5-8 rows of very narrow cells on basal margin; costa percurrent; cells of upper surface of costa papillose, in section smaller than guide cells with single low papillae. Seta ca. 1 cm long, slightly flexuous, reddish when mature.

Distribution: California, Mexico, Uruguay, Argentina.

A phyletic subdivision of the genus Trichostomopsis would place T. umbrosa in a group with T. curvipes and T. trivialis having adaxial cells of the costa smaller than the guide cells

and having many rows of narrow marginal cells on the leaf base. Of this series, T. umbrosa has larger leaf cells and more highly differentiated margins on a broader ovate leaf base. Asteriscium flavisetum as described is only a rather immature specimen of the species.

Specimens examined:

U.S.A. California: Los Angeles Co., Montrose, 1961 W. Verdugo Blvd, 25 VI 1953, MacFadden 21702 (US); Hondo, Rancho Los Amigos, 7 X 1955, MacFadden 22085 (US).

MEXICO. without precise locality, Liebmann s.n. (NY).

Dist. Fed.: near Texcoco, on soil, dry roadside bank, 8 IX 1954, H. Robinson s.n. (US). Hidalgo: Guadalupe, volcanic hills to the east, alt. 2270 m, inside aqueduct, 21 VIII 1929, Ynes Mexia 2756 (NY, US); Xula, 9 X 1908, Pringle 15273 (isotype of Trichostomopsis crispifolia, NY). Jalisco: Rio San Francisco, 14 X 1910, Bro. Nicolas 5622 ex Bro. Arsène (US). Mexico: Tenango, 10 III 1927, Bro. Amable s.n. (NY). Michoacán: vicinity of Morelia, Cerro Azul, 2300 m, III 1910, Bro. Arsène 4934 (US); 4936 (NY, US). Puebla: vicinity of Puebla, Rancho Posadas, 20 VIII 1908, Bro. Arsène 4807 (US); vicinity of Puebla, Rancho Santa Barbara, 2160 m, 5 IX 1907, Bro. Arsène 4593 (NY, US); 4599 (US). San Luis Potosi: Charcas, damp stucco wall, 6 VII 1934, A.A. Lundell 50 (US).

URUGUAY. Montevideo: Jardín Botánica, Pared, IX 1961, Zorrón 2787 (US); Facultad de Agronomía Sayago, X 1961, Zorrón 2795 (US); Prado, sobre ladrillo, VIII 1963, Zorrón 2966 (US).

ARGENTINA. Cordoba: near Cordoba, with Trichostomum umbrosum, 1870, Lorentz s.n. (syntype of Barbula umbrosa, NY); Ascochinga, 1871, Lorentz s.n. (syntype of Barbula umbrosa, NY); Tulumba, VI 1871, Lorentz s.n. (syntype of Barbula umbrosa, NY).

Trichostomopsis curvipes (C.Müll.) H. Robinson, comb. nov.

Barbula (Asteriscium) curvipes C.Müll., Linnaea 42: 344. 1879.

Asteriscium curvipes (C.Müll.) Hilpert, Beih. Bot.

Centralbl. 50 (3): 619. 1933.

Stems up to 5 mm high. Leaves somewhat crisped when dry, spreading when moist, 1.5-2.0 mm long, narrowly lanceolate from an oblong base, narrowly cylindrically attenuate; cells of upper leaf lamina irregularly quadrate or oblong with rather thickened corners, multipapillose with minute papillae, mostly 7-8 $\mu$  wide, juxtacostal cells up to 12 $\mu$  wide, series of cells near margins often shorter than wide; inner basal cells very lax, up to 55 $\mu$  long and 20 $\mu$  wide, 3-4 rows of very narrow marginal cells; costa percurrent; cells of upper surface of costa finely papillose, in section smaller than guide cells. Seta short flexuous or decurved.

Distribution: Argentina.

The species seems distinct in its finely papillose leaf

cells. On the basis of limited material the slender leaf apex seems distinctive also, but somewhat attenuate apices have been seen in the variable T. umbrosa.

Specimens examined:

ARGENTINA. Tucumán: between Siambon and Tafi, 1872, Lorentz s.n. (syntype of Barbula curvipes, NY); Siambon, 1872, Lorentz s.n. (NY); Tucumán and Tafi, 1872, Lorentz s.n. (NY).

Trichostomopsis trivialis (C.Müll.) H.Robinson, comb. nov.

Barbula trivialis C.Müll., Hedwigia 38: 107. 1899.

Stems up to 1 cm high. Leaves scarcely crisped when dry, spreading when moist, 1.5-2.5 mm long, narrowly lanceolate from an oblong base, acute, channelled to the tip; cells of upper leaf lamina irregularly quadrate or rectangular with rather thickened corners, smooth to mamilllose, mostly 7-10 $\mu$  wide, series of cells near the margin often shorter than wide; inner basal cells very lax, up to 50 $\mu$  long and 20 $\mu$  wide, with 3-5 rows of very narrow marginal cells; costa percurrent; cells of upper surface of costa slightly papillose or mamilllose, in section smaller than guide cells. Seta of medium length, slightly flexuous, reddish when mature.

Distribution: South Africa.

The species is closest to the South American T. curvipes from which it differs by its relatively smooth cells and shorter leaf tips. Two specimens, Rehmann 98 and 99, were distributed as Barbula trichostomacea var. chlorophyllosa C.Müll. Only Rehmann 99 was later cited by Müller. Material seen of no. 98 proves to be the same as typical B. trichostomacea C.Müll. which is equal to Trichostomopsis australasiae.

Specimen examined:

SOUTH AFRICA. Orange Free State: Kadziberg, 1875.

A.Rehmann 99 (isotype of Barbula trivialis, NY).

Trichostomopsis australasiae (Hook. & Grev.) H.Robinson, comb. nov.

Tortula australasiae Hook. & Grev., Edinburgh J. Sc. 1: 301. 1824.

Barbula australasiae (Hook. & Grev.) Brid., Bryol. Univ. 1: 828. 1827.

Barbula poeppigiana C.Müll., Linnaea 17: 585. 1843.

Barbula rufiseta Tayl., London J. Bot. 5: 51. 1846.

Tortula poeppigiana (C.Müll.) Mont. in Gay, Hist. Fis.

Polit. Chile Bot. 7: 155. 1850.

Trichostomum fuscescens Hook.f. & Wils., Fl. Nov. Zel. 2: 73. 1854.

Barbula decolorans Hampe, Ann. Sc. Nat. Bot. ser. 5, 3: 1865.

Tortula fuscescens Hook.f. & Wils. ex Hook.f., Handb. New Zealand Fl. 796. 1867. in syn., error pro Trichostomum

fuscescens.

- Tortula decolorans (Hampe) Mitt., J. Linn. Soc. Bot. 12: 149. 1869.
- Trichostomum australasiae (Hook. & Grev.) Jaeg., Ber. S. Gall. Naturw. Ges. 1871-72: 397. 1873.
- Tortula incurvidens Stirt., Proc. Nat. Hist. Soc. Glasgow 2: 187. 1876.
- Trichostomum cockaynii R. Brown ter., Trans. New Zealand Inst. 29: 486. 1897 (in part).
- Trichostomum gracile R. Brown ter., Trans. New Zealand Inst. 29: 486. 1897. hom. illeg.
- Barbula trichostomacea C. Müll., Hedwigia 38: 108. 1899.
- ? Trichostomum makanuiense R. Brown ter., Trans. New Zealand Inst. 35: 332. 1903.
- Didymodon subtrophaceus R. S. Williams, Bull. New York Bot. Gard. 3 (9): 119. 1903.
- Didymodon decolorans (Hampe) R. S. Williams, Bull. New York Bot. Gard. 3 (9): 120. 1903.
- Didymodon diaphanobasis Card., Rev. Bryol. 37: 125. 1910.
- Desmatodon subtrophaceus (R. S. Williams) R. S. Williams, Bull. Torrey Bot. Club 42: 398. 1915.
- Barbula ecuadoriensis Broth., Rev. Bryol. 47: 8. 1920.
- Didymodon diaphanobasis var. angustifolius Thér. in Bartram, Bryologist 32: 8. 1929.
- Trichostomopsis brevifolia Bartram, Bryologist 34: 61. 1932.
- Asteriscium decolorans (Hampe) Hilpert, Beih. Bot. Centralbl. 50 (3): 619. 1933.
- Asteriscium ecuadoriense (Broth.) Hilpert, Beih. Bot. Centralbl. 50 (3): 619. 1933.
- Asteriscium poeppigianum (C. Müll.) Hilpert, Beih. Bot. Centralbl. 50 (3): 619. 1933.
- Asteriscium subtrophaceum (R. S. Williams) Hilpert, Beih. Bot. Centralbl. 50 (3): 619. 1933.
- Asteriscium trichostomaceum (C. Müll.) Hilpert, Beih. Bot. Centralbl. 50 (3): 619. 1933.
- Trichostomopsis diaphanobasis (Card.) Grout, Moss Fl. N. Amer. 1: 228. 1939.

Stems up to 1 cm high. Leaves incurved to contorted when dry, spreading when moist, 1.5-2.5 mm long, oblong to narrowly lanceolate from an oblong base, short to long acute, channelled to the tip; cells of upper leaf lamina subquadrate often with somewhat thickened corners, pluripapillose with papillae sometimes C-shaped, cells mostly 9-12 $\mu$  wide, many series are slightly shorter than wide; inner basal cells very lax, up to 60 $\mu$  long and 20 $\mu$  wide, with 2-3 rows of only slightly narrower marginal cells; costa percurrent; cells of upper surface of costa distinctly pluripapillose, in section as large as or larger than guide cells. Seta 7-10 mm long, straight, reddish

when mature.

Distribution: U.S.A., Mexico, Guatemala, Venezuela, Colombia, Ecuador, Peru, Bolivia, Chile, Australia, Tasmania, New Zealand South Africa.

The wide distribution of T. australasiae has only been partially appreciated before. Dixon (1923) realized that New Zealand and Chilean material were the same as the Australian. Crum has annotated some Venezuelan plants as being identical to the Mexican T. diaphanobasis. In reality, most plants from Australia, New Zealand, Chile, Bolivia, Ecuador, Colombia, Venezuela, Mexico and South Africa seem indistinguishable. In only two areas are there variations worth noting. A number of specimens from the SW United States that have been called T. brevifolia have less differentiated hyaline leaf bases. These specimens somewhat resemble Husnotiella. The coastal region of Peru as represented by three collecting areas, Ancash, Lima, and Libertad seems to consistently show a very narrow leaved variant that never has the short-acute leaf tips so common in other specimens.

Specimens examined:

U.S.A. Arizona: Pima Co., Santa Catalina Mts., alt. 2500 ft., 2 I 1923, Bartram 175 (US); Santa Catalina Mts., alt. ca. 2600 ft., 26 II 1927, Bartram 1691, Musci Acrocarpi Boreali Americani et Europaei 636 (US, distributed as Didymodon crasspedophyllus Card.); Picacho Peak, 1600 ft., on soil on rock, open desert, II 1945, Haring & Haskell 3317 (NY); Pinal Co., Picacho Peak, 1600 ft., on soil among rocks and along wash, shaded or open desert on mountain side, 3 III 1945, Haring & Haskell 3234, 3255 (NY). California: Los Angeles Co., Tuna Canyon, under shrubs on hill top, III 1931, MacFadden 8107 (Isotype of Trichostomopsis brevifolia, NY).

MEXICO. Dist. Fed.: Mixcoac, 2270 m, 18 IX 1913, Bro. Arsène 9442 (US); Desierto de los Leones, on soil, VI 1956, Sanchez & Herrera s.n. (US). Mexico: Valle de Mexico, Contradero, 17 XII 1925, Bro. Arsène s.n. (US). Michoacan: Paracutin, 1 IX 1949, Crum 1448 (US).

VENEZUELA. Merida: Piedra Gorda, 9 II 1928, Pittier 12960 (US); probably between Tabay and Mucuruba, 1928, Pittier 12966 (US).

COLOMBIA. Cundinamarca: Bogotá, Guadalupe, alt. 3100 m, VIII 1863, Lindig s.n. (Isotype of Barbula decolorans, NY); Monoserrate near Bogotá, alt. 9000 ft., 27 VI 1965, King & Guevara C-737 (US).

ECUADOR. Chimborazo: Tixan, alt. 9200 ft., 23 VIII 1918, Rose & Rose 23635 (US); Cotopaxi: around Pilalo, 72°2' W, 0°57' S, on soil, in shadow, moderate humidity, 30 VI 1968, Holm-Nielsen & Jeppesen 1078 (AAU, US).

PERU. Ancash: 5 kms. NE of Huaráz, alt. 3100 m, a la orilla de un cañón chico tributario del Río Santa, 28 VIII 1965, Dana & Nancy Griffin III s.n. (US). Arequipa: 67 kms. above Arequipa,

23 VIII 1914, Mr. & Mrs. J.N.Rose 19533 (US). La Libertad: Prov. Trujillo, Cerro Campana, alt. 720-740 m, terricola & saxicola, 11 X 1968 - 3 XI 1968, Ayala 7095, 7097, 7131 (US); Cerro Chiputur, alt. 550 m, sobre rocas & epifita, sobre arbusto, 16 VIII 1968 - 30 X 1968, Ayala 7065, 7067, 7108 (US). Lima: Prov. Canta, Saucán, camino a Huascoy, falde de terreno, 2 II 1960, Cesar Acleto 76 (US); Huascoy, alt. 2800 m, sobre terreno aranso, expuesto, 28 III 1964, Cesar Acleto 796 (US); Huascoy, alt. 2800 m, sobre muro, flanco expuesto, 20 IV 1969, Cesar Acleto 1467 (US). Puno: Juliaca, 4 IX 1914, Mr. & Mrs. J.N.Rose 19099 (US).

BOLIVIA. La Paz: Canabuca on Lake Titicaca, 4200-4300 m, IV 1918, Buchtien 232 (US); Copacabana on Lake Titicaca, alt. 3840, I 1951, Aliaga Suarez 11 (US).

CHILE. Aconcagua: La Ligua, 21 X 1914, Mr. & Mrs. J.N.Rose 19521 (US). Coquimbo: Las Vacas, near Choapa, 6 X 1914, Mr. & Mrs. J.N.Rose 19230 (US). Concepción: Talcomanco, 1828, Poeppig 4 (type frag. Barbula poeppigiana, NY). Santiago: Cerro Bravo, in terra admuros, IX 1934, M.Bertho, Musci Selecti et Critici Ser. III, 113 (NY, US).

AUSTRALIA. Queensland: Swan River, 1843, J.Drummond s.n. (NY). Victoria: near Melbourne, 27 VII 1884, JR 52 (NY).

TASMANIA: 10 VII, M.Archer s.n. (NY); N side of Cataract, IX 6, M.Archer s.n. (NY); Tasman Peninsula, Eaglehawk, on beach, 29 X 1889, Weymouth s.n. (NY); Hobart Waterworks, on wall of overflow, 14 XII 1891, Weymouth s.n. (NY).

NEW ZEALAND. NE Valley, X 1889 W.Ball s.n. (NY); Colenso 1447 (NY); Insellay, Colenso s.n. (NY); Keri Keri, Kirk 261 (NY); Knight s.n. (NY). North Island: Wairoa "Kiwi", on rich ground, 1931, Hodgson s.n. (NY); Napier, VIII 1874, S.Berggren s.n., Musci Novae Zelandiae (NY).

SOUTH AFRICA. Cape of Good Hope: Rondebosch, VIII 1875, A.Rehmann 97 (Isotype of Barbula trichostomacea, NY); Cape Town, 1875, A.Rehmann 98 (NY).

Trichostomopsis fayae Grout, Moss Fl. N. Amer. 1: 228. 1939.

Stems 3-5 mm high. Leaves subimbricate and incurved when dry, spreading when moist, ca. 1.5 mm long, broadly lanceolate from an oblong base, sharply acute, channelled to the tip; cells of upper leaf lamina rounded-hexagonal with somewhat thickened corners, slightly mamilllose, pluripapillose on part of the abaxial surface, mostly 12-15 $\mu$  wide, many cells shorter than wide; inner basal cells very lax, up to 80 $\mu$  long and 25 $\mu$  wide, with marginal cells only slightly narrower; costa percurrent; cells of upper surface of costa distinctly pluripapillose, in section as large as or larger than the guide cells. Seta up to 1 cm long, straight and erect.

Distribution: California.

The species seems very close to T. australasiae but has

cells generally larger and smoother. Only the type specimen is known. Later collections that were placed under the name have proven to be T. umbrosa.

Specimen examined:

U.S.A. California: Los Angeles Co., near Sherman Way, from wash, under Syringa shrubs, 9 V 1932, MacFadden 8172 (Holotype, DUKE).

Species Excluded

Barbula (Asteriscium) uncinicoma C.Müll., *Linnaea* 42: 345. 1879.

The species has narrower basal cells and a unistratose strongly recurved margin. Also, the peristome is described as contorted. The species seems best retained in Barbula for the present in spite of the lack of an adaxial stereid band in the costa.

Barbula (Asteriscium) fuscula C.Müll., *Linnaea* 42: 343. 1879.

According to Hilpert (1933) the proper disposition is Erythrophyllopsis fuscula (C.Müll.) Hilpert.

Literature Cited

- Dixon, H. N. 1923. Studies in the Bryology of New Zealand with special reference to the herbarium of Robert Brown, of Christchurch, New Zealand. Part III. Bull. New Zealand Inst. 3: 75-152, pl. 7-8.
- Herzog, Th. 1952. Beiträge zur Kenntnis der argentinischen Bryophytenflora. Feddes, Rep. Spec. Nov. Regn. Veg. 55: 1-27.
- Hilpert, F. 1933. Studien zur Systematik der Trichostomaceen. Beih. Bot. Centralbl. 50 (3): 585-706.