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New combinations and new synonyms in Pilotrichaceae (Bryophyta) II

by

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Abstract: While continuing the taxonomic revision of *Hookeriopsis* (Besch.) A.Jaeger sensu lato, nine new synonyms with species of the genera *Brymela* Crosby & B.H.Allen, *Thamniopsis* (Mitt.) M.Fleisch. and *Trachyxiphium* W.R.Buck as well as seven new combinations, *Brymela cavifolia* (Mitt.) Vaz-Imbassahy & Costa, *Lepidopilidium pallidifolium* (Mitt.) Vaz-Imbassahy & Costa, *Thamniopsis papillosula* (Broth. & Potier de la Varde) Vaz-Imbassahy & Costa, *Thamniopsis ptari-tepuiensis* (E.B.Bartram) Vaz-Imbassahy & Costa, *Trachyxiphium cuspidatissimum* (Hampe) Vaz-Imbassahy & Costa, *Trachyxiphium saxicola* (R.S.Williams) Vaz-Imbassahy & Costa and *Trachyxiphium williamsii* (Herzog) Vaz-Imbassahy & Costa, were recognized in the Pilotrichaceae.

Keywords: Pilotrichaceae, *Hookeriopsis*, nomenclatural novelties, taxonomy.

Introduction

The moss genus *Hookeriopsis* (Besch.) A.Jaeger, placed in the Pilotrichaceae, Hookeriales (Goffinet & Buck 2004, Stech & Frey 2008), was described by Bescherelle (1876) as a section of *Hookeria* Sm. and originally included only two species, *Hookeria leiophylla* Besch. and *Hookeria luteorufescens* Besch.

Because Bescherelle's circumscription of the genus was insufficient to clearly define the genus, throughout the years many authors described and transferred species to *Hookeriopsis*, resulting in a broad and diverse genus. In 1987, Buck rearranged ca. 70 names placed in *Hookeriopsis* into three different genera, *Brymela* Crosby & B.H.Allen, *Thamniopsis* (Mitt.) M.Fleisch. and *Trachyxiphium* W.R.Buck, accepting

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only the two original species under *Hookeriopsis*, *H. leiophylla* and *H. luteorufescens*, and defining and differentiating the four genera. However, 62 names were not included in this study, remaining in *Hookeriopsis* with an uncertain status.

After that, several names placed in *Hookeriopsis* were transferred or synonimized with genera of Hypnaceae and Pilotrichaceae by different authors (Churchill 1991, Churchill & Fuentes 2005, Florschütz De-Waard 1990, Oliveira-e-Silva & Yano 1998). Crosby et al. (1999) presented 51 valid names of *Hookeriopsis*, of which 31 were considered poorly known from a taxonomic point of view.

A worldwide taxonomic revision of the genus *Hookeriopsis* sensu lato has been underway since 2005. Part of the results were published by Vaz-Imbassahy & Costa (2008), where twenty-two new synonymies with species of the genera *Thamniopsis* and *Trachyxiphium* as well as two new combinations were proposed. In continuance of the study of *Hookeriopsis*, nine new synonymies with species of the genera *Brymela, Thamniopsis* and *Trachyxiphium* as well as seven new combinations are proposed in the present work.

Results and discussion

Brymela cavifolia (Mitt.) Vaz-Imbassahy & Costa, comb. nov.

Hookeria cavifolia Mitt., J. Linn. Soc., Bot. 12: 361. 1869. *Hookeriopsis cavifolia* (Mitt.) A.Jaeger, Ber. Thätigk. St. Gallischen Naturwiss. Ges. 1875–76: 363. 1877. Type. Ecuador. Andes Quitenses, Mont Tungurahua, Spruce s.n. (holotype, NY!).

Brymela cuspidata (A.Jaeger) W.R.Buck., Brittonia 39: 217. 1987. *Hookeria cuspidata* Mitt., J. Linn. Soc., Bot. 12: 355. 1869, hom. illeg., non Dozy & Molk. (1844) nec Müll.Hal. (1851). *Hookeriopsis cuspidata* A.Jaeger, Ber. Thätigk. St. Gallischen Naturwiss. Ges. 1875–1876: 359. 1877, syn. nov. Type. Ecuador. Andes Quitenses, Canelos, Spruce 682 (isotype, NY!).

Distribution and ecology: Costa Rica and Ecuador; between 1500–4000 m. Occurs also in Panama, El Salvador and Peru.

Additional specimens studied: COSTA RICA. Rio Naranjo: 1893, Tonduz s.n. (NY, isotype of *Hookeriopsis laevinervis* Renauld & Cardot).

Discussion: Mitten (1869) described *Hookeria cavifolia* and *Hookeria cuspidata.* The later name is considered an illegitimate homonym because Dozy & Molkenboer (1844) had already used this to describe another species (currently considered to belong to *Distichophyllum cuspidatum* (Dozy & Molk.) Dozy & Molk). In 1877, Jaeger & Sauerbeck published *Hookeriopsis cuspidata* A.Jaeger based on the type material of Mitten's *Hookeria cuspidata,* giving a new name on adoption of the epithet *cuspidata.* In 1987, Buck transferred *Hookeriopsis cuspidata* to the genus *Brymela.*

Studying the type materials of *Hookeriopsis cavifolia* and *Brymela cuspidata*, both housed at NY, we came to the conclusion that they are synonyms. However, since *Brymela cuspidata* has priority only from 1877 (based on article 58.1 of ICBN-McNeill et al. 2006), we propose here the new combination, *Brymela cavifolia.*

This species is known by few collections, above 1500 m, and is characterized by its oblong to ovate-oblong leaves, aristate apex, costa reaching 3/4 of leaf length to the

base of the acumen and upper margin serrulate. Possibly, the distribution of this species may prove wider after futher studies.

Lepidopilidium pallidifolium (Mitt.) Vaz-Imbassahy & Costa, comb. nov.

Hookeria pallidifolia Mitt., in J.C.Melliss, St. Helena, a physical, historical, and topographical description of the island: 362. 1875. *Hookeriopsis pallidifolia* (Mitt.) Geh. & Herzog, Biblioth. Bot. 73: 59. 1910. Type. St. Helena Island. Hooker 427; ibid. s.coll.; East Indies. Dickson s.n. (lectotype, Hooker 427, NY!, here designated; syntypes s.coll., NY!, Dickson s.n., NY!).

DISTRIBUTION AND ECOLOGY: St. Helena Island and East Indies (Thailand, Cambodia, Vietnam, Philippines, Malaysia and Indonesia); on soil and logs; 750–785 m.

ADDITIONAL SPECIMENS STUDIED: ST. HELENA ISLAND. DIANA'S PEAK NATIONAL PARK: Wigginton 05/031a, 05/034 (NY); Wigginton 05/347 (NY).

DISCUSSION: The inconspicuous double costa, reaching 1/4 leaf length, smooth long-rhomboidal cells, the presence of a hyalodermis and slightly heterogeneous areolation place this species in *Lepidopilidium*. *Lepidopilidium pallidifolium* is distinguished from the other species of the genus by its narrow oblong-lanceolate leaf, acuminate apex, and rhomboidal cells at apex and long-rhomboidal cells above midleaf.

The basionym *Hookeriopsis pallidifolia* was described by Mitten (1875) based on three specimens, two from St. Helena Island and one from East Indies. We have examined all type specimens (NY) and confirm that they belong to the same taxon. The presence of *Lepidopilidium pallidifolium* also could be confirmed for St. Helena Island by two recent collections made by M.Wigginton, but the same was not possible for the East Indies. In addition, the syntype from East Indies are poorly labeled collections and does not provide its specific locality. However, in spite of the distance between the collections studied and the unconfirmed distribution of the species for East Indies by recent collections, we believe in the Asiatic origin of the syntype material and that the distribution of this species may prove to be wider in the future.

Thamniopsis diffusa (Wilson) W.R.Buck, Brittonia 39: 218. 1987.

Hookeria diffusa Wilson in Seem., Bot. Voy. Herald 245. 1854. *Hookeriopsis diffusa* (Wilson) A.Jaeger, Ber. Thätigk. St. Gallischen Naturwiss. Ges. 1875–76: 359. 1877. Type. Panama. Pacific Ocean, 1847, Seeman s.n. (isotype, NY!).

Hookeriopsis standleyi E.B.Bartram, Contrib. U.S. Natl. Herb. 26: 102. 1928, syn. nov. Type. Costa Rica. Cartago, Pejivalle, Standley & Valerio 47155 (holotype, FH!; isotype, NY!).

DISTRIBUTION AND ECOLOGY: Central America, Colombia, Ecuador and Guyana; on logs, tree and bushes trunks and branches and soil; 30–2040 m.

ADDITIONAL SPECIMENS STUDIED: COSTA RICA. PUNTARENAS: Cocos Islands, Svenson 341a (NY). PANAMA. BETWEEN VERAGUAS AND SAN BLAS: Between Llano and Cartí, Valdevino et al. 1006 (NY). COLOMBIA. NARIÑO: Tumaro, Sipman et al. 32938 (NY); CHOCÓ: Nuqui, Churchill et al. 18633 (NY); DEL VALLE: Calima River, Cuatrecasas 21190 (NY). GUIANA. MAZARUNI: north slope of Roraima Mont, Gradstein et al. 5271 (NY). ECUADOR. PASTAZA: Curaray, Holm-Nielsen et al. 22248 (NY); PICHINCHA: Buck 10367 (NY).

DISCUSSION: Comparing the type materials of *Hookeriopsis standleyi* (FH, NY) and *Thamniopsis diffusa* (NY) we came to the conclusion that they are undoubtedly synonymous.

Thamniopsis diffusa is not likely to be confused with any other species of the genus and can be characterized by ovate leaves with the upper margin strongly and irregularly serrate. The apex is acute to short-acuminate and the costa almost reaches the apex, projecting and ending in a cluster of 3–4 cells.

Thamniopsis langsdorffii (Hook.) W.R.Buck, Brittonia 39: 218. 1987.

Hookeria langsdorffii Hook., Musci Exot. 2: 121. 1819. *Hookeriopsis langsdorffii* (Hook.) A.Jaeger, Ber. Thätigk. St. Gallischen Naturwiss. Ges. 1875–76: 360. 1877. Type. Brazil. Rio de Janeiro, Langsdorf s.n. (holotype, BM!).

Hookeriopsis lepidopiloides Herzog, Biblioth. Bot. 87: 133. 1916. *Thamniopsis lepidopiloides* (Herzog) S.P.Churchill, Trop. Bryol. 26: 129. 2005, syn. nov. Type. Bolivia. Cochabamba, Tablas, Herzog 4580 (holotype, JE!).

ADDITIONAL SPECIMENS STUDIED: VENEZUELA. AMAZONAS: Rio Negro, Buck 11328 (NY). BRASIL. MINAS GERAIS: Santa Bárbara, Serra do Espinhaço, Buck 26888 (NY); PARANÁ: Tijucas do Sul, Kummrow 1080 (NY); RIO DE JANEIRO: Rio de Janeiro, Tijuca, Rose 20633 (NY); RIO GRANDE DO SUL: São Francisco de Paula, Wasum et al. 781 (NY); SÃO PAULO: Ubatuba, Vital 8804 (NY). BOLIVIA. LA PAZ: Inquisisvi, Lewis 41125 (NY).

DISTRIBUTION AND ECOLOGY: Tropical America; on tree trunks and branches, soil, rocks and logs, often associated to streams; 0–2200 m.

DISCUSSION: Churchill & Fuentes (2005) proposed the new combination *Thamniopsis lepidopiloides*. However, studying the type collection we came to the conclusion that it belongs to the variable *T. langsdorffii*.

Thamniopsis langsdorfii shows considerable variation in leaf shape (from lanceolate and oblong-lanceolate to oblong and obovate) and apex shape (acute, acuminate, obtuse, rounded, or truncate). This variation can be found on the same plant or between individual collections, as pointed out by Vaz-Imbassahy & Costa (2008). Other distinctive features of the species include marginal cells forming evident swollen teeth in the upper half and margins indistinctly bordered by 4–5 rows of narrower cells.

Thamniopsis papillosula (Broth. & P. de La Varde) Vaz-Imbassahy & Costa, comb. nov.

Hookeriopsis papillosula Broth. & P. de La Varde, Rev. Bryol., nouvelle série 1: 93. 6 f. 1. 1928. Type. Gabon. Poungui, Le Testu 5636 (holotype, PC!; isotype, H-BR!).

DISTRIBUTION AND ECOLOGY: Gabon.

DISCUSSION: Although this species presents serrulate margins and almost no swollen teeth, the combination of the presence of a hyalodermis, heterogeneous areolation and differentiation of lateral and dorsal/ventral leaves undoubtedly place this species in *Thamniopsis*.

When describing *H. papillosula*, Potier de la Varde (1928) cited Le Testú 5637 as the type collection. However, the same collector and collection number is referred to the type material of *Trichosteleum letestui* P. de la Varde, described in the same work. When examining the material housed in PC, we found the type collection of *H. papillosula* under Le Testú 5636 and the type of *Trichostelium letestui* under Le

Testú 5637. Thus, we assume that an orthographical mistake occurred and that the correct collection number of the type of *H. papillosula* is Le Testú 5636.

Thamniopsis papillosula and *T. diversifolia* appear to be very closely related and may eventually prove to be synonymous. Given the distribution of both species (Africa) and the variation observed in *T. diversifolia*, the differences between the two species are not consistent. However, we prefer to retain both species since too few samples have been examined.

Thamniopsis ptari-tepuiensis (E.B.Bartram) Vaz-Imbassahy & Costa, comb. nov.

Hookeriopsis ptari-tepuiensis E.B.Bartram, Fieldiana, Bot. 28: 5. 1951. Type. Venezuela. Bolivar, Ptari-tepuí, Steyermark 59846 (holotype, FH!).

DISTRIBUTION AND ECOLOGY: Venezuela; on wet sandstone, ca. 2130 m.

DISCUSSION: *Thamniopsis ptari-tepuiensis* resembles *T. diffusa*, both having similar habit and size, ovate leaves with strong and parallel costa, reaching 3/4 or more of leaf length. The two species can be separated, however, by the marginal teeth and cells. In *T. ptari-tepuiensis* the marginal teeth are formed by only one cell and the laminal cells are long-rhomboidal, whereas in *T. diffusa* the teeth are formed by 2 or more cells and the laminal cells are short-rhomboidal to rhomboidal.

Thamniopsis sinuata (Mitt.) W.R.Buck, Brittonia 39: 219. 1987.

Hookeria sinuata Mitt., J. Linn. Soc. Bot. 12: 358. 1869. *Hookeriopsis sinuata* (Mitt.) A.Jaeger, Ber. Thätigk. St. Gallischen Naturwiss. Ges. 1875–76: 361. 1877. Type. Ecuador. Andes Quitenses, Pallatanga, Spruce s.n. (holotype, NY!).

Hookeriopsis steyermarkii E.B.Bartram, Fieldiana, Botany 28: 5. 1951, syn. nov. Type. Venezuela. Bolivar, Ptari-tepuí, Steyermark 59942 (holotype, FH!).

DISTRIBUTION AND ECOLOGY: Colombia, Venezuela, Ecuador and Bolivia; on tree and bushes trunks and logs, often associated to streams; 1100–3400 m.

ADDITIONAL SPECIMENS EXAMINED: COLOMBIA. ANTIOQUIA: Frontino, Parque Nacional de Las Orquideas, Callejas et al. 2792 (NY). BOLIVIA. LA PAZ: Yungas, Lewis 83-757 (NY); above Tablas, Herzog 2823 (JE, M, holotype and isotype of *Hookeriopsis pachydictyon*).

DISCUSSION: Although *Hookeriopsis pachydictyon* Herzog is still referred to as an accepted name in world checklist of mosses and its additions (Crosby et al., 1999; Crosby & Magill, 2005, 2006), it is a synonym of *T. sinuata*, as proposed by Churchill et al. (2000).

Thamniopsis sinuata is characterized by leaves ovate-lanceolate, the lateral and ventral/dorsal leaves not differentiated, with costa reaching 2/3 or less of leaf length, not projecting, and margins bordered by 3–4 rows of narrower and elongate marginal cells.

Thamniopsis utacamundiana (Mont.) W.R.Buck, Brittonia 39: 219.1987.

Hookeria utacamundiana Mont., Ann. Sci. Nat. Bot. sér.2, 17: 247.1842. *Hookeriopsis utacamundiana* (Mont.) Broth., Nat. Pflanzenfam. I(3): 942. 1907. *Lepidopilidium utacamundianum* (Mont.) Mitt., J. Proc. Linn. Soc., Bot., Suppl. 2: 116. 1859. Type. India. Montibus Nilghariensibus, Perrottet s.n. (isotype, NY!).

Lepidopilum thwaitesianum Mitt., J. Proc. Linn. Soc. Bot., Supplement 2: 116. 1859, syn. nov. *Hookeriopsis thwaitesiana* (Mitt.) Broth., Nat. Pflanzenfam. I(3): 942. 1907. Type. Sri Lanka. Thwaites s.n. (holotype, NY!).

Hookeriopsis wichurae M.Fleisch., Die Musci der Flora von Buitenzorg 3: 1032. 1908, syn. nov. Type. Indonesia. Java, mountain in Bandung, Wichura s.n.; Gedeh, Tijobodas, Fleischer s.n. (lectotype, Wichura s.n., FH!, designed by Tan, 1988; syntype, Fleischer s.n., FH!; isosyntype, Fleischer s.n., NY!).

DISTRIBUTION AND ECOLOGY: Widespread in Africa (Uganda, Tanzania, Angola and South Africa), Asia (Sri Lanka, India, Nepal, China, Yakushima Island - Japan, Taiwan, Thailand, Philippines, Indonesia), and Oceania (Hawaii, Papua New Guinea, Australia, Fiji Island, French Polynesia); on tree trunks, logs and rocks, often associated with streams; 0–3050 m.

ADDITIONAL SPECIMENS EXAMINED: UGANDA. KALANGALA: Bugala Island, Wood 1037 (NY). SOUTH AFRICA. EASTERN CAPE: Transkei, Van Rooy 2053 (NY); KWAZULU-NATAL: Zululand, Van Rooy 1049 (NY); GAUTENG: Transvaal, Buck 13517 (NY); WESTERN CAPE: Swellendam, Magill 6203 (NY); LIMPOPO: Mariepskop, Vorster 573 (NY). SRI LANKA. CENTRAL PROVINCE: Nuwara Eliya waterfall, Herzog 47/a (JE). PHILIPPINES. LUZON: Benguet, Bacani 15929 (JE, NY). INDONESIA. BORNEO: Tenompok, Holhum 2532 (NY); JAVA: VI-1898, Fleischer s.n. (as *Hookeriopsis wichurae*, BM, JE); MOLUCAS ISLAND (NORTH): Tidore 16694a (BM). PAPUA NEW GUINEA. PORT MORESBY: Carr 14185 (JE, NY). INDIA. ANDHRA PRADESH: Vijawada, Palneys, Foreau 226 (NY); MADRAS: Madura, Palni Montains, Foreau 1350 (NY); SIKKIM: Hooker 707 (NY). CHINA. GUANGDONG: Lin 1291 (NY); GUIZHOU: Crosby 15763 (NY); YUNNAN: Xishuangbanna, Redfearn 33907 (NY). TAIWAN. Chang 1291 (NY). FIJI. NADARIVATU: Victoria Mont, Norris 44699 (NY). THAILAND. PHITSANULOK: Puh Mien Mont, Larsen et al. 1054 (NY). FRENCH POLYNESIA. TAHITI: 1896, Nadeaud s.n. (NY). HAWAII. HAWAII: Kohala, Cranwell et al. 4245 (NY); OAHU: Miller 1976 (NY); MAUI: West Maui, Baldwin 38 (NY).

DISCUSSION: *Thamniopsis utacamundiana* is a polymorphic species, which is variable mainly in the shape of the leaf apex (acute, obtuse or mucronate) and cell shape (rhomboidal to long-rhomboidal or linear). This variation can be found on the same plant (as observed in the isotype - NY) or between the studied collections, where some samples present a mucronate apex with broad rhomboidal cells and others an acute apex with linear cells. Much of this variation accounts for several names given to this species. The length of the apical cells is correlated with the shape of the leaf apex; in shorter apices they are more rhomboidal, in longer apices they are long-rhomboidal to linear. Marginal teeth can be highly variable as well, which also was observed by Tan & Robinson (1990) and Wu et al. (2002). In some samples marginal teeth can be inconspicuously swollen and in others they can be formed by more than one cell. However, all variations observed proved to be continuous through the several collections of Africa, Asia and Oceania.

All collections examined (including types), here treated as *T. utacamundiana*, presented lateral and ventral/dorsal leaves differentiated by symmetry, leaves oblong, lanceolate or oblong-lanceolate, margin serrate above and serrulate to sinuate below, bordered by 1–4 rows of narrower cells, with swollen theeth (sometimes not evident), costa reaching 1/2–2/3 leaf length.

Tan & Robinson (1990) pointed at the similarity between *T. utacamundiana* and *H. wichurae*. As they had studied few specimens they kept them separate because of

differences observed in apex, cell shape and marginal teeth. However, after the study of several collections (including types) from JE, NY, and BM we came to the conclusion that they are synonymous.

Thamniopsis utacamundiana shares with *T. langsdorffii* many characteristics, which seem to be very closely related, differing only in margin and costa length, presenting margin bordered by 1–4 rows of narrower cells with costa reaching 1/2–2/3 of leaf length, while *T. langsdorffii* has margin bordered by 4–5 narrower cells with costa reaching 2/3–3/4 of leaf length. In addition, *T. utacamundiana* presents less contrast in size between the upper marginal cells (all forming swollen teeth) and laminal cells than observed in *T. langsdorffii,* which has also stronger serration. *Thamniopsis utacamundiana* is widespread in Paleotropics, while *T. langsdorffii* is known only for the Neotropics.

Thamniopsis diversifolia is uncomfortably close to some forms of *T. utacamundiana,* especially those found in Africa (with marginal teeth and costa weaker). Both occur in Africa and can be very variable. *Thamniopsis diversifolia* certainly has its affinities with *T. utacamundiana* as broadly considered in this study, however, we prefer to keep them separate until more collections of *T. diversifolia* can be examined.

The type of *Hookeriopsis borneensis* Nog. & Z.Iwats. (NICH) could not be examined. However, the study of the original description and illustration suggests that it is a possible synonym of *T. utacamundiana.*

Trachyxiphium cuspidatissimum (Hampe) Vaz-Imbassahy & Costa, comb. nov.

Hookeria cuspidatissima Hampe, Vid. Meddelelser Dansk Naturhistorisk For. Kjøbenhavn ser. 3 6: 164. 1875. *Hookeriopsis cuspidatissima* (Hampe) Broth., Nat. Pflanzenfam. I(3): 939. 1907. Type. Ecuador. Krause s.n. (holotype, BM!).

Trachyxiphium pernutans (Müll.Hal.) W.R.Buck, Brittonia 39: 220. 1987, syn. nov. *Hookeria pernutans* Müll.Hal., Linneae 42: 496. 1879. *Hookeriopsis pernutans* (Müll.Hal.) Broth., Nat. Pflanzenfam. I(3): 939. 1907. Type. Venezuela. Fendler 127 (isotype, NY!).

DISTRIBUTION AND ECOLOGY: Colombia, Venezuela and Ecuador; on rocks, often associated with streams; 200–2000 m.

ADDITIONAL SPECIMENS EXAMINED: COLOMBIA. AMAZONAS: Schultes & Cabrera 16579 (NY).

DISCUSSION: Churchill et al. (2000) synonymized *Hookeriopsis cuspidatissima* with *Trachyxiphium guadalupense* (Brid.) W.R.Buck. Studying the type material of both species (BM), we came to the conclusion that *H. cuspidatissima* does not belong to *T. guadalupense*, but is a valid species of the genus *Trachyxiphium*, justifying the new combination.

Trachyxiphium cuspidatissimum is similar to *T. guadalupense* but differs by the narrow oblong-lanceolate leaves and weaker serration at apex, with less bifid and swollen teeth. Further characteristics of *T. cuspidatissima* include lateral and ventral/dorsal leaves not differentiated, costa projecting and slightly toothed at apex, reaching 3/4 leaf length, laminal cells long-rhomboidal, similar through all lamina leaf.

Trachyxiphium guadalupense (Spreng. ex Brid.) W.R.Buck, Brittonia 39: 220.1987.

Hypnum guadalupense Spreng. ex Brid., Muscol. Recent. Suppl. 2: 96.1812. *Hookeria guadalupense* (Spreng. ex Brid.) Müll.Hal., Syn. Musc. Frond. 2: 212. 1851. *Hookeriopsis guadalupense* (Spreng. ex Brid.) A.Jaeger, Ber. Thätigk. St. Gallischen Naturwiss. Ges. 1875–76: 362. 1877. Type. Guadalupe. s. coll. (holotype, B!).

Hookeriopsis subscabrella M.Fleisch. ex Broth., Rev. Bryol. 47: 37. 1921, syn. nov. Type. Ecuador. Oriente, Monte Tres Cruces, Oct 1918, Allioni s.n. (holotype, H!).

DISTRIBUTION AND ECOLOGY: Tropical America; on rocks, logs, tree roots, humus and soil, often in very humid sites or associated to streams, 0–3700 m.

ADDITIONAL SPECIMENS EXAMINED: CUBA. ORIENTE: Acuña 291 (NY). COLOMBIA. CAUCA: Between Almaguer and Pasta, Humboldt & Bompland s.n. (NY). ECUADOR. PICHINCHA: Pichincha volcano, Buck 9708 (NY).

DISCUSSION: *Trachyxiphium guadalupense* is very common throughout tropical America and is somewhat variable. It is characterized by lanceolate to ovate-lanceolate leaves, often falcate-secund, long-acuminate apex, margin strongly serrate at apex, with bifid and swollen teeth, laminal cells long-rhomboidal to linear, smooth or prorulose and costa projecting and toothed.

Given the presence of most of the characteristics discussed above in the type material of *H. subscabrella*, we suspected that it could be a synonym of *T. guadalupense*, although it differs by a more homogeneus areolation. However, after examining the various collections previously made under *H. falcata*, an ecotype of *T. guadalupense* including the type material (JE, NY), we could confirm that it belongs to *T. guadalupense*.

Trachyxiphium saxicola (R.S.Williams) Vaz-Imbassahy & Costa, comb. nov.

Stenodictyon saxicola R.S.Williams, Bull. New York Bot. Gard. 6(21): 248. 1909. *Hookeriopsis saxicola* (R.S.Williams) B.H.Allen, Lindbergia 11: 156. 1986. Type. Bolivia. Trail between Aten and Apolo, Williams 2081 (holotype, NY!).

Trachyxiphium heteroicum (Cardot) W.R.Buck, Brittonia 39: 220. 1987, syn. nov. *Hookeriopsis heteroica* Cardot, Rev. Bryol. 37: 51. 1910. Type. Mexico. Veracruz, Jalapa, Pringle 15145 (isotype, NY!).

DISTRIBUTION AND ECOLOGY: United States, Mexico, Honduras, Colombia, Bolivia, Brazil and Paraguay; on wet rocks and logs, 230–1800 m.

ADDITIONAL SPECIMENS EXAMINED: MEXICO. OAXACA: Sharp et al. 4726c (NY); PUEBLA: Santos 3336a (NY); VERACRUZ: Sharp 5589 (NY). BRAZIL. MATO GROSSO: Chapada dos Guimarães, Prance et al. 19412 (INPA). MINAS GERAIS: Conceição do Mato Dentro, Yano 534 (SP). RIO DE JANEIRO: Nova Friburgo, Costa et al. 857 (RB). RIO GRANDE DO SUL: Cambará, Schäfer-Verwimp & Verwimp 10630 (SP). PARAGUAY: GUAIRÁ: Ybytyruzú cordillera, Zardini 8098 (NY).

DISCUSSION: The known distribution of *T. saxicola* probably does not reflect its real distribution and further collections may increase its occurrence in Neotropics.

The species can be characterized by oblong-lanceolate leaves, the relatively short costa for the genus (reaching 1/2–2/3 of leaf length), areolation slightly heterogeneous, smooth cells, margins with few double teeth and the absence of a hyalodermis. A gradual variation can be observed in the specimens studied, where the costa can be

slightly toothed or not and the marginal serration can be stronger or weaker than that found in the type of *T. saxicola*.

Trachyxiphium williamsii (Herzog) Vaz-Imbassahy & Costa, comb. nov.

Hookeriopsis williamsii Herzog, Biblioth. Bot. 87: 134. 1916. Type. Bolivia. Herzog 4547 (holotype, JE!).

DISTRIBUTION AND ECOLOGY: Bolivia, ca. 1800 m.

DISCUSSION: *Trachyxiphium williamsii* is only known from the type collection, which hampers a thorough characterization of the species.

It is similar to *Trachyxiphium tenue* (Mitt.) W.R.Buck, a species widespread in South America, however, the leaves are elliptic-lanceolate, the apex is short-acuminate and has sharply serrate margins with conspicuous bifid teeth whereas in *T. tenue* they are ovate-lanceolate, with acute apex and margins serrulate.

Trachyxiphium williamsii shares with *T. saxicola* the acuminate apex, but it is longer in the latter and the serration is sharper in the former species.

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