

Synonymy and Typifications in *Groutiella tomentosa* (Orthotrichaceae, Bryopsida)

Author(s): Yu Ning-Ning, Jia Yu, and Zhao Jian-Cheng

Source: *Novon: A Journal for Botanical Nomenclature*, 21(2):290-293.

Published By: Missouri Botanical Garden

DOI: <http://dx.doi.org/10.3417/2009137>

URL: <http://www.bioone.org/doi/full/10.3417/2009137>

BioOne (www.bioone.org) is a nonprofit, online aggregation of core research in the biological, ecological, and environmental sciences. BioOne provides a sustainable online platform for over 170 journals and books published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Web site, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/page/terms_of_use.

Usage of BioOne content is strictly limited to personal, educational, and non-commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

Synonymy and Typifications in *Grouitiella tomentosa* (Orthotrichaceae, Bryopsida)

Yu Ning-Ning,^{1,2} Jia Yu,² and Zhao Jian-Cheng¹

¹College of Life Science, Hebei Normal University, Shijiazhuang 050016,
People's Republic of China

²State Key Laboratory of Systematic and Evolutionary Botany, Institute of Botany, Chinese Academy
of Sciences, Beijing 100093, People's Republic of China

ABSTRACT. The results of morphological observation and principal component analysis indicate that *Grouitiella laxotorquata* (Müll. Hal. ex Besch.) Wijk & Margad. is conspecific with *G. tomentosa* (Hornsch.) Wijk & Margad. Furthermore, the names *G. tomentosa*, *G. laxotorquata*, and *G. pobeguini* (Paris & Broth.) Wijk & Margad. are lectotypified.

Key words: Bryopsida, *Grouitiella*, *Macromitrium*, Orthotrichaceae.

Grouitiella Steere is primarily a tropical to subtropical genus of 15 species in the moss family Orthotrichaceae (Crosby et al., 1999; Allen, 2002). *Grouitiella tomentosa* (Hornsch.) Wijk & Margad. is the only species of this genus that occurs in both the Old and New World tropics. Vitt and Crum (1970) discussed the morphological variation of *G. tomentosa* and treated some species as synonyms of it. *Grouitiella laxotorquata* (Müll. Hal. ex Besch.) Wijk & Margad. is an African taxon first described from Réunion. Bizot (1965, 1973) expanded its range considerably in Africa and added an additional four synonyms.

One of the most distinctive features of both *Grouitiella tomentosa* and *G. laxotorquata* is the presence of subulate leaves with fragile apices, and indeed, this has been a diagnostic character for *G. tomentosa* (Gangulee, 1976; Vitt, 1994; Vitt et al., 1995; Allen, 2002) and is not found in any other species of *Grouitiella*. In view of the variability of *G. tomentosa* and *G. laxotorquata* (Bizot, 1965, 1973; Vitt & Crum, 1970), the following study was undertaken to clarify the relationship between the two taxa.

MATERIALS AND METHODS

This study was conducted using specimens housed in H, HBG, MO, NSW, NY, PC, and PE, a total of 79 specimens (including eight types). All morphological characters were observed under stereoscopic and light microscopes. Comparative observations of papillae and spores were performed with a scanning electron

microscope. In *Grouitiella tomentosa* and *G. laxotorquata*, leaves vary considerably in shape and size based on their position on the stem, and therefore we selected only median leaves for measurements. Nine morphological characters were analyzed using the SPSS ver. 13.0 software package (SPSS Inc., Chicago, Illinois, U.S.A.). The morphological characters include branch length; leaf undulation, length, and width; leaf border proportions and the number of border cell rows; upper leaf cell length; basal leaf cell length; the shape of papillae on basal leaf cells; setae length; capsule length and diameter; and spore diameter.

RESULTS

PRINCIPAL COMPONENT ANALYSIS (PCA)

A data matrix for nine characters was obtained from 79 herbarium specimens. A total of 70.2% of the variation occurred in four components. Component 1 contained 22.3% of the statistical variation, mostly from leaf border cell rows, basal leaf cell length, and leaf length; component 2 varied by 18.3%, mostly from leaf length, leaf width, and leaf border proportions; component 3 varied by 16%, mostly from upper leaf cell length, branch length, and basal cell length; and component 4 varied by 13.4%, mostly from leaf undulation and branch length. PCA scatter plots (Fig. 1A, B) indicate that the two taxa cannot be separated.

MORPHOLOGY

Sporophytic characters were examined using SEM micrographs and numeric taxonomic assessment. Capsule shape and color were similar in *Grouitiella laxotorquata* and *G. tomentosa*, and their peristomes and spores were also nearly identical.

TAXONOMIC TREATMENT

Grouitiella tomentosa (Hornsch.) Wijk & Margad.,
Taxon 9: 51. 1960. Basionym: *Macromitrium*

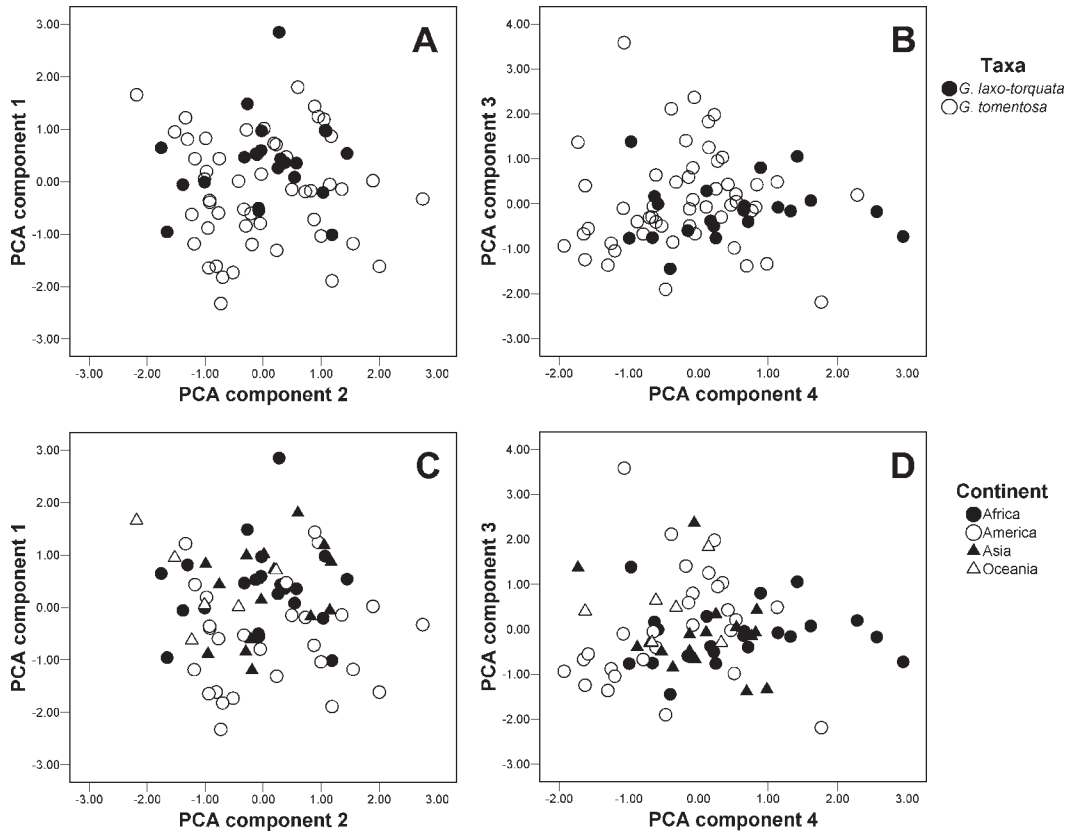


Figure 1. Scatter plots based on components 1–4 from PCA analysis of 79 specimens. —A, B. Scatter plots of taxa. —C, D. Scatter plots of different geographic populations.

tomentosum Hornsch., Fl. Bras. (Martius) 1(2): 21. 1840. *Micromitrium tomentosum* (Hornsch.) Paris, Index Bryol. 3: 242. 1905. TYPE: Brazil. “in campis montecidensibus,” s.d., F. Sellow s.n. (lectotype, designated here, H-BR 2726013).

Groutiella laxotorquata (Müll. Hal. ex Besch.) Wijk & Margad., Taxon 9: 51. 1960, syn. nov. Basionym: *Macromitrium laxo-torquatium* Müll. Hal. ex Besch., Ann. Sci. Nat., Bot., sér. 6, 9: 362. 1880. TYPE: Mauritius. Mauritius Island, s.d., V. de Robillard (lectotype, designated here, H-BR 2725007).

Macromitrium pobeguini Paris & Broth., Rev. Bryol. 31: 44. 1904. *Micromitrium pobeguini* (Paris & Broth.) Paris, Mém. Soc. Bot. France 14: 26. 1908. *Groutiella pobeguini* (Paris & Broth.) Wijk & Margad., Taxon 9: 51. 1960. TYPE: Guinea. Kankan, Kouroussa, “ad ramulos editiores arborum viae, 1903,” H. Pobeguini s.n. (lectotype, designated here, PC 0106740).

Discussion. The specimen at H (H-BR 2726013) corresponds to the original description for *Macromitrium tomentosum* Hornsch. [= *Groutiella tomentosa* (Hornsch.) Wijk & Margad.]; the label information shows that it was collected by Sellow in Brazil, and this location is the same as stated in the

protologue (Hornschuch, 1840). Bernard Goffinet was the first to suggest this specimen as lectotype in his specimen notation. Because the holotype of *G. tomentosa* was destroyed at B during World War II, the specimen from H-BR is lectotypified here.

The specimen H-BR 2725007 corresponds to the original description of *Macromitrium laxo-torquatium* Müll. Hal. ex Besch. [= *Groutiella laxotorquata* (Müll. Hal. ex Besch.) Wijk & Margad.]. The label information shows that it was collected by V. de Robillard from Mauritius (ex Geheeb’s herbarium), as indicated in the 1880 protologue by Müller. Because no further information was cited for the type in the protologue, we choose here for lectotypification the specimen that Bernard Goffinet first recommended on the specimen label at H-BR.

The specimen PC 0106740 corresponds to the original description of *Macromitrium pobeguini* Paris & Broth. [= *Groutiella pobeguini* (Paris & Broth.) Wijk & Margad.]. The label information agrees with the 1904 protologue by Paris and Brotherus. Because no specimen was cited in the protologue, the specimen from PC is lectotypified here.

The most significant diagnostic character for *Groutiella tomentosa* is the fragile leaf tips of the upper leaves, which readily break off (Bartram, 1949; Vitt & Crum, 1970; Crum & Anderson, 1981; Vitt & Ramsay, 1985; Vitt, 1994), but this character was also found in *G. laxotorquata*. Sometimes, the leaf tips of *G. tomentosa* may be broader and weakly dentate (Australia: Norris 40897, 43099, 43108, 43540; Bolivia: Fuentes et al. 4060; Churchill & Arroyo 21527-B; Brazil: Reese 16161; Mexico: Reese 4447; China: Wen-Xuan Xu 11337), and this variation has been observed in *G. laxotorquata* (Comoros: Magill & Pócs 11432, 10960, 10947). Also distinctive in *G. tomentosa* are the basal leaf cells, which are usually tuberculate and are a noteworthy feature in *Groutiella* species. In *G. laxotorquata*, the basal leaf cells are usually tuberculate as well, and the papillae can be up to 5 µm high (Guinea: Norman s.n.; Ivory Coast: Frahm 802971; Tanzania: Brenan 1621) or only a few bulging (Ghana: Richards 6966; Nigeria: Jones 3936). No significant differences in the papillae were observed between *G. laxotorquata* and *G. tomentosa*.

Groutiella tomentosa has the broadest distribution in *Groutiella* (Fig. 2). No one has yet investigated whether there is a relationship between distribution and the variation of the above morphological characters. To throw light upon this question, we made scatter plots based on specimens from different continents, using PCA components (results available from the authors). Our analysis indicates that there is no relationship between continental distribution and morphological characters (Fig. 1C, D); this conclusion is congruent with that reached by Vitt and Crum (1970: 148), where specimens “from the Old World, . . . and also from the New World, all exhibit the entire range of variation of these characters.” In our opinion, the morphological characters of *G. tomentosa* are relatively more variable, based on microenvironmental conditions rather than based on broader geographic distribution.

Specimens examined for PCA analysis, Groutiella tomentosa. ANGOLA. Cuarza River, J. Boss s.n. (MO). AUSTRALIA. **Queensland:** Cook, ca. 5 mi. S of Atherton, D. H. Norris 43540 (NSW); Cook, above Tinaroo Dam, D. H. Norris 40897 (NSW); Cook, end of Mt. Windsor Rd., D. H. Norris 43099, 43108 (NSW). BELIZE. **Cayo:** Las Cuevas Field Station, B. Allen 18062 (MO). **Toledo:** Columbia River Forest Reserve, B. Allen 18613 (MO). BOLIVIA. **La Paz:** Franz Tamayo, arroyo Negro, A. Fuentes, M. Villanueva & B. Guili 4060 (MO). **Santa Cruz:** Prov. Ichilo, Bosque Exp. Elías Meneses, S. P. Churchill & L. Arroyo P. 21527-B (MO). BRAZIL. **Amazonas:** “ibidem loco Tanaú,” R. Spruce 110c (syntype, *Groutiella fragilis* (A. Jaeger) H. A. Crum & Steere [= *Groutiella tomentosa* (Hornsch.) Wijk & Margad.], NY 913261). **Pará:** Serra do Cachimbo, W. D. Reese 16161 (MO); Base Aérea do Cachimbo & vic., W. D.

Reese 16128 (MO). **Sergipe:** Rio Tabora, Mpio. Itahaiana, D. M. Vital 2874 (MO). CHINA. **Yunnan:** Simao Co., Xu Wen-Xuan 6959, 11337 (MO, PE). COSTA RICA. **Guanacaste:** along sec. rd. 150 betw. Tilarán & Tronadora, M. R. Crosby 3740 (MO). **San José:** Meseta Central, I. Holz CR 99-1344 (MO). ECUADOR. **Galápagos:** Isla Santa Cruz, W. A. Weber B-13523 (MO). **Sucumbíos:** Res. Faunística Cuyabeno, R. RH 1990-332c (MO). HONDURAS. **Atlántida:** Pico Bonito Natl. Park, B. Allen 17285 (MO). **Comayagua:** trail from San José Del Los Planes to El Plan, B. Allen 13755 (MO). **Copán:** along rd. to Agua Caliente at El Zapote, B. Allen 17733 (MO). **Yoro:** Cordillera Nombre de Dios, N slope, B. Allen 13513 (MO). INDONESIA. **Java:** Samarang prope Medini, monte Ungaran, s. coll. (type, *Groutiella goniorhyncha* (Doxy & Molk.) E. B. Bartram [= *Groutiella tomentosa* (Hornsch.) Wijk & Margad.], NY 913248); Tjibodas, Le Hans Winkler 176 (HBG). **Reindjani[?]:** Mt. Lombok?, P. Sebert 1545 (NSW). **Sumatra:** s. loc., Teysmann s.n. (NY 913249). JAMAICA. **St. James Parish:** Montego Bay, P. & E. Hegewald 8219 (MO). **St. Thomas Parish:** W of Armtully & May Hall, M. R. Crosby 3350 (MO). MEXICO. **México:** 22–24 mi. WSW of Mexico City, W. D. Reese 4447 (MO). **Veracruz:** Sierra de la Cruz, F. Mueller 2261a (syntype, *Groutiella schlumbergeri* (Schimp.) Wijk & Margad. [= *Groutiella tomentosa* (Hornsch.) Wijk & Margad.], NY 913256). NICARAGUA. **Estelí:** N slope of Cerro Tomabú, W. D. Stevens 15016 (MO). **Jinotega:** ca. 2 km NW of San Rafael del Norte on rd., W. D. Stevens & A. Grijalva 15070 (MO). PANAMA. **Panamá:** along rd. around Goofy Lake, M. R. Crosby 4346 (MO). PAPAUA NEW GUINEA. [Morobe: Yabim,] “Nova Guinea germanica: ad arbois prope Yabim,” J. Kaulfuss s.n. (HBG, NSW). PHILIPPINES. St-Andre-des-Arts, Paris s.n. (HBG 2189-14). **Luzon Island:** Rizal Prov., M. Ramos 12550 (NSW); Sablang Prov., E. Fénix 12806 (NSW); Benguet Prov., Cordillera Admin. Region, A. D. E. Elmer 8345 (NSW). SURINAME. **Brokopondo:** Brownsberg Nat. Reserve, Zacharia Magombo 5325 (MO). **Para:** Joden Savanne, B. Allen 19459 (MO). **Paramaribo:** s. loc., M. J. Price 370 (NSW). **Sipaliwini:** Kayserberg Airstrip, B. Allen 25041 (MO). THAILAND. **Northern:** Ban Mae Pang 30 km N of Mae Sariang, Larsen et al. 2362 (MO); 30 km S of Bo Luang along Om Koi trail, Larsen et al. 2060 (MO); Doi Pha Dam betw. Hang Dong & Bo Luang, Larsen et al. 2197 (MO). **Peninsular:** Yala, Charoenphol et al. 4140 (MO). **Prachinburi:** Khao Yai Natl. Park, Khao Khieo, Larsen et al. 137, 224 (MO). TRINIDAD AND TOBAGO. **St. George:** Northern Range, near summit of Lalaja Rd., M. R. Crosby 2145 (MO). COUNTRY UNKNOWN. Longbiou, s. coll. (HBG 2189-18). **Menigsea[?]:** Vecas Caiccy?, Sumichrash s.n. (NSW 792583).

Specimens examined for PCA analysis, Groutiella laxotorquata. CAMEROON. **Bipinde:** Urwaldgebiet, G. Zenker 2186 (HBG 2189-13). COMOROS. **Anjouan (Ndzuani):** W of Gegi, R. E. Magill & T. Pócs 11432 (MO). **Grande Comore (Ngazidja):** N of Massif du Kartala, R. E. Magill & T. Pócs 10947 (MO); along rd. betw. Koimbani & Salimani, R. E. Magill & T. Pócs 10960 (MO). GABON. **Gabon:** Chute De La Barra, Le Leits 6149 (HBG 2189-15). GHANA. **Eastern:** Ahuri Bot. Garden near Accra, Richards 6302, 6966 (MO); Kade, Atewa Range, Mt. Aliwiredu, Richards 6301 (MO). GUINEA. “Arbres pres de Bourouhadjo, Apr. 1901,” I. Norman s.n. (holotype, *Groutiella limbatula* (Broth. & Paris) Wijk & Margad. [= *Groutiella laxotorquata* (Müll. Hal. ex Besch.) Wijk & Margad.], PC

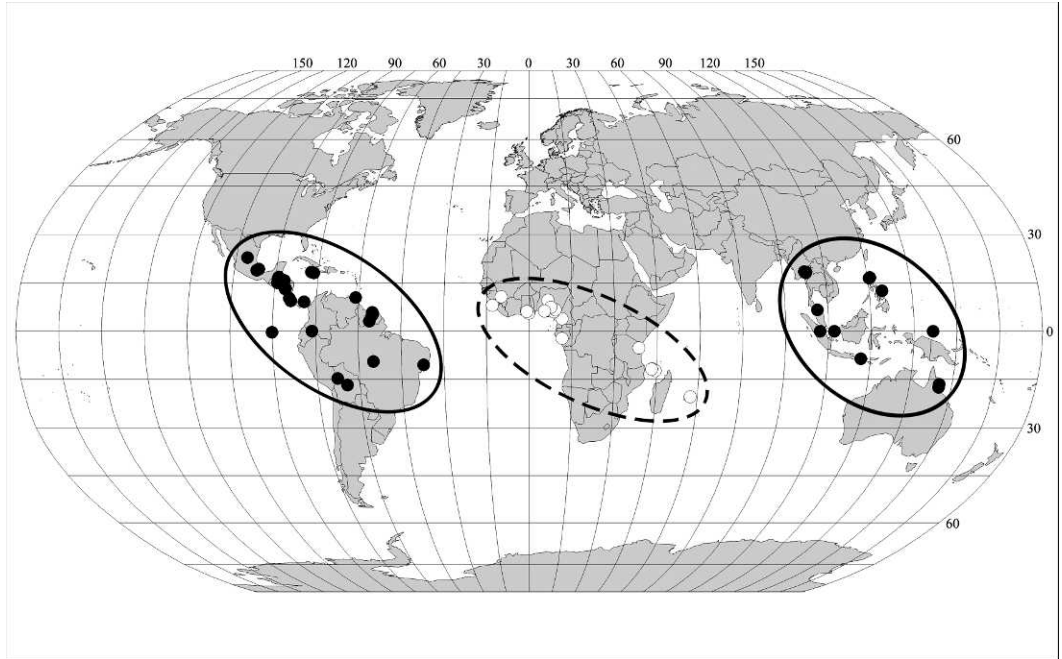


Figure 2. Distribution of *Groutiella tomentosa* and *G. laxotorquata* (= *G. tomentosa*). *G. tomentosa* (•) with solid line; *G. laxotorquata* (○) with dotted line.

0100087); "Arbres pres Dango, Mar. 1901," *I. Norman s.n.* (holotype, *Groutiella pleurosigmoidea* (Paris & Broth.) Wijk & Margad. [= *Groutiella laxotorquata* (Müll. Hal. ex Besch.) Wijk & Margad.], PC 0100086). IVORY COAST. [Dix-Huit Montagnes:] Man, Elfenbeinkueste, Mt. Toukovi Bei Man, *Frahm 802971* (MO). MAURITIUS?. s. loc., *W. Monkemeyer s.n.* (HBG 2189-16). NIGERIA. **Bendel:** Benin Prov., Okomu Forest Reserve, *Richards 3936* (MO). **Minna:** Abuja Distr., Garki Kuimi, *E. W. Jones 887* (MO). **Ogoja:** Ikom, Afi River Forest Reserve, *A. P. D. Jones 18947* (MO); Obudu division, Sonkwala area, *H. J. Savory & R. W. J. Keay 25141* (MO). SIERRA LEONE. **Western:** Leicester Peak, *Brenan s.n.* (MO). TANZANIA. **Tanga:** Korogwe Distr., *Brenan 1621* (MO).

Acknowledgments. We thank Marshall R. Crosby and two anonymous reviewers for their comments on the manuscript. We also thank the curators of H, HBG, MO, NSW, NY, and PC for specimen loans. This study was supported by the National Natural Science Foundation of China (No. 30570124).

Literature Cited

Allen, B. H. 2002. Moss Flora of Central America, Part 2, Encalyptaceae–Orthotrichaceae. *Monogr. Syst. Bot. Missouri Bot. Gard.* 90: 536–559.

Bartram, E. B. 1949. Mosses of Guatemala. *Fieldiana Bot.* 25: 223–224.

Bizot, M. 1965. Quelques Mousses d'Afrique Occidentale. *Rev. Bryol. Lichénol.* 33: 494–497.

Bizot, M. 1973. Mousses Africaines Récoltées par M. Dénes Balázs. *Acta Bot. Acad. Sci. Hung.* 18: 7–28.

Crosby, M. R., R. E. Magill, B. Allen & S. He. 1999. A Checklist of Mosses (vers. 2). Missouri Botanical Garden, St. Louis.

Crum, H. A. & L. E. Anderson. 1981. *Groutiella*. Pp. 736–739 in *Mosses of Eastern North America*, Vol. 2. Columbia University Press, New York.

Gangulee, H. C. 1976. Mosses of Eastern India and Adjacent Regions. Privately published, Calcutta.

Hornschuch, C. F. 1840. Lycopodiaceae. P. 21 in *Flora Brasiliensis*, Vol. 1(2). F. Fleischer, Munich.

Vitt, D. H. 1994. Orthotrichaceae. In A. J. Sharp, H. Crum & P. M. Eckel (editors), *Moss Flora of Mexico*. *Mem. New York Bot. Gard.* 69: 590–656.

Vitt, D. H. & H. Crum. 1970. *Groutiella tomentosa* new to the United States. *Bryologist* 73: 145–149.

Vitt, D. H. & H. P. Ramsay. 1985. The *Macromitrium* complex in Australia (Orthotrichaceae: Bryopsida). Part I. Taxonomy and phylogenetic relationships. *J. Hattori Bot. Lab.* 59: 325–451.

Vitt, D. H., T. Koponen & D. H. Norris. 1995. Bryophyte flora of the Huon Peninsula, Papua New Guinea. *LV. Acta Bot. Fenn.* 154: 1–94.