

A SYNOPSIS OF *SCHIZOSTACHYUM* (GRAMINEAE: BAMBUSOIDEAE) FROM VIETNAM

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The genus *Schizostachyum* was established by Nees von Esenbeck (1829) with a single species *S. blumei* Nees from Java. Since then, several authors have studied the genus taxonomically and a great deal more has been documented, which allows specialists to made better interpretation of the different species recognized, are more than 50 species recognized today. They are distributed in tropical and subtropical Asia - from southern China, to Malesian and extending to the Pacific Islands, with the majority of the species found in Malaysia, and Indonesia (Xia 1993, 1996; Ohrnberger 1999; Xia and Stapleton 2006). All species of *Schizostachyum* have sympodially branching rhizomes; erect or straggling thin-walled culms; branches of the same size arising from the node; spiklets in groups at the distal nodes of a branch the base of which leafy or on wholly leafless branches; 1 to several bracts and no true glumes, at the base of the bract where they are joined onto the rachilla; lodicules are present or absent (Holtum 1958; Xia 1993; Xia and Stapleton 2006).

In Vietnam, the genus *Schizostachyum* has been studied by several authors (Balansa 1890; Camus & Camus 1923; Pham 2000). The first known species is *S. zollingeri* Steud., was collected from Quang Yen, Tonkin and illustrated by Balansa (1890). Camus & Camus (1923) recorded another one, *S. aciculare* Gamble, from southern Vietnam. Pham (2000) published the second edition of *Illustrated Flora of Vietnam*. In this book, the species number was increased to 11, i.e., *S. aciculare* Gamble, *S. blumei* Nees, *S. brachycladum* (Kurz) Kurz, *S. chilanthum* Kurz, *S. gracile* Munro, *S. hainanense* Merr. ex McClure, *S. leviculm* McClure, *S. zollingeri* Steud., *S. pseudolima* McClure, *S. lima* (Blanco) Merr. and *S. funghomii* McClure. In 2007, one newly recorded *S. species* were found in evergreen broad-leaved forest in Hoang Lien Son National Park is *S. chinense* Rendle by Nguyen & Tran (2007). Moreover, during our ongoing revision of the genus *Schizostachyum*, the authors (2010) described two new species: *S. ninhthuanense* Xia, Tran et Nguyen and *S. yalyense* Xia, Tran et Nguyen. However, the genus has not been revised for Vietnam since the first species recorded by Balansa (1890). A synopsis of *Schizostachyum* is urgently needed for the identification, conservation and utilization of the species from Vietnam. Here, we present a synopsis of the genus, including new synonyms, and taxonomic transfers for the remaining species

I. METHODS

This study is based on herbarium collections from the herbaria [CANT, FSIV (Herbarium of forest Science Institute of Vietnam), HN, HNU, KUN, IBSC, K, SWFC, P, SYS and VNM] and on field studies throughout Vietnam. This study is to undertake a full nomenclatural revision of all synonyms and their corresponding type specimens.

II. RESULTS

1. Synopsis

1.1 *Schizostachyum aciculare* Gamble, Ann. Roy. Bot. Gard. Calcuta 7: 104. 1896. TYPE. Malaca, rupayoong, Alwis 2167 (Holotype: SING?). - *S. gracile* auct non Gamble: Pham in Illustr. Fl. Vietnam. 3: 620. 2000.

Habitat and distribution: They sparsely occur within degraded natural forest or mixed broad leaves forest, at cross-river and here found in small population, in moist sandy habitats. They grow in the in moist sandy habitats degraded natural forest in valleys elevation 30 -50 m a.s.l., in Phu Quoc Island, south of Vietnam.

Taxonomic notes: The species of *S. gracile* (Pham 2000, No. 10208) often occur in moist sandy habitats from Phu Quoc Island collected by us. In its habit, most of its vegetative structures and reproductive parts of *S. gracile* was illustrated by Pham has much similarity to the type of *S. aciculare*, such as, culm commonly 0.5-2 cm in diameter, culm sheaths blade reflexed, the spikelet group 3-4, basal bud bearing bracts several. Thus, it seems to us that it impossibly named *S. gracile*.

S. aciculare is related to *S. gracile*, but it can be distinguished by culms small, internodes 30-40 cm, diameter 0.8-1 cm; culm sheaths hard, fragile, pale to yellowish green, outside with covered densely appressed brown-white hairs; auricles lobes, unequal, with dense bristles 4-6 mm long; blade reflexed.

Additional specimens examined: Vietnam, Kien Giang province, Phu Quoc Island District, Cau Trang VIII. 2009; V.T. Tran No. 082009046 (IBSC), 0820090466 (FSIV-Herbarium of Forest Sciences Institute of Vietnam, Hanoi).

1.2. *Schizostachyum chinense* Rendle, Linn. Soc., Bot. 36: 448. 1904. TYPE. A. Henry 10420. - *Leptocanna chinensis* (Rendle) L. C. Chia & H. L. Fung. Act. Phytotax. Sin. 19(2): 212. 1981-Type: A. Henry 10420 (Holotype: K).

Habitat and distribution: They occur within degraded natural forest or mixed broad leaves forest, at cross-valley and mountain gorge in Hoang Lien National Park - Lao Cai, north of Vietnam.

Taxonomic notes: Distinctive characters in *S. chinense* are: presence of blade of culm sheaths erect, true glumes, rachilla not disarticulating, stigmas 2.

Additional specimens examined: Vietnam, Lao Cai province: Hoang Lien Son National Park; H: 2022 m a.l.s., XII. 2008 V.T. Tran 122008046009 (IBSC), 1220080468 (FSIV-Herbarium of Forest Sciences Institute of Vietnam).

1.3. *Schizostachyum dullooa* (Gamble) Majumdar, Fl. Ind. Num. Mono. 281. 1989; Camus et Camus in Fl. Gén. L indo-Chine. Paris 7 (2): 648-649. - *Teinostachyum dullooa* J. S. Gamble, Ann. Roy. Bot. Gard. Calcutta. 7:101. 18 86; - *Nehouzeaua dullooa* Camus, Bull. Mus. Nation. Hist. Nat. Paris 28: 101. 1922; 1923. TYPE. Burma, Katha dist., Feb. 1892, Oliver s.n. (Holotype: K).

Habitat and distribution: They occur at cross-valley and mountain gorge and in Tuyen Quang province, and here found in large population. They grow in the degraded natural forest in valleys elevation 300 m a.s.l., north of Vietnam.

Taxonomic notes: Majumda (1989) adopted a modification of Holttum's findings, and transferred *N. dullooa* to the synonymy of *Schizostachyum*. *S. dullooa* can be diagnosed by the

combination of culm sheath apex horizontal, inflorescence bearing verticals of 3-4 pseudospiklets, filaments fused to a tube and exerted.

Additional specimens examined: Vietnam, Hanoi, Hanoi Park, Balansa B. 471, flower and leafy branch only (P); Hanoi Park, Balansa B. 649, flower and leafy branch only (VNM); H.N. Nguyen, V.T. Tran 0710600 (FSIV - Forest Science Institute of Vietnam); 16.I.2009, H.N. Nguyen, V.T. Tran 07109601 (IBSC).

1.4. *Schizostachyum brachycladum* (Munro) Kurz, J. Asiat. Soc. Bengal n.s. 39(2): 89. 1870. - *Melocanna brachyclada* Kurz in Teysm. et Binn., Cat. Hort. Bogor. 20. 1866, nom. nud. - *Melocanna zollingeri* var. *brachyclada* Kurz ex Munro, Trans. Linn. Soc. London 29(4): 134. 1868. TYPE: Hort. Bogor, Kurz, s.n. (Holotype: CAL, K). - *S. zollingeri* auct non Steudel: B. Balansa in Morot. J. de Bot. 332. 1890; E.G. Camus, Mon. Bio.Cult. Prin. Usag. 137.1913; E.G. Camus et A. Camus in Fl. Gén. de l'Indo-chine. 7: 644-645. 1923; H. H. Pham, in Illustr. Fl. Vietnam, 3: 622. 2000.

Taxonomic notes: The species of *S. zollingeri* was recorded and illustrated by Balansa (1890) based on his collected specimen (*Balansa755*) collected in 1885 from Quang Yen - Tonkin. Camus & Camus (1923) conserved this species in their description and directly annotated on a sheet of *Poilane517* kept at P, collected by Poilane in 1919 from Ca Mau, Bac Lieu, Cochinchine. Pham (2000) also applied description of both the authors above for his illustrated. However, Dransfield (1983) directly labeled on a sheet of *Poilane 517* is present at P, bearing the words "*S. brachycladum*". Otherwise, in 2010, we dissected to all collected specimens of *S. zollingeri* from Vietnam deposited at P and VNM (including a single of *Balansa755* and two sheets of *Poilane517*), and confirmed the presence of 1-2 perfect flowers (Balansa 1890; Camus et Camus 1923; Pham 2000). Therefore, it seems to us that the specimens very close in their reproductive characters of that *S. brachycladum*.

This species is most similar to *S. zollingeri* from which it differs mainly by having culms yellow, auricles small, pseudospikles consisting of 1-2 florets.

Additional specimens examined: Vietnam, Tonkin, Quang Yen, Balansa755, flower and leafy branch only (P); Cochichine, Ca Mau Province, Park, Poilane 517, culm sheaths, flower and leafy branch (P, VNM).

1.5. *Schizostachyum funghomii* McClure, Lingnan Sci. J. 14(4): 585. 1935. TYPE: China. Kwangtung. Meu-ming District, Ng-uk. 00563 (Holotype: US)

Habitat and distribution: They occur at cross-valley and mountain gorge and in Tuyen Quang, Phu Tho province, and here found in large population. They grow in the degraded natural forest in valleys elevation 300 m a.s.l., north of Vietnam.

Taxonomic notes: Distinctive characters in *S. funghomii* are presence of culm sheaths truncate or slight concave, palea bifid acute, filaments usually connate in pairs at its base.

Additional specimens examined: Vietnam, Phu Tho Province, Doan Hung District, Chan Mong Commune, Cau Hai Locality; 50 m a.l.s., X. 2006; XII. 2008 V. T. Tran No. 122008046005 (IBSC), 1220080464 (FSIV-Herbarium of Forest Sciences Institute of Vietnam, Hanoi); Nghe An: Vinh, Poilane 19956 (P).

1.6. *Schizostachyum hainanense* Merr. ex McClure, Lingnan Sci. J. 14(4): 5591. 1935. TYPE: Hainan, Ling-Shui District, Chin-shan, McClure 20063 (Holotype: US).

Habitat and distribution: They occur within degraded natural forest or mixed broad leaves forest, at cross-valley and mountain gorge in Bach Ma National Park - Thua Thien Hue, central of Vietnam.

Taxonomic notes: Distinctive characters in *S. hainanense* are presence of apex culm sheaths deep concave, oral setae well developed, especially at its base with bristle, white hairs.

Additional specimens examined: Vietnam, Thua Thien Hue province, Bach Ma National Park; H: 152 m, XII. 2008 V. T. Tran No. 122008046008 (IBSC), 1220080467 (FSIV-Herbarium of Forest Sciences Institute of Vietnam, Hanoi).

1.7. *Schizostachyum ninhthuanense* N. H. Xia, V. T. Tran & H. N. Nguyen *Nordic J. Bot.* 28:487-492. 2010. TYPE: Vietnam, Ninh Thuan Province, Ninh Son District, Ngoan muc Pass, elevation 962 m; 15 Dec. 2008, H. N. Nguyen, V. T. Tran, 1512200804661 [Holotype: FSIV (Herbarium of Forest Science Institute of Vietnam)], 151220080466 (Isotype: IBSC).

Distribution, Habitat and phenology: Only known from the type locality, but here found in several populations. They grow in the degraded natural forest in valleys and mountain gorges, but common on mountain gorges, between 300 and 1000 m a.s.l., south centre of Vietnam. They flowered from 2005 to 2008 especially in 2006 when they were mass-flowering. The flowering period extends from August to December, and fruits are found October to February. New shoots are developed between July to September.

Taxonomic notes: This species is similar to *Schizostachyum hainanense* Merrill ex McClure in general appearance, but differs in having a culm sheaths apex with white-brown hairs; the ligule margins densely pale-ciliate and densely covered with appressed white hairs on the dorsal surface; the lower surface of the leaf densely hairy and margins serrate; two stigmas apically on the style and the third stigma branching off from one of the two other stigmas.

1.8. *Schizostachyum pseudolima* McClure, *Lingnan Sci. J.* 19: 537. 1940. TYPE: China, Hainan, Ling - Shui Dict, Chim Shan; Fung, H. 20078, (Holotype: US).- *S. leviculm* auct. non McClure: H. H. Pham in *Youth Pub. House*: 3: 624. 2000.

Habitat and distribution: They occur at cross-valley and mountain gorge and in Tuyen Quang, Phu Tho, Vinh Phuc province, and here found in large population. They grow in the degraded natural forest in valleys elevation 300 m a.s.l., north of Vietnam;

Taxonomic notes: Herbarium specimens (*Petelot 7555 VNM*) of *S. leviculm* collected by Petelot in 1941, from Thai Nguyen province, with reproductive parts have much similar to the type species, *S. pseudolima*.

Distinctive characters in *S. hainanense* are presence of apex culm sheaths truncate or slightly truncate, oral setae well developed, especially at its base with long bristle, leaf blades small.

Additional specimens examined: Vietnam, Phu Tho province, Doan Hung District, Cau Hai Commune; 50 m a.s.l., X. 2006; XII. 2008 V.T. Tran 122008046006 (IBSC), 1220080465 (FSIV-Herbarium of Forest Sciences Institute of Vietnam, Hanoi); Thai Nguyen, Lang Hit, Petelot 7.555 (VNM). Hanoi: Balansa B. 4751 (P). Tien Yen, Tsang 30536, 30119, 30322 (K). Tonkin: Lung Van - Dam Ha, Tsang 30119 (K).

1.9. *Schizostachyum yalyense* N. H. Xia, V. T. Tran & H. N. Nguyen *Nordic J. Bot.* 28:487- 492.2010. TYPE: Vietnam, Gia Lai Province, Yaly River, elevation 642 m a.s.l., Jul. 2005, H. N. Nguyen, V. T. Tran 06200504662 [Holotype: FSIV (Herbarium of Forest Science Institute of Vietnam)], 0620050466 (Isotype: IBSC)

Distribution, Habitat, and phenology: Only known from the type locality, but here found in several populations. They grow in the degraded natural forest in valleys and mountain gorges, but common along river or valleys, between 400 and 700 m a.s.l., northern highland of Vietnam.

They were mass-flowering 2005. The flowering period extends from June to August. New shoots are developed between June - August.

Taxonomic notes: This species is similar to *Schizostachyum lima* (Blanco) Merrill in general appearance, but it distinct from it in its culm sheaths apically concave and 1.0-1.5 cm deep, lodicule 1.

2. Uncertain species

S. lima was recorded by Pham (No. 10218b) without any reference to the location. No specimen of this species was found in all the herbaria I visited. So its occurrence in Vietnam is doubtful.

3. Excluded species

The species *S. blumei* recorded from Dalat city Lamdong province (Pham 2000, No. 10.204). In 2005, we revisited to Prenn pass, Dalat City, Lamdong province, where is indicated by Pham in his book. The bamboo we collected matched the original description and illustration of *S. blumei* by Pham. The branching habits of this bamboo are quite different from other Vietnam species by primary branch dominant. It is impossible to place this species in the genus *Schizostachyum*. From the general appearance, it is perhaps a member of *Gigantochloa*.

S. chilianthum with the local name “Luc Binh” collected by first author from Dong Thap province, where is indicated by Pham. “Luc Binh” is characterized by having culms slight zig-zag, branches are many at each node with the primary branch dominant, low branching habit (Pham 2000, No. 10206). It seems to be more close to *Bambusa* than *Schizostachyum*.

REFERENCES

1. **Balansa, B.** 1890: *Journal de Botanique*, 4: 27-32.
2. **Camus, E.G., Camus, A.** 1923: *Flore générale de l'Indo-chine*, Paris 7: 203-650.
3. **Gamble, J.S.**, 1896: *Annals of the Royal Botanic Garden*, Calcutta, 7: 104. 1896.
4. **Holtum, R.E.**, 1958: *Garden bulletin Singapore*, 16: 31-52.
5. **Kurz, S.**, 1870: *Journal of the Asiatic Society of Bengal*, 39(2): 89. 1870.
6. **Majumda, N.C.**, 1989: *Flora India Enumerous Monocotyledon*, 281.
7. **McClure, F.A.** 1935: *Science Journal*, 14(4): 585-591.
8. **Nees Von Esenbeck, C.G.D.**, 1829: *Agrostologia Brasiliensis seu description Graminum in imperio Brasiliensi huc usque detectorum*, 2: 535.
9. **Nguyen, H. N., Tran V.T.** 2007: *Vietnam Journal of Forest Science*, 4: 438-440.
10. **Pham, P.H.**, 2000: *An illustrated flora of Vietnam*. Youth Pub. House. Ho Chi Minh City, 3: 560-627.

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**TÓM LƯỢC THÀNH PHẦN LOÀI CỦA CHI NỨA (*SCHIZOSTACHYUM* Nees)
Ở VIỆT NAM**

TRẦN VĂN TIẾN, NGUYỄN HOÀNG NGHĨA, NIANHE XIA

TÓM TẮT

Chi Nứa được mô tả lần đầu tiên vào năm 1929 bởi nhà thực vật học người Braxin Nees von Esenbeck, dựa trên loài chuẩn *S. blumei*. Kể từ đó, chi này được nhiều nhà thực vật nghiên cứu và mô tả nhiều loài mới, nâng tổng số loài hiện nay hơn 50 loài. Các loài thuộc chi Nứa phân bố rất đa dạng, từ những vùng nhiệt đới cho đến á nhiệt đới thuộc châu Á. Các vùng phân bố chủ yếu ở Nam Trung Quốc, Malaixia, Indonexia, Ấn Độ (Xia, 1993, 1996; Ohrnberger, 1999; Xia và Stapleton, 2006). Ở Việt Nam, Balansa là người đầu tiên nghiên cứu về chi Nứa, trong quá trình nghiên cứu, tác giả bổ sung một loài mới, *S. zollingeri* Steudel vào năm 1890, loài này phân bố ở Quảng Yên, miền Bắc Việt Nam. Năm 1923, Camus và Camus ghi nhận thêm một loài nữa phân bố ở miền Nam Việt Nam, *S. aciculare* Gamble. Năm 2000, trong lần tái bản “Cây cỏ Việt Nam” Phạm Hoàng Hộ đã mô tả bổ sung 9 loài Nứa và nâng tổng số loài lên 11 loài *S. aciculare* Gamble, *S. blumei* Nees, *S. brachycladum* (Kurz) Kurz, *S. chilianthum* Kurz, *S. gracile* Munro, *S. hainanense* Merr. ex McClure, *S. leviculm* McClure, *S. zollingeri* Steud., *S. pseudolima* McClure, *S. lima* (Blanco) Merrill và *S. funghomii* McClure. Năm 2007, Nguyễn Hoàng Nghĩa và Trần Văn Tiến nghiên cứu bổ sung một loài mới có phân bố hỗn giao trong rừng lá rộng thường xanh ở Vườn Quốc gia Hoàng Liên, *S. chinense* Rendle. Năm 2010, các tác giả là Trần Văn Tiến, Nianhe Xia và Nguyễn Hoàng Nghĩa đã mô tả 2 loài mới cho khoa học, *S. ninhthuanense* Xia, Tran & Nguyen and *S. yalyense* Xia, Tran & Nguyen. Trong quá trình nghiên cứu phân loại, nhóm tác giả đã nghiên cứu các mẫu vật thu trước đây được lưu giữ ở các bảo tàng thực vật cũng như các mẫu thu được trong quá trình nghiên cứu từ 2005 đến nay, đồng thời so sánh các mẫu chuẩn cũng như tham khảo các tài liệu nghiên cứu về chi Nứa ở trên thế giới, chi Nứa ở Việt Nam hiện nay có 9 loài (*S. aciculare*, *S. brachycladum*, *S. chinense*, *S. dullooa*, *S. funghomii*, *S. hainanense*, *S. ninhthuanense*, *S. pseudolima*, *S. yalyense*), 1 loài định loại chưa chắc chắn (*S. lima*) và 2 loài định loại trước đây không thuộc chi nứa (*S. blumei*, *S. chilianthum*).