

A taxonomic revision of *Pseudosymblepharis* Broth. (Musci: Pottiaceae) in Asia

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Abstract: In Asia, *Pseudosymblepharis* Broth., consists of only one species: *Pseudosymblepharis bombayensis* (C. Muell.) Sollman. Although the extremes in the collections (e.g. larger versus smaller plants) at first sight look distinct, intermediates were seen rather frequently. The more variable characters are discussed. Small-sized specimens of *Pseudosymblepharis* are distinguished from *Trichostomum tenuirostre* (Hook. & Tayl.) Lindb., *Trichostomum brachydontium* Br. and several other species. Twenty-three reductions to synonymy are proposed. Data on distribution and habitat are given.

Introduction

Several names now assigned to *Pseudosymblepharis* Broth., were mostly originally described in *Trichostomum* Br., *Tortella* (Lindb.) Limpr. and *Oxystegus* (Limpr.) Hilp. among other genera, and were afterwards often transferred back and forth. Later, after the creation of the genus *Pseudosymblepharis* in 1924, only some of these species were placed in it.

Seemingly more or less strongly deviating plants, often sterile/non-fruiting, were sometimes also described as new taxa, even in new genera like *Chionoloma* Dix. (in 1922) and *Stephanodictyon* Dix. (in 1935), mostly based on very few collections and scrappy material.

Within the genus *Pseudosymblepharis* 14 species are currently being recognized, of which 9 species are reported to occur in Asia (Wijk et al. 1959-1969).

Norris & Koponen (1989) suggested that

after a serious revision likely only one pantropical species will remain. Recently, R.H. Zander (pers. comm.) suggested that the genus is in need of a revision.

The purpose of this study is:

1. to redescribe *Pseudosymblepharis* based on Asian material;
2. to describe the variation observed;
3. to distinguish small-statured material of *Pseudosymblepharis* from *Trichostomum tenuirostre* (Hook. & Tayl.) Lindb., *Trichostomum brachydontium* Br. and some other species with which *Pseudosymblepharis* can be confused;
4. to describe the distribution and habitat.

Short history of the genus

Brotherus (1924) created the genus *Pseudosymblepharis* with three species: *P. circinata* Broth. nom. illeg.

(= *P. schimperiana* (Par.) Crum) from Mexico, *P.*

papillosula (Card. & Thér.) Broth. (= *P. angustata* (Mitt.) Hilp.) from China, and *P. pervaginata* (Broth.) Broth. (= *P. subduriuscula* (C. Muell.) Chen) from the Philippines. However, he did not indicate a type for the genus.

Saito (1975, p. 439) selected *Pseudosymblypharis papillosula* as lectotype.

Brotherus' means of distinguishing *Trichostomum* in his key (l.c. p. 249), however, is vague. Moreover -in retrospect- he and other authors created too many names in the group (*Pseudosymblypharis-Trichostomum*). Most new names were proposed as 'regional' taxa, in many cases based only on one or a few collections and nearly always in a sterile/ non-fruiting state.

Fleischer (1902) noted that *Pseudosymblypharis angustata* (as *Trichostomum angustatum*) is a variable species.

Chen (1941) accepted four species in the genus, but with reservation (p. 149), mostly due to lack of available material, probably caused by war conditions at that time.

Saito (1975) gave an adequate standard description and figure based on Japanese specimens, but provided very little information on more or less deviating collections.

Eddy (1990) recognized two taxa for Malaysia, but with reservations (p. 156).

Material and methods

In total, circa 800 herbarium collections of *Pseudosymblypharis* were studied microscopically. Nearly all the material came from Asia and is housed in GRO and L. In addition, about 300 collections from other (sub) tropical regions were studied, as follows: about 250 from Africa and 40 from the Americas. Various type material has also been studied.

As far as the delimitation of *Pseudosymblypharis* from *Trichostomum*, I have studied about 70 collections of *Trichostomum tenuirostre* worldwide, but with a clear geographical cluster in Europe and Asia, and about 400 specimens of *Trichostomum brachydontium* throughout its total range (a subcosmopolite). Circa 70 collections of *Trichostomum crispulum* Br. were studied, among which many were from Europe.

Among the few species of *Trichostomum* present in Asia, *Trichostomum tenuirostre* is most

likely confused with smaller states of *Pseudosymblypharis*. For the differences between these taxa, see below.

The gametophyte of ten morphologically rather different collections of *Pseudosymblypharis* were fully analyzed. Nine fruiting collections were studied intensively. They came from the whole geographical area in Asia. This material was used for the description given below. All collections are housed in L except the Rosario collections that are in GRO. In short (country + person + number), they are in alphabetical order of persons: Indonesia, M. Fleischer 125; India, G. Foreau L 980.220.823, L 981.75.398; China, H. von Handel-Mazzetti 281; Sri Lanka, T. Herzog 1276; Japan, K. Mayebara 287; Malaysia, W. Meijer B. 11.775; Papua New Guinea, D.H. Norris 59.229; Indonesia, S.J. van Oostroom 14.362; Philippines, R.M. del Rosario 7261-A, 12.116, 14.610, 15.228-C; Thailand, A. Touw 9368; Philippines, C. M. Weber 1315; Indonesia, W.J.J.O. Wilde 14.323; Philippines, B.O. van Zanten 68.3865-I, 68.3900-B.

All measurements were done on material wetted in water for about half an hour or more.

Emphasis is laid here especially on the characters of the gametophyte. Fruiting plants were seen in less than c. 7% of all the collections studied.

(fig. 1, 2, 3).

Description of the genus based on Asiatic material

Plants in cushions or turfs (1-) 2-6 (-10) cm high, mostly *glossy, olive to golden green* above, *tan to brownish* in older parts, *matted with rhizoids* in lower parts; stems mostly *oblique- to erect-ascending*, without or with few ramifications, branches partly subfloral; outer cortical cells 2-4:1, in longitudinal rows, rectangular, smooth, brownish; in cross-section rounded, fluted, about (200-) 280-320 μm in diameter, outer cells thick-walled, brownish, mostly in 2-3 layers, inner cells hyaline, about 1:1, central strand mostly absent or weakly developed; rhizoids and *tomentum commonly present*, often dense, as webs in leaf axils, inserted along the ventral side of the leaf insertion, irregular branched, wine-red to brownish, faintly spiculate, about 16-25 (30) μm wide in older parts, the younger ones light-brown

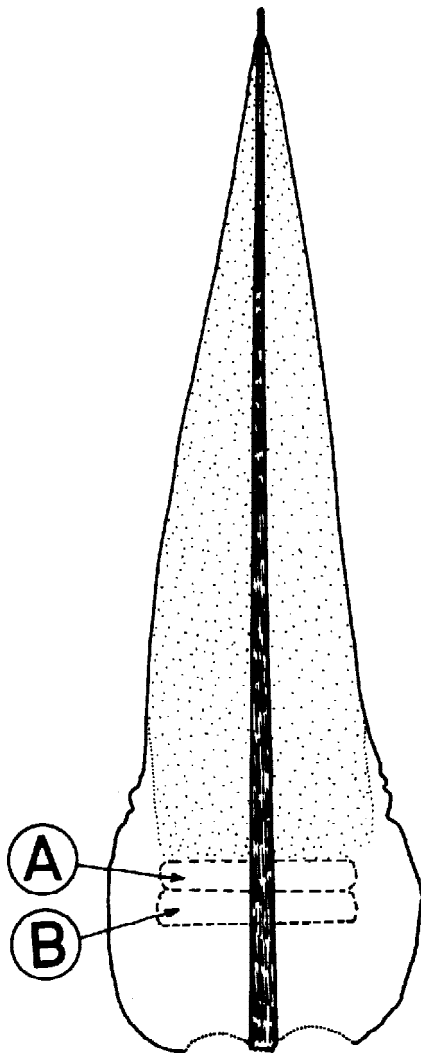


Fig. 1. Leaf shape of medium sized plants. A. position of the transitional cells, when present. B. position of the pitted/sinuose cells, when present.

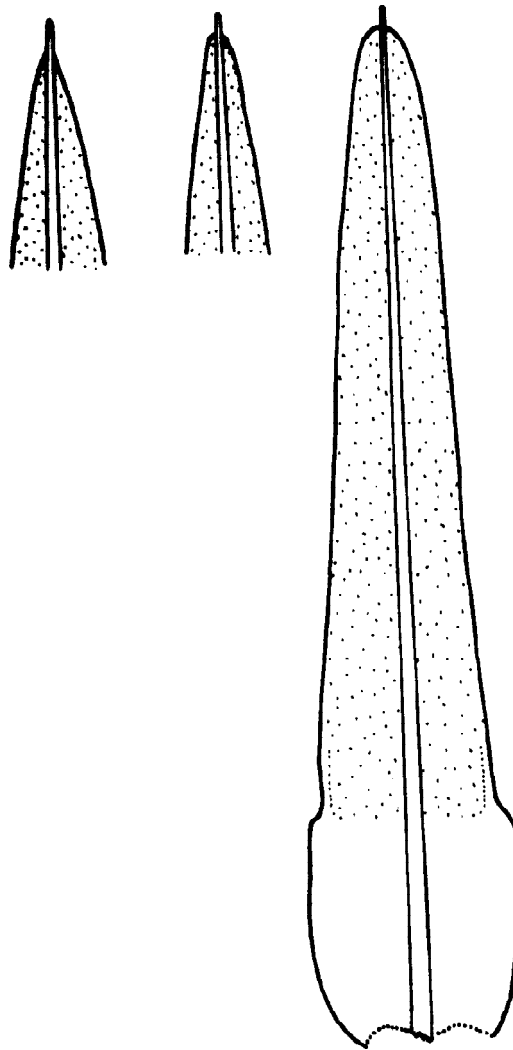


Fig. 2. Leaf shape of small sized plants.

to hyaline, nearly smooth, about $8\ \mu\text{m}$ wide; rhizoid tubers and gemmae absent; axillary hairs mostly on the upper stem, to $300\ \mu\text{m}$ high, to 25 cells long, cells each about 2-4:1, all hyaline, in one row, thin-walled, not bulging; leaves mostly from a wider base gradually tapering to a long- or short-acuminate apex, in small and very young plants sometimes cuspidate-mucronate; usually more or less fragile, to about 8 mm long, 6-20:1, when moist erect-spreading to (especially in larger leaves) somewhat reflexed near apex, when dry often strongly *crispate and circinate*, the apical

portion often one or two times inrolled, especially in larger leaves; better developed leaves mostly with an *expanded-sheathing base*, comprising about $1/5 - 1/10$ of the total leaf length, *clasping the stem*; leaves usually regularly arranged along the stem, rather closely set, not rosulate, nor capitulate, near apex commonly larger, not or scarcely decurrent; insertion: forming a vertical 'line' over the stem; leaves mostly widely U-shaped near leaf base, V-shaped in mid leaf, in apex narrowly V-shaped to more rarely about tubulose; a weak longitudinal ascending furrow

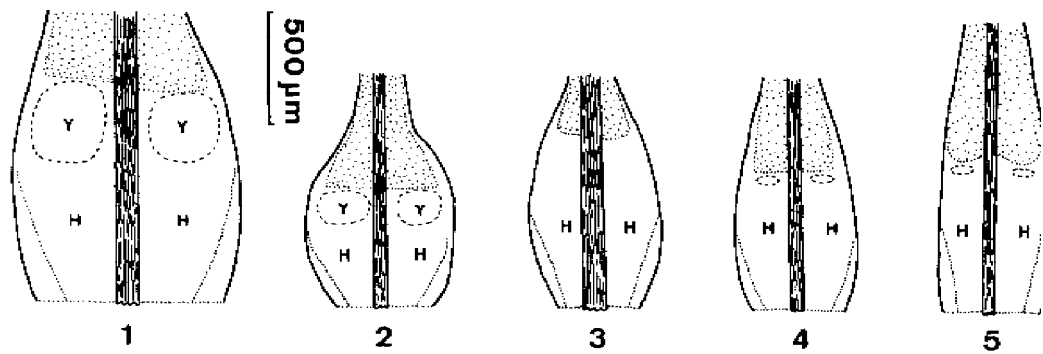


Fig. 3. Variation of the leaf base. The weakly demarcated, often somewhat ascending marginal border is left white. The marked area (Y) shows variation in the area of the region with yellowish, mostly pitted, thick-walled cells. H, idem but showing the area of the hyaline leaf base cells. Numbers 1-3 illustrate the more common forms of variation in the shape of the leaf base. Number 4 and 5 were more rarely seen. All figures are on the same scale. Number 1 and 2 from the type of *Tortula angustata* Mitt. (G. Gardner 134, BM); number 3 from the lectotype of *Trichostomum bombayense* C. Muell. (Bombay, herb. Kegelianum no. 10.025, H); number 4 from the type of *Tortella yunnanensis* Broth. (H. von Handel-Mazzetti 281, H); number 5 from the type of *Oxystegus crassicosatus* Norris & T. Kop., D.H. Norris 59.229, H).

sometimes present in the center of the leaf base; lamina commonly *unistratose* throughout, margins entire, *straight* or nearly so, *plane* except for a variably expressed basal undulation, sometimes with some leaves more or less undulate throughout, seldom partly *bistratose* above, occasionally with some bulging cells or with some crenulation at apex, more or less involute, margins of older leaves near base sometimes eroded; median cells with several low papillae on both sides, mostly 1:1 (2:1), 8-14 μm , rectangular, without corner thickenings, in longitudinal rows, lumen-wall ratio about 3-4:1; papillae about 4-9 per cell surface, located mostly over the periphery of the lumen, plate like, *obscuring the lumina*, massive, simple, blunt, low conical to knobby, uneven, to about 6 μm in height; transitional cells - just proximal to the upper laminal cells (fig. 1) - variably differentiated, shorter than the median cells, mostly quadrate, rather thick-walled, the papillae not so dense as at mid-leaf; basal cells rectangular, 4-8:1, sometimes slightly bulging, thin-walled, hyaline, in longitudinal rows, along the leaf margin usually somewhat narrower but otherwise similar, extending along the margin to the shoulder, where they are often collapsed in several rows; interior cells in the transitional zone

of the leaf base *mostly pitted-sinuose*, *commonly yellowish*, well developed to nearly absent in small leaves; the non-papillose leaf base cells in larger leaves mostly *gradually merging* (often via transitional cells) into the upper papillose cells, in younger and shorter leaves commonly more abruptly so; *a contrasting marginal border of varying extent* often present, sometimes reaching far up the leaf limb, in most collections ceasing only a short distance above the shoulder and *commonly not sharply demarcated*; border cells mostly smooth or nearly so, usually hyaline, with age rarely yellowish-orange, sinuose or straight, about (8-) 4-2:1, thick- to thin-walled; costa at leaf base about (60-) 80-130 (-150) μm wide, gradually tapering to a percurrent or shortly excurrent, smooth point, (50-) 100-200 (-280) μm long, with 3-5 cells, about 3:1 each, thick-walled, yellowish to brownish, apical cell rounded; ventral side mostly flat superficially, sometimes slightly bulging, nearly always completely covered with dense, papillose cells, similar to those of the lamina to near leaf base; dorsal side clearly bulging superficially, cells 4-8:1, nearly always *smooth*, in longitudinal rows, rounded-rectangular, brownish, seldom partly covered with low spiculate papillae near apex; in cross-section near leaf base mostly

reniform, about 1:3, to semi-circular at mid-leaf (about 1:1), with both stereid bands thick, the ventral commonly larger than the dorsal, sometimes of about the same size, with one layer of guide cells (at leaf base 6-10 cells, about 1:1 each), with a well differentiated ventral hyaline epidermis (each cell about 1:1) and a poorly differentiated or absent dorsal epidermis.

Dioicous: male and female plants similar. Perichaetia terminal (sometimes seemingly lateral by innovations); perigonia terminal, bud-like; perichaetial leaves few, little differentiated from the cauline leaves. Seta 1-2 cm long, 1 (2) per perichaetium, red-brown below to yellowish brownish above, mostly straight, more rarely somewhat winding, smooth, sometimes more or less twisted. Capsule erect, symmetrical, the urn cylindric, sometimes somewhat arcuate, about 2 mm, circa 4-5:1, brownish to flesh coloured when empty; exothecial cells (1) 2-4 (5):1, thin-walled, rectangular, with 4-5 rounded edges, in indistinct longitudinal rows, neck with about three phanerophore stomata, stomatal cells in 3-5 layers, about 1 (2):1, with 4-5 edges, dark brown, thick-walled. Operculum long conic-rostrate, straight, to 1/3 – 1/2 of the urn length. Calyptra long-rostrate, circa 2 mm in length, smooth, yellowish, with one long tear, cucullate. Annulus consisting of 1-2 (3) layer(s) of well-differentiated hyaline to slightly brownish cells, each about 1-2:1, separating in pieces. Peristome teeth 16, sublinear, mostly of unequal length, *straight* to slightly dextrorse, pale brownish below to grayish above, densely and bluntly spiculate, to circa 250 µm long, apices blunt, with 4-8 segments of 20-40 µm each, sometimes irregularly forked in the lower part or rudimentally developed, *a low basal membrane* when present to circa 40 µm high, smooth, finely striate, brownish. Spores 12-16 µm in diameter, mostly rounded, sometimes to slightly oval or somewhat triangular, bluntly spiculate, greenish to brownish. Reported chromosome number n=13, 14 (Zander, 1993).

Taxonomy

Although there are clearly several trends present in the Asian material, especially longer versus shorter leaved plants, the degree of differentiation of a marginal laminal border in the lower part of at least some leaves, the degree of papilosity of the

dorsal side of the costa (sometimes to slightly spiculate -especially near apex- in only some leaves) and the degree of thickening (two layers) of the leaf margins near the apex, I have not given these tendencies any taxonomic status, because they are (regularly) connected by intermediates.

In my opinion, *Oxystegus* is not distinguishable from *Trichostomum*, as a genus.

The oldest name available for the names I am reducing to synonymy is: *Trichostomum bombayense* C. Muell. In Sollman & Eén (1996) a new combination was made: *Pseudosymblespharis bombayensis* (C. Muell.) Sollman.

Pseudosymblespharis bombayensis (C. Muell.) Sollman, Tropical Bryology 12: 2. 1996.

Trichostomum bombayense C. Muell., Syn. Musc. 2: 628. 1851.

Tortula bombayensis (C. Muell.) Mitt., J. Linn. Soc. Bot.

Suppl. 1: 28. 1859.

Didymodon bombayensis (C. Muell.) Jaeg., Ber. S. Gall. Naturw. Ges. 1871-1872: 368. 1873. (Ad. 1: 216).

Type: (India), Bombay, herb. Kegelianum no. 10.025 ... herb. V. Brotherus, H, lectotype!, selected by Sollman & Eén (1996); isolectotype, S!

Note.

The figure in Zander (1993, p. 89), plate 12: fig. 1-3, as *Trichostomum bombayense*, is likely based on the material present in herb. NY (compare p. 90) and probably represents *Trichostomum tenuirostre* (Hook. & Tayl.) Lindb., judging from the figure only. Compare also the discussion in Townsend (1983).

Given the variation observed in *Pseudosymblespharis*, the following taxa, nearly all described from Asian material, are proposed as new synonyms. They are in chronological order:

N.B. The types of the taxa synonymized earlier, were studied/checked. They were found all to be correctly placed. Only where 'fide' is followed by a literature reference, I did not study the type material myself.

Barbula orthodonta C. Muell., Bot. Zeit. Regensburg 11 : 57-58. 1853. syn. nov.

Tortula orthodonta (C. Muell.) Mitt., J. Linn. Soc. Bot. Suppl. 1: 28. 1859.

Trichostomum orthodontum (C. Muell.) Broth., Nat. Pfl. 1 (3): 394. 1902.

Type: (India), Mont. Neilgherenses ... JE, isotype!
Note. This collection with the text n.sp., in the hand of C. Mueller.

Syrhopodon crispus Doz. & Molk., Pl. Junghuhn. 3: 335. 1854. syn. nov.

Type: (Indonesia, Java) in silva meriod. montis Merapi ad saxa, alt 4000 ft, F. Junghuhn, L, syntype!; (Indonesia, Java) Slamet, alt: 4-6000 ft, F. Junghuhn, L, syntype!

Tortula duriuscula Mitt., J. Linn. Soc. Bot. Suppl. 1:27-28. 1859. syn. nov.

Didymodon duriusculus Wils., Kew J. Bot. 9: 299. 1857. nom. nud.

Barbula duriuscula (Mitt.) C. Muell., Linnaea 36:12. 1869.

Trichostomum duriusculum (Mitt.) Broth., Nat. Pfl. 1 (3): 394. 1902.

Pseudosymblepharis duriuscula (Mitt.) Chen, Hedwigia 80:153. 1941.

Chionoloma duriuscula (Mitt.) Menzel, Willdenowia 22: 198. 1992. Type: (Sri Lanka), in Ceylon, G. Gardner 161, BM, isotype!

Note. Although Chen (1941 p. 153) gives J. Nietner as the type, the original publication clearly mentions only the Gardner collection. I have studied both collections. They are *Pseudosymblepharis bombayensis*.

Tortula angustata Mitt., J. Linn. Soc. Bot. Suppl. 1:28. 1859. syn. nov.

Barbula angustata (Mitt.) Sande Lac., Bryol. Jav. 2: 226. 1870.

Didymodon angustatus (Mitt.) Jaeg., Ber. S. Gall. Naturw. Ges. 1871-1872: 367. 1873. (Ad. 1: 215).

Trichostomum angustatum (Mitt.) Broth., Nat. Pfl. 1(3): 339. 1904.

Pseudosymblepharis angustata (Mitt.) Hilp., Beih. Bot. Centralbl. 50: 702. 1933.

Chionoloma angustata (Mitt.) Menzel, Willdenowia 22: 197. 1992.

Type: (Sri Lanka), in Ceylon, G. Gardner 134, BM, isotype!

Note. *Symblepharis angustata* (Mitt.) Chen is an orthographical error for *Pseudosymblepharis angustata* (Redfearn, et al., 1996).

Tortula stenophylla Mitt., J. Linn. Soc. Bot. Suppl. 1: 28. 1859. syn. nov.

Barbula stenophylla (Mitt.) Jaeg., Ber. S. Gall. Naturw. Ges. 1871-1872: 415. 1873. (Ad. 1: 263).

Trichostomum stenophyllum (Mitt.) Broth., Nat. Pfl. 1 (3): 394. 1902.

Oxystegus stenophyllus (Mitt.) Gangulee, Nova Hedwigia 12: 429. 1966.

Type: (India), in Himalayae orient., reg. alp. Sikkim in arborum cortice, J.D. Hooker 159, BM, lectotype! Notes.

1. Lectotype selected by Townsend (1983, p. 563-565). The taxon is also discussed there.

2. After studying the BM-material, including several additional non-type collections, I can see no more in the material than a (very) small state of *Pseudosymblepharis bombayensis*, with a somewhat unusual peristome. However, this (variation) has been seen several times, while studying fruiting *Pseudosymblepharis* collections (e.g. India, Foreau L. 981.75.398).

Tortula khasiana Mitt., J. Linn. Soc. Bot. Suppl. 1: 29. 1859. syn. nov.

Barbula khasiana (Mitt.) Jaeg., Ber. S. Gall. Naturw. Ges. 1871-1872: 415. 1873. (Ad. 1: 263).

Trichostomum khasianum (Mitt.) Broth., Nat. Pfl. 1 (3): 394. 1902.

Oxystegus khasianus (Mitt.) Gangulee, Nova Hedwigia 8: 149. 1964.

Pseudosymblepharis khasiana (Mitt.) Zand., Genera of the Pottiaceae ... : 80. 1993.

Type: (India), in monte Khasia, reg. sub trop. inter *Plagiochasma cordatum*, J.D. Hooker & T. Thomson s.n., NY, holotype!

Barbula subduriuscula C. Muell., Linnaea 38: 554. 1874. *Trichostomum subduriusculum* (C. Muell.) Broth., Nat. Pfl. 1 (3): 394. 1902.

Oxystegus subduriusculus (C. Muell.) Hilp., Beih. Bot. Centralbl. 50 (2): 667. 1933.

Pseudosymblepharis subduriuscula (C. Muell.) Chen, Hedwigia 80: 152. 1941.

Chionoloma subduriuscula (C. Muell.) Menzel, Willdenowia 2: 198. 1992.

Synonymized with *Pseudosymblepharis angustata* (Mitt.) Hilp. by Norris & Koponen (1989). Here treated as *Pseudosymblepharis bombayensis*.

***Symblepharis papillosula* Card. & Thér.**, Bull. Ac. Int. Geogr. Bot. 19: 17. 1909.

Pseudosymblepharis papillosula (Card. & Thér.) Broth., Nat. Pfl. 2 (10): 261. 1924.

Synonymized with *Pseudosymblepharis angustata* (Mitt.) Hilp. by Saito (1975). Here treated as *Pseudosymblepharis bombayensis*.

***Trichostomum ? aduncum* Par.**, Rev. Bryol. 36: 45. 1909. syn. nov.

Type: Nov. Caledonia, pr. summo Mt Mou, 1908, A. le Rat (s.n.), herb. E.G. Paris, L, isotype!

***Trichostomum verrucosum* Broth. & Par.**, Oefv. Finska Vet. Soc. Foerh. 51A (17): 12. 1909. syn. nov.

Oxystegus verrucosus (Broth. & Par.) Hilp., Beih. Bot. Centralbl. 50 (2). 667. 1933.

Pseudosymblepharis verrucosa (Broth. & Par.) Zand., Genera of the Pottiaceae ... : 80. 1993.

Type: New Caledonia, ad ripam Caricouie, pr. Noumea ... c. 140-300 m, Feb. 1904, A. le Rat 1180, herb. V. Brotherus, H, lectotype!

Note. Lectotype selected by Norris & Koponen (1989).

***Trichostomum mouense* Broth. & Par.**, Oefv. Finska Vet. Soc. Foerh. 51A (17): 13. 1909. syn. nov.

Type: New Caledonia, Monte Mou, in silvaticis, ad radicus, Jan. 1908, A. le Rat 1162, herb. V. Brotherus, H, lectotype!

Note. Lectotype selected by Norris & Koponen (1989).

***Trichostomum rigens* Broth. & Par.**, Oefv. Finsk. Vet. Soc. Foerh. 53A (11): 15. 1910.

Synonymized with *Trichostomum dubium* Thér., fide Thériot (1932). Here treated as *Pseudosymblepharis bombayensis*.

***Trichostomum (?) dubium* Thér.**, Bull. Ac. Int. Geogr. Bot. 20: 99. 1910.

Synonymized with *Pseudosymblepharis angustata* (Mitt.) Hilp., fide Norris & Koponen (1989). Here treated as *Pseudosymblepharis bombayensis*.

Note. Collections I studied (herb. L) from the type locality, indeed belong here.

***Trichostomum siamense* Broth. in Hosseus**, Beih.

Bot. Centralbl. 28 (II): 362. 1911. syn. nov.

Type: (Thailand), Siam, s.d., C. Hosseus s.n., herb. V. Brotherus, H, holotype!

Note. This name is not present in Index Muscorum (Wijk, et al. 1959-1969), although legitimately published.

***Trichostomum pervaginatatum* Broth.**, Leaf. Philipp. Bot. 6: 1978. 1913.

Pseudosymblepharis pervaginata (Broth.) Broth., Nat. Pfl. 2 (10): 261. 1924.

Synonymized with *Pseudosymblepharis subduriuscula* (C. Muell.) Chen, by Chen (1941). Here treated as *Pseudosymblepharis bombayensis*.

***Trichostomum sarawakense* Dix.**, J. Linn. Soc. Bot. 43: 308 + fig. 10. 1916. syn. nov.

Type: (Malaysia), Borneo, Sarawak, circa 1913, J.M. Pearson, ex herb. G. Webster, GRO, isotype!

***Tortella sakuraii* Broth.**, Oefv. Finsk. Vet. Soc. Foerh. 62 A (9): 6. 1921.

Synonymized with *Pseudosymblepharis papillosula* (Card. & Thér.) Broth. by Chen (1941). Here treated as *Pseudosymblepharis bombayensis*.

***Chionoloma induratum* Dix.**, J. Bot. London 60: 102 + fig. 6. 1922.

Tortula indurata Mitt. in Dix., J. Bot. London 60: 102. 1922. nom. nud.

Synonymized with *Pseudosymblepharis subduriuscula* (C. Muell.) Chen by Eddy (1990). Here treated as *Pseudosymblepharis bombayensis*.

***Tortella yunnanensis* Broth.**, Sitzungsber. Ak. Wiss. Wien Math. Nat. Kl. Abt. 1, 133: 564. 1924.

Synonymized with *Pseudosymblepharis subduriuscula* (C. Muell.) Chen, by Chen (1941). Here treated as *Pseudosymblepharis bombayensis*.

***Trichostomum minusculum* Dix. & P. Varde**, Arch. de Bot. (Bull. Mens.) 1 (8-9): 165 + fig. 7. 1927. syn. nov.

Type: India, Perumalmalai Shola, Pulney Hills, on trigonometrical survey stone ... 7329 ft, 4 April 1926, G. Foreau, herb. H.N. Dixon 200, BM!

Notes.

1. The original literature (Dixon & Varde, 1927) makes no explicit statement, if and where a type is designated.

2. The illustration in the protologue is not (quite) representative for the studied material.

***Pseudosymblepharis indica* Dix. & Varde**, Arch. de Bot. (Bull. Mens.) 1 (8-9): 166 + fig. III, 4. 1927. syn. nov.

Oxystegus indicus (Dix. & P. Varde) Hilp., Beih. Bot. Centralbl. 50 (2): 702. 1933.

Type: India, Tiger Shola, S. ridge, Perumalmalai, c. 6000 ft, 9 April 1926, G. Foreau, herb. H.N. Dixon 251, BM!

Note. The original literature (Dixon & Varde, 1927) makes no explicit statement, if and where a type is designated.

***Trichostomum perannulatum* Dix. & P. Varde**, Ann. Crypt. exot. I: 280-281 + fig. 3. 1928. syn. nov. Type: S. India, Mahableshwar, western Ghats, on tree, 1918, S.J. Sedgwick, herb. H.N. Dixon 4667, BM!

Note. The original literature (Potier de la Varde, 1928) makes no explicit statement if and where the type is designated.

***Chionoloma latifolium* Dix.**, J. Siam Soc. Nat. Hist. Suppl. 9: 17. 1932.

Synonymized with *Pseudosymblepharis subduriuscula* (C. Muell.) Chen by Eddy (1990). Here treated as *Pseudosymblepharis bombayensis*.

***Pseudosymblepharis tortelloides* Dix. in Hilp.** Beih. Bot. Centralbl. 50 (2): 670. 1933. nom. nud. Collection studied: Philippines, Palawan, Mt Manalsal, 4000 ft, 1929, G. Edano, herb. H.N. Dixon, BM!

Note. The material is clearly a common form of *Pseudosymblepharis bombayensis*.

***Chionoloma longifolium* Dix.**, J. Linn. Soc. Bot. 50: 85. + fig. 13. 1935.

Synonymized with *Pseudosymblepharis subduriuscula* (C. Muell.) Chen by Eddy (1990). Here treated as *Pseudosymblepharis bombayensis*.

***Stephanodictyon borneense* Dix.**, J. Linn. Soc. Bot. 50: 86 + fig. 14. 1935.

Trichostomum borneense (Dix.) Zand., Genera of the Pottiaceae ... : 92. 1993.

Synonymized with *Pseudosymblepharis subduriuscula* (C. Muell.) Chen by Eddy (1990). Here treated as *Pseudosymblepharis bombayensis*.

***Pseudosymblepharis pallidens* Dix.**, J. Bombay Nat. Hist. Soc. vol. 39: 776 + fig. 3. 1937. syn. nov. *Trichostomum pallidens* (Dix.) Zand., Genera of the Pottiaceae... 92. 1993.

Type: (India), Assam, Japwa, Naga Hills, 8000 ft, Oct. 1935, Bor, herb. H.N. Dixon 322, BM, holotype!

***Tortella goughii* Dix.**, Not. R. Bot. Garden Edinb. 19(95):284 + fig. 6. 1938.

Synonymized with *Pseudosymblepharis angustata* (Mitt.) Hilp., fide Townsend (1978). Here treated as *Pseudosymblepharis bombayensis*.

Note. Not listed as such in Zander (1993).

***Pachyneurum bartlettii* Bartr.**, Philip. J. Sc. 68: 100-101 + fig. 119. 1939. hom. illeg. syn. nov. *Pachyneuroopsis bartlettii* (Bartr.) H.A. Miller, Taxon 19: 822. 1970.

Type: Philippines, Luzon, Rizal Prov., Montalban, 30 June-4 July 1935 H. H. Bartlett 14.392, FH, holotype!

Note. See also the text below.

***Stephanodictyon obscurirete* Dix.**, J. Bot. London 79:60.1941.

Synonymized with *Pseudosymblepharis angustata* (Mitt.) Hilp. by Eddy (1990). Here treated as *Pseudosymblepharis bombayensis*.

Note. Zander (1993) considers *Stephanodictyon obscurirete* as *Trichostomum brachydontium* Br. However, I agree with Eddy (1990), after studying type material, that it is a *Pseudosymblepharis* species (*P. bombayensis*).

***Symblepharis marginata* Dix.**, J. Bot. London 79: 58. 1941.

Synonymized with *Pseudosymblepharis subduriuscula* (C. Muell.) Chen, fide Eddy (1990). Here treated as *Pseudosymblepharis bombayensis*.

***Trichostomum uncinifolium* Dix.** (“*uncinifolium*”), 150th Anniv. R. Bot. Garden Calcutta 180. 1942. syn. nov.

Type: India, Kashmir, Srinagar ... Aug. 1932, Mrs Garret 2515, herb. H.N. Dixon, BM, holotype!

Notes.

1. This name is not present in Index Muscorum (Wijk, et al., 1959-1969), although legitimately published.

2. Only one collection was available for study.

***Trichostomum subulifolium* Bartr.**, *Lloydia* 5: 255 + fig. 9. 1942.

Synonymized with *Pseudosymblepharis angustata* (Mitt.) Hilp. by Norris & Koponen (1989). Here treated as *Pseudosymblepharis bombayensis*.

***Holomitrium trichostomoides* Dix.**, *J. Linn. Soc. Bot.* 80: 3. 1942.

Synonymized with *Pseudosymblepharis angustata* (Mitt.) Hilp., fide Norris & Koponen (1989) and Eddy (1990). Here treated as *Pseudosymblepharis bombayensis*.

***Holomitrium novae-guineae* Dix.**, *Farlowia* 1: 27. 1943.

Synonymized with *Pseudosymblepharis angustata* (Mitt.) Hilp. by Norris & Koponen (1989) and Eddy (1990). Here treated as *Pseudosymblepharis bombayensis*.

***Trichostomum subminusculum* Dix. & P. Varde**, *Rev. Bryol. Lich.* 15: 145. 1946. syn. nov.

Type: India merid., Shembaganur, Feb. 1932, G. Foreau 5929, herb. H.N. Dixon, BM!, PC!

Notes.

1. The protologue (Potier de la Varde, 1946) makes no explicit statement, if and where the type is designated.

2. Only one collection was available for study.

***Pleurochaete squarrosa* (Brid.) Lindb. var. *crispifolia* Nog.**, *J. Jap. Bot.* 27 (9): 287 + fig. 54. 1952.

Trichostomum crispifolium Nog., *J. Jap. Bot.* 27 (9): 287. 1952. nom. nud.

Synonymized with *Pseudosymblepharis angustata* (Mitt.) Hilp. by Saito (1975). Here treated as *Pseudosymblepharis bombayensis*.

***Trichostomum burmense* Bartr.**, *Rev. Bryol. Lich.* 23: 245. 1954. syn. nov.

Oxystegus burmensis (Bartr.) Gangulee, *Moss. E. India* 653. 1972.

Type: Burma, Maymyo-Lashio road, 10 mi. NE of Maymyo, 1952-1953, R. Svihla 3305, FH, holotype!

Note. Although I once (Sollman, 1984) reduced this name to *Trichostomum tenuirostre*, this name is better considered as a very small state of *Pseudosymblepharis bombayensis*. It is the kind of material on which no new names should be based.

***Trichostomum perlongifolium* Froehl.**, *Rev. Bryol. Lich.* 31: 92. 1962. syn. nov.

Pseudosymblepharis perlongifolia (Froehl.) Zand., *Genera of the Pottiaceae ...* : 80. 1993.

Type: (Malaysia), N. Borneo, Bukit Ampuan, base of Mt Kinabalu, 3-4000 ft, 2 Nov. 1959, W. Meijer B. 12.689, det. J. Froehlich, L, NY, isotype!

Note. Some of the large collections made by W. Meijer -mostly distributed as very small duplicates- were sent to J. Froehlich for identification. *Trichostomum perlongifolium* and *Stephanodictyon angustinerve* were in fact based on material collected by W. Meijer and provided by him with a collecting number, although the original publication gives no numbers. I have studied all the *Pseudosymblepharis* collections made by W. Meijer in Borneo.

***Stephanodictyon angustinerve* Froehl.**, *Rev. Bryol. Lich.* 31: 92. 1962. syn. nov.

Trichostomum finukamactum Zand. nom. nov., *Genera of the Pottiaceae ...* : 92. 1993.

Type: (Malaysia), N. Borneo, west coast res. Mt Kinabalu, above Paka cave, mossy subalpine forest, 9000 ft, July 1960, W. Meijer B. 12.723, det. J. Froehlich, L, isotype!

***Pseudosymblepharis papillosula* (Card. & Thér.) Broth. var. *robusta* Tixier**, *Rev. Bryol. Lich.* 34: 132-134 + fig. 5. 1966. syn. nov.

Type: Vietnam, Chapa, sur rochers ensoleillés, sommet du mamelon surplombant l'extrémité du village, vers 1600 m, juillet 1928, A. Pételot 96,

herb. I. Thériot, in herb. T. Herzog, JE, isotype!
Notes.

1. Pételot 96. The material should be present in the general herbarium PC, but was not available for study; I tried several times. Only the Jena-part could be studied. However, likely this part of the number was not seen by Tixier.

2. Other Pételot numbers studied (herb. PC), from the type locality, also belong to *Pseudosymblepharis bombayensis*.

***Oxystegus crassicostatus* Norris & T. Kop.**, Acta Bot. Fenn. 137: 90 + fig. 2 g-k. 1989. syn. nov.

Type: Papua New Guinea, Morobe ... moist shaded soil, 1200-1450 m, 18 May 1981, D.H. Norris 59.229, H, holotype!; 58.777, H, paratype!

Note. The description, figure and table characters in the original publication (Norris & Koponen, 1989) do not agree well with the type material.

Note 1.

***Trichostomum robustum* Broth. ex Ihs.**, Trans. Sapporo Nat.Hist. Soc. 13: 396. 1934.

Type material is most probably lost. I was unsuccessful to locate it in H, BM, NY, or S. Compare also: Saito 1975, p. 528; Sayre 1977, p. 510; Noguchi 1988, p. 271 and Norris & Koponen 1989, p. 95. I have seen some material bearing this name, all det. Brotherus (herb. GRO, H, L). They are all *Pseudosymblepharis bombayensis*.

Note 2.

***Trichostomum brachyphyllum* Wils.**, Kew J. Bot. 9: 321. 1857. nom. nud.

Material studied: 126. (China), Tibet occid.; Iskardo, Balti, alt 7.000 ped., T.T., herb. Wilson, BM!

This name was treated as a synonym of *Pseudosymblepharis duriuscula* (Mitt.) Chen, by Chen (1941, p. 153); copied by the authors of Index Muscorum (Wijk, et al., 1959-1969). However, the material studied (above) is much better treated as belonging to, or very near *Barbula amplexifolia* (Mitt.) Jaeg., with the large, axillary gemmae present. This species is rather common in the Himalaya-region. In total, I studied c. 40 collections from this area.

Note 3.

***Tortula apiculata* Wils.**, Kew J. Bot. 9: 322. 1857.

nom. nud.

Material studied: 166 (113). Nepal orient., Tambur river, alt 8-10.000 ped., J.D.H., herb. Wilson, BM! This name was treated as a synonym of *Pseudosymblepharis duriuscula* (Mitt.) Chen, by Chen (1941, p. 153); copied by the authors of Index Muscorum (Wijk, et al., 1959-1969).

However, the material studied (above) is much better treated as belonging to, or very near *Barbula amplexifolia* (Mitt.) Jaeg., with large axillary gemmae present. This species is rather common in the Himalaya-region.

Note 4.

***Tortula gregaria* Mitt.**, J. Linn. Soc. Bot. Suppl. 1: 29. 1859.

Barbula gregaria (Mitt.) Jaeg., Ber. S. Gall. Naturw. Ges. 1871-1872: 424. 1873 (Ad.l: 272).

Barbula indica (Hook.) Spreng. var. *gregaria* (Mitt.) Zander, Cryptog. Bryol. Lichénol. 2: 6. 1981. Type: 166. (Nepal), in Nepaliae orient. reg. temp. ... J.D. Hooker, syntype, BM!; 126. (China), in Tibetiae reg. temp. T. Thompson, syntype, BM! Remarks.

1. The type material (above) was studied, including other non-type collections, mostly from the herbarium Hooker & Thomson (BM). In my opinion, all this material belongs to, or is very near *Barbula amplexifolia* (Mitt.) Jaeg. Large, redbrown axillary gemmae are present on the plants. Mitten (1859, p. 29-30) used the numbers 126 and 166, to describe his new species *Tortula gregaria* Mitt., citing also *Tortula apiculata* Wils. nom. nud. and *Trichostomum brachyphyllum* Wils. nom. nud. See also the notes 2 and 3, above.

2. However, Index Muscorum (Wijk, et al., 1959-1969) treated *Tortula gregaria* Mitt. as a synonym of *Pseudosymblepharis duriuscula* (Mitt.) Chen, citing Chen (1941, p. 153). This is clearly not correct.

3. Furthermore, Zander (1979, p. 185) treated *Tortula gregaria* Mitt. as a synonym of *Barbula indica* (Hook.) Spreng. s.l. A few years later this author (Zander 1981, p. 6) treated this taxon as a variety of *Barbula indica*, viz. var. *gregaria*. However, in my opinion this is not correct.

4. In addition, I have studied many collections called *Barbula indica*, throughout the total range (pantropical) and observed very little variation. I did not observe variation in the

direction of *Barbula amplexifolia*. In total, I studied circa 40 collections called *Barbula amplexifolia*, mostly from the Himalaya-region.

5. In conclusion, *Tortula gregaria* Mitt., is best considered as identical with, or very near *Barbula amplexifolia* (Mitt.) Jaeg.

Note 5.

Tortula cylindrotheca Mitt., J. Linn. Soc. Bot. Suppl. 1: 30. 1859.

Barbula cylindrotheca (Mitt.) Jaeg., Ber. S. Gall. Naturw. Ges. 1871-1872: 416. 1873. (Ad. 1: 264).

Trichostomum cylindrotheca (Mitt.) Broth., Nat. Pfl. 1 (3): 394. 1902.

Oxystegus cylindrothecus (Mitt.) Gangulee, Nova Hedwigia 12: 430. 1966.

Type: 164-B. (India), Sikkim, Himalaya, 9000 ped., Chongtam reg. temp., herb. J.D. Hooker, BM!, NY! Remarks.

1. By mistake, printed in Townsend (1983, p.561) as Hooker 1646.

2. The BM-collection annotated by C.C. Townsend as *Trichostomum bombayensis* C.M., dat. 28 March 1979.

3. The nomenclature here is rather complicated; discussed in Townsend (1983, p. 561). However, Wilson & Mitten (1857, p. 322) clearly state in their list, that no. 164-B contains two elements. Mitten (1859, p. 30) described *Tortula cylindrotheca*, based on no. 164-B, from fruiting plants, referring to Wilson & Mitten (1857, p. 322).

4. The material (above) matches the illustration (fig. 314) in Gangulee (1972) well, although here a non-type is illustrated.

5. In conclusion -contrary to Townsend (1983)- I prefer to treat *Tortula cylindrotheca* Mitt. as a synonym of *Trichostomum tenuirostre* (Hook. & Tayl.) Lindb.

Illustrations

Good, often detailed figures, based -mainly- on Asiatic material, are given by: Chen (1941): p. 150, Abb. 15, fig. 1-11. Eddy (1990): p. 154, fig. 262; p. 155, fig. 263; p. 157, fig. 264. Gangulee (1972): p. 658, fig. 312; p. 668, fig. 317; p. 671, fig. 318. Gao (1996): p. 144, fig. 53, 1-13; p. 161, fig. 57, 1-6. Noguchi (1988): p. 273, fig. 112. Norris & Koponen (1989): p. 92, fig. 3, a-n. Saito (1975): p. 438, fig. 28, 7-15. Zander (1993): p. 77, plate 6 (as

Chionoloma); p. 78, plate 7 (*Pseudosymblespharis*); p. 81, plate 8 (as *Pachyneuropsis*).

Discussion of variable characters

Morphological variation in *Pseudosymblespharis* can be considerable.

1. height of the plants

The stems of most collections measure between 2-4 cm in length, but occasionally up to 8 (-10) cm.

Smaller plants, only up to 1-2 cm in length, occur also rather frequently. Specimens shorter than 1 cm are rare; they grew mostly on wood or on rather hard stony substrata.

2. colour of the plants

The colour of herbarium specimens can be variable, ranging from rather dark green to clearly yellowish.

Most collections seen are yellowish or greenish above, more tan to reddish-brownish in older parts. Sometimes rather strikingly yellowish plants were seen. Furthermore, material that has been longer in a dry condition can show a fading of the colouring towards a yellowish tinge.

3. ramification

Usually not branching, or very few branches are present. Larger plants usually show some branching, partly subfloral.

4. foliation

In most cases the leaf insertion is rather regular. More seldomly, the leaves occur in more or less interrupted tufts, especially in some larger plants.

5. fragility of the leaves

Specimens with fragile leaves occur rather frequently. Judging from information on herbarium labels, these plants are often collected near water.

6. leaf margin

In some collections seen, there are some bistratose patches present along the leaf margins (mostly near the apex). This trend in the material was seldom seen, and is variably expressed in the collections studied. A rather extreme expression of this kind is: *Pachyneuropsis bartlettii* (Bartr.) H.A. Miller, only known from the type locality on the Philippines, H.H. Bartlett 14.392 (FH). Even in this collection, the border thickening is rather variable, viz. of one to two or three layers, mostly only in the apex region.

On balance, but with hesitation, this collection

can be considered as a variety of *Pseudosymblypharis bombayensis*. However, more additional collections are desirable.

7. leaf base (fig. 1; fig. 3)

In most cases the leaf base is clearly sheathing or at least expanded on some leaves. However, the variation observed, was considerable, frequently even within one tuft or on cauline leaves from one plant (e.g. China, H. von Handel-Mazzetti 281, type of *Tortella yunnanensis* (H); Indonesia, M. Fleischer 125 (L)).

Most collections seen have an expanded base at least in some (better developed) leaves.

The structural details of the leaf base can be highly

variable on leaves from one plant, especially in

1. the shape of the leaf base;
2. the length of the leaf base in relation to the leaf length;
3. the extent of marginal bordering;
4. the pitting, colour and wall thickening of the cells (e.g. Philippines, R.M. del Rosario 12.116 (GRO); Malaysia, W.Meijer B. 11.775 (L)).

8. colour of leaf base

Mostly, the leaf bases are yellowish to orange, especially when old. Plants with a nearly completely hyaline leaf base also occur rather frequently. This last condition is more commonly present in smaller material and in younger parts of plants.

9. shape and colour of marginally enlarged basal cells

The enlarged marginal basal cells are hyaline to yellowish-orange, sometimes obliquely ascending up margin for a longer or shorter distance. In some cases the usually hyaline ascending marginal border is rather pronounced, but mostly it is variable, frequently even on leaves from one plant, e.g. Malaysia, W. Meijer 11.775 (L); Papua New Guinea, D.H. Norris 59.229, type of *Oxystegus crassicosatus* (H). The marginal border zone (when present) is usually weakly demarcated, but sometimes more or less clearly present, e.g. in the type of *Chionoloma indurata* Mitt. ex Dix. (Burma, Parish 137 (BM)).

Especially in smaller material, the border of the variably ascending marginal cells can be almost absent or completely so. These plants were often collected on wood, mostly tree bases, sometimes on stony substrata or on compacted soil. Smaller

specimens are likely to be confused with *Trichostomum tenuirostre* and some forms of *Trichostomum brachydontium* (see below).

The group of oblique ascending marginal cells (when present) is commonly not sharply demarcated. In the related genus *Tortella* (Lindb.) Limpr. it is sharply demarcated (see below).

10. the pitted cells in the leaf base

In larger, better- to well-developed plants these cells are very often clearly present. However, in material with much shorter leaves, these cells can be variably differentiated to nearly absent, e.g. India, G. Foreau s.n., L 980.220.823; Philippines, R.M. del Rosario 12.116 (GRO).

11. undulation of the leaf margin just above the leaf base (fig. 1)

This undulation is mostly present in larger plants, but can be almost or completely absent in smaller material. This condition is variable even on one plant or in one tuft (e.g. Philippines, B.O. van Zanten 68.3900-B (GRO)).

12. costa

The strong costa provides one of the better characters, especially suited for separating collections that are difficult to distinguish from *Trichostomum tenuirostre* and from some forms of *Trichostomum brachydontium* (see below).

In nearly all the material seen, the dorsal side of the costa is essentially smooth. However, in some collections, several low, spiculate papillae are present in the apical region, mostly only on a few leaves.

13. length of excurrent part of the costa

This character is too variable to be useful, although Chen (1941 p. 149) used it in his key. Furthermore, the excurrent part of the costa is regularly broken off, especially on older material.

14. the leaf apex

In most cases the apex gradually tapers to a long- or short- acuminate point, but this can be variable sometimes, even on leaves from one plant. In small specimens with leaves not yet fully grown, the apex is sometimes more broadly rounded. Cuspidate to nearly mucronate leaf apices sometimes occur. Rather rarely small cucullate leaf apices are present. This kind of material can easily be confused with *Trichostomum crispulum* (see below).

15. laminal papillae

The laminal papillae are best examined, if possible,

in younger leaves of the plants. In older material, or plants in poor condition, the laminal papillae are sometimes more difficult to distinguish well. This kind of material was rather rarely seen and came mostly from very wet places, e.g., on a bluff and near water.

Delimitation from other taxa

Larger plants of *Pseudosymblepharis bombayensis* are rather easily recognized. In fact, very few collections seen were found to be misnamed as to genus in herbaria. Smaller states, however, are apt to be confused with several other taxa.

1. *Trichostomum tenuirostre*

The variation within *Trichostomum tenuirostre*, is discussed in Crum & Anderson (1958). The contrasting table in Sollman & Een (1996) is repeated here.

Especially smaller, non-fruiting samples are sometimes very difficult to tell apart. The best characters for identifying poorly developed specimens are listed in tab. 1.

2. *Trichostomum brachydontium*

The best characters for separating the taxa are:

1. In *Trichostomum brachydontium* the costa at leaf base on the ventral side is mostly to about 80 µm in width (only occasionally somewhat wider). In *Pseudosymblepharis* it is far more pronounced, about 100 µm (to 150 µm) in width, in better developed leaves.

2. In *Trichostomum brachydontium* the general leaf outline is commonly lanceolate, to about 3.5 mm long, 3-6:1, mostly with rather abruptly rounded apices, with a percurrent to shortly excurrent costa. *Pseudosymblepharis bombayensis* commonly has another leaf outline (fig. 1).

3. The basal laminal cells in *Trichostomum brachydontium* more commonly gradually grade into the upper green papillose cells. In *Pseudosymblepharis bombayensis*, on the contrary, this transition zone is mostly far more abrupt, especially in small material.

4. The rhizoids emerge from the stem base in *Trichostomum brachydontium*. In *Pseudosymblepharis bombayensis* tomentum is

present in nearly every leaf axil, but not so in *Trichostomum brachydontium*.

5. In well developed plants of *Pseudosymblepharis* the laminal papillae are far more dense over the lumen than is the case in *Trichostomum brachydontium*.

As far as I am aware, *Trichostomum brachydontium* is rarely collected in tropical countries near the equator, although it does occur there. *Pseudosymblepharis* is far more common in this region.

3. *Trichostomum crispulum*

In tropical countries near the equator, *Trichostomum crispulum* is very rarely collected as far as I am aware. Some collections of *Pseudosymblepharis* can be morphologically very similar, e.g., the type of *Trichostomum sarawakense* Dix. Contrary to Norris & Koponen (1989, p. 98), who suggest this plant is possibly *Trichostomum crispulum*, I agree with Eddy (1990, p. 156) after studying the type material, that this taxon is a small state of *Pseudosymblepharis* with markedly pitted basal cells, which are not present in *Trichostomum crispulum*.

4. *Tuerckheimia svihlae* (Bartr.) Zand.

Formerly known as *Gymnostomum angustifolium* (Saito 1972), but now treated as a *Tuerckheimia* species (Zander 1993).

This plant is rarely present in parts of S.E. Asia. I have not seen any confusion, but misnaming is possible. Sometimes *Tuerckheimia* and *Pseudosymblepharis* grow together. For a discussion of *Tuerckheimia*, see Zander (1993). In small states of *Pseudosymblepharis bombayensis* the leaf base is mostly clearly sheathing or at least expanded.

The general outline of the leaves in *Pseudosymblepharis* is mostly quite different from those of *Tuerckheimia*.

In cross sections of *Tuerckheimia*, the structure and details of the laminal papillae are clearly different from those of *Pseudosymblepharis bombayensis*.

5. *Tortella* species

The species most commonly present in parts of tropical Asia is *Tortella humilis* (Hedw.) Jenn. This plant is usually fruiting. The sharply

*Pseudosymblepharis
bombayensis*

Leaf base often expanded to sheathing.

Yellowish, elongated, sinuose and thick-walled transitional cells present in most leaves but variably expressed.

Upper 2/3 of lamina plane, or nearly so, in most leaves.

Costa at leaf base on ventral side at least 80 μm wide, often much more; on dorsal side brownish or reddish, dull.

Laminal papillae in mid leaf dense, in surface view obscuring the lumen.

Leaf margin just above leaf base often with undulate "shoulders", especially in older and larger leaves, but otherwise plane.

Leaf margins nearly always forming straight lines.

Rhizoids tubers not known.

*Trichostomum
tenuirostre*

Leaf base not or hardly expanded, nor sheathing.

Yellowish transitional cells absent.

Upper 2/3 of lamina, and especially the borders, wavy or undulate in most leaves.

Costa at leaf base on ventral side mostly less than 80 μm wide; on dorsal side whitish, glistening.

Laminal papillae in mid leaf not obscuring the lumen, which is pluri-papillose.

"Shoulders" absent.

Leaf margins, especially near apex, bulging somewhat irregularly, seldom forming straight lines.

Rhizoid tubers sometimes present. Conf. Zander (1993: 87).

Tab.1: Characters distinguishing *Pseudosymblepharis bombayensis* and *Trichostomum tenuirostre*.

demarcated, obliquely ascending group of basal cells is clearly present, in most leaves.

Part of the *Pseudosymblepharis* material seen has only a weakly developed ascending marginal border, present only in some leaves and very often weakly demarcated and variably expressed. These specimens are therefore not likely to be confused with *Tortella* s.str. Small *Pseudosymblepharis* specimens with a clearly ascending hyaline marginal border can easily be recognized by the differences in the type of the papillae on the laminal cells. In *Tortella* they are high and coroniform. In *Pseudosymblepharis* they are lower and plate-like.

Furthermore, in *Pseudosymblepharis* the costa at leaf base is commonly much wider than in *Tortella*. In addition, in *Tortella* the yellowish transitional cells - commonly present in *Pseudosymblepharis* - are lacking.

6. *Molendoa* species

It is possible that some states of *Pseudosymblepharis* are confused with *Molendoa* taxa. Furthermore, their geographical ranges can sometimes come close, or overlap partly (e.g. Himalaya region, China, Japan).

However, *Molendoa* taxa are mainly arctic-alpine in distribution. *Pseudosymblepharis* on the whole has a (sub) tropical range.

1. *Molendoa* taxa have a well developed, large central strand in the stem. In *Pseudosymblepharis* this is commonly lacking, or only (very) weakly present.

2. Furthermore, there are clearly differences between the two genera in the type of papillae covering the cells of the lamina.

3. Usually the details of the leaf bases between *Pseudosymblepharis* and *Molendoa* are different.

4. Commonly the costa disappears near the leaf apex in *Molendoa*. In *Pseudosymblepharis* it is commonly shortly excurrent.

5. Occasionally, *Molendoa* taxa have also gemmae present. They are not known in *Pseudosymblepharis*.

Furthermore, see especially (the text) in Saito (1975, p. 461).

Geographical distribution in Asia

Material of *Pseudosymblepharis bombayensis* was seen from the countries listed below. The total number of studied collections is given in parentheses. For the larger countries, the provinces or regions are added. The countries are given in alphabetical order.

Bhutan (3); Burma (3); China (15): Prov. Guangdong, Guizhou, Hubei, Kouy-Tscheou, Sichuan, Yunnan; India (40): Assam, Karnataka, Kashmir, Maharashtra, Meghalaya, Sikkim, Tamil Nadu, Uttar Pradesh; Indonesia: Ambon (1), Bali (3), Borneo (42), Buru (1), Flores (13), Java (65), Lombok (3), Sulawesi (16), Sumatra (22), Timor (1); Japan (18); Peninsular Malaysia (6); Nepal (8); Papua New Guinea (140): East Highlands, Goroka, Koroba, Milne Bay, Morobe, Wabag, Western Highlands, West Sepik, Tari district/region; Philippines: Luzon (200), Mindanao (10), Mindoro (1), Negros (2), Palawan (10); Sri Lanka (53); Taiwan (1); Thailand (49); Vietnam (7); Yemen, Socotra (2).

Note. C.I.S. countries (formerly USSR). Not listed in the consulted checklist (Ignatov & Afonina, 1992).

Habitat

Pseudosymblepharis bombayensis is frequently collected in the tropics and subtropics of Asia. The species is found on stony substrata, mostly with (at least some) lime, such as basalt, brick, boulders, granite, lava, rocks and sandstone. The plant is also found in primary and secondary forest, on living and dead wood, especially *Pandanus*. Collections were seen from tree bases, stumps, trunks, branches, vines and sometimes on shrubs. Most habitats are more or less earth-covered.

Furthermore, the species is regularly found on soil, clay, loam and steep walls (along hollow roads). Some collections were from litter, peaty humus, tussock and dead plants, a few from tree ferns, rarely on larger mosses (e.g., *Spiridens*).

Most material came from places that are rather shaded and moist to wet, more or less permanently so. A minority of the collections seen were from more exposed habitats.

The species is most frequently collected from sea level to circa 3000 m, more seldom to about 4000 m.

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