

Studies on some Asian mosses of the Pottiales, mainly from the Himalayas

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Abstract. Eighteen taxa are proposed as new synonyms in this study. *Barbula calycina* Schwägr. and *Tortula ruraliformis* (Besch.) Ingham are reported new for China. The types of *Barbula pugionata* Müll. Hal. and *Streblotrichum gracillimum* Herzog could not be located; comments on these two taxa are given. *Barbula pugionata* is considered as a questionable synonym of *Syntrichia gemmascens* (P.C. Chen) R.H. Zander. *Streblotrichum gracillimum* is *Bellibarbula recurva* (Griff.) R.H. Zander. Fruiting specimens of *Didymodon giganteus* (Funck) Jur., *Didymodon leskeoides* K. Saito and *Didymodon subandreaeoides* (Kindb.) R.H. Zander are reported from the Himalayas. *Didymodon subandreaeoides* and *Bryoerythrophyllum rubrum* (Geh.) P.C. Chen are reported new for Mongolia. *Didymodon hastatus* (Mitt.) R.H. Zander replaces *Didymodon maschalogenae* (Renauld & Cardot) Broth. *Barbula subcontorta* Broth. is here viewed as *Didymodon tectorum* (Müll. Hal.) K. Saito: the latter is a distinct species.

Over the last years many unnamed pottiaceous specimens from the Himalaya region were identified by the author. These include the large collections made by G. and S. Miehe (Marburg, Germany), and also much of the materials housed in herbarium at Edinburgh (U.K.) which were mainly collected by D.G. Long. In this context, several types from the region were also examined. The identified specimens of the Miehe materials are housed in L, while the Edinburgh collections were returned to E, with a small representative duplicate set kept in Leiden at L.

The pottiaceous taxa described as new to science from North West Himalayas by Dixon (1942) were also examined. Interestingly, this Dixon's publication was not mentioned in Index Muscorum (Wijk et al. 1959 – 1969). However, the information of moss taxa in this paper was later included in the numerous volumes of Crosby's Index of Mosses (Crosby et al. 1992, 1994, 1997). All author citations in botanical names follow Brummit and Powell (1992).

(1) *Barbula amplexifloia* (Mitt.) A. Jaeger
(1a) *Rhamphidium crispifolium* ('cribbifolium')
Dixon, in K. Biswas (Ed.), 150th Anniv. Vol.
Roy. Bot. Garden Calcutta: 179. 1942. *syn. nov.*
Type: India, Sikkim, Choongtam, 2450 m, non
fruiting, May 1849, coll. *J.D. Hooker (195)*, BM
(holo!).

The characteristic axillary gemmae are present. I have seen much material from the Himalayas. This collection fits easily the rather variable *Barbula amplexifolia*. The material is not *Rhamphidium* Mitt. in the modern sense (see especially Norris & Koponen, 1989: 98-99; Zander, 1993: 275). The lamina cells in this material are densely pluripapillate.

(1b) *Rhamphidium laticuspe* Dixon in K. Biswas
(Ed.), 150th Anniv. Vol. Roy. bot. Garden
Calcutta: 179. 1942. *syn. nov.*

Type: (India), NW Himalaya, Murree Hills,
„Pipe Line“, fruiting, 2150 m, 16-17 June 1927,
R.R. Stewart (9111), Hb. H.N. Dixon (BM,
holo!).

Again, this collection is not a *Rhamphidium*. Two non type collections bearing this name were also studied. They are as follows: India, United Provinces, between Chakrata and Deoban, 8-9000 ft, fruiting, 1939, *N.L. Bor 514*, Hb. Dixon (BM!, „co-type“); India, U.P., 10.000 ft, 1940, *N.L. Bor (531-E)*, Hb. Dixon (BM!).

Large, axillary gemmae are present among the material. All these collections possess a large central strand in the stem. The plants are considered here to be *Barbula amplexifolia*.

(2) *Barbula calycina* Schwägr.

Although this taxon is not mentioned in the recent moss checklist for China (Redfearn et al., 1996), I came across it in the following specimen: China, Dgin, 2500-2800 ft, non fruiting, s. date, *Griffith s.n.*, Hb. W. Mitten (NY!, mixed in *Hyophila involuta*, *Philonotis*). There are two packets bearing the same data. However, this taxon was given in Magill's flora (Magill 1981, p. 241) for Southeast Asia. Gangulee's flora (1972) mentions this taxon (p. 663 as *Tortella*) for Asia 3 region of the Index Muscorum.

The Griffith collections are all from the Himalayan region. There are actually two localities as 'Dgins' on the Chinese side of the Himalayas, one in the Prov. Yunnan and one in Tibet.

(3) *Barbula (Syntrichia) pugionata* Müll, Hal.,
Nuov. Giorn. Bot. Ital. n. ser. 4: 253 - 254, 1897;
Tortula pugionata (Müll. Hal.) Broth., Nat. Pfl.
1 (3): 432. 1902.

The type of this taxon was not located in herb. BM, H, JE, M, S. Very likely, the type was an unicate (see also below). The Helsinki herbarium (H) sent on loan only a non type collection, which is as follows: *Barbula (Syntr.) pugionata* C.M., China interior, provincia Schensi, septentr. in Monte Kuan tou san (rariss), fruiting, *Rev. J. Giraldi 1290* Bis, hb. E. Levier, det. V.F.B., H-BR. no. 40.05.018!

This collection belongs, without any doubt, to *Syntrichia gemmascens* (P.C. Chen) R.H. Zander. Gemmae are present. The leaf margins are finely crenulate, with some marginal bordering. The leaves are only slightly recurved below. The stem bears brown tomentum. The lamina cells are pluripapillose, with tiny papillae not obscuring the lumen. This collection packet has the pencil text (likely in the hand writing of Brotherus): „erinnert durchaus an das unicum *B. pugionata*!“ („resembles absolutely the unicate *B. pugionata*!“).

Barbula pugionata is here considered as a still questionable synonym of *Syntrichia gemmascens*. Although *Barbula pugionata* is an older name (1897) than *Syntrichia gemmascens* (1929), no new combination is proposed here.

(4) *Bellibarbula recurva* (Griff.) R.H. Zander

Among the many collections studied from the Himalayas, I have not found any rhizoidal tubers for this species, which are illustrated by Vashistha and Chopra (1984) as the tubers of *Didymodon recurvus* (Griff.) Broth. I agree with Allen (2002: 33) that this taxon does not have rhizoidal tubers. However, in the closely related *Bryoerythrophyllum ferruginascens* (Stirt.) Giacom., the tubers are constantly present.

Bellibarbula recurva is apparently not rare in the Himalayas at higher altitudes, judging from the many collections present in the herbarium at Edinburgh. I agree with Zander (1993: 142) that *Bellibarbula kurziana* P.C. Chen is only weakly distinguishable from *Bellibarbula recurva*, using the characters given by Chen (1941: 223).

Seen in this context, the following taxa were studied and treated as one species under the name of *Bellibarbula recurva*:

(4a) *Bellibarbula kurziana* Hampe ex P.C. Chen, Hedwigia 80: 223 and pl. 38, fig. 1 – 5, 1941, *syn. nov.*

Gymnostomum kurzianum Hampe in A. Jaeger, Ber. Tätigk. St. Gallischen Naturwiss. Ges. 1877 – 78: 367, 1880, *nom. nud.*

Gymnostomum kurzii Hampe ex Kindb., Enum. Bryin. Exot. 61, 1888, *nom. nud.*

Hymenostylium kurzii Hampe in Müll. Hal., Gen. Musc. Frond. 396, 1900, *nom. nud.*

Type: India, Sikkim, Phaloot Top, c. 3550 m, fruiting, *S. Kurz 2062*, hb. Hampe, BM, holo! (Note: some literature (Zander, 1993: 140; Li and Crosby, 2001: 135) give *S. Kurz 2026* as type. However, this is not correct).

(4b) *Bellibarbula kurziana* Hampe ex P.C. Chen var. *purpurascens* Gangulee, Nova Hedwigia 8: 147 and plate 4 (below), 1964, *syn. nov.*

Gymnostomum purpurascens Hampe, *nom. nud.* (herbarium name).

Type: (India), Sikkim, Himalaya, Phalut Top (Phaloot), c. 3550 m, no fruits, *S. Kurz no. 2133*, hb. Hampe, BM! (Note. The herb Calcutta material was not available for study).

(4c) *Streblotrichum gracillimum* Herzog, Hedwigia 65: 155 – 157 and fig. 3, 1925, *syn. nov.*

Barbula gracillima (Herzog) Broth., Nat. Pfl. Ed. 2: 528. 1925.

Type: (China, Yunnan), bei Pe yen tsin, auf steiniger Erde, ca. 3000 m, anderen Moosen sehr spärlich beigemischt, fruiting, hb. Herzog, JE, not seen.

The type of this species has not been located by me, nor by Chen (1941: 222). Recently, the curator in hb. Jena (JE) informed

me, that the type is missing in the Herzog herbarium because of the destruction brought by Second World War. No other collections bearing this name were seen. I also have not located the type in H, JE, M, S.

The protologue of the *Streblotrichum gracillimum* provides the following characters:

1. the leaves are closely recurved below;
2. differentiated perichaetial leaves are present;
3. capsules are without peristomes;
4. the lamina cells are subpellucid, densely papillose;
5. the costa is rusty red in colour.

Interestingly I observed sometimes also smaller flagellate shoots in collections of *Bellibarbula recurva* from the Himalaya region.

Judging from the protologue and figures, the plants of *Streblotrichum gracillimum* belong to *Bellibarbula recurva* (Griff.) R.H. Zander. This suggestion was also expressed by Chen (1941: 222).

In conclusion, I agree with Zander (1978: 549; 1993: 142) that *Bellibarbula recurva* is a rather variable taxon.

(5) *Bryoerythrophyllum ferruginascens* (Stirt.) Giacom.

Didymodon strictorubellus Dixon, in K. Biswas (Ed.), 150th Anniv. Vol. Roy. bot. Garden Calcutta, p. 180. 1942. *syn. nov.*

Type: (India), Punjab, near Kyelang, above Chumba, non fruiting, 2750-4500 m, 1935, *Mr. and Mrs J. Garrett (2615)*, hb. Dixon (BM, holo!)

This collection bears rhizoidal tubers. The leaf apices are entire, not denticulate. The leaf base is sheathing. The general tinge is reddish brown. In my opinion the material is *Bryoerythrophyllum ferruginascens*.

(6) *Bryoerythrophyllum rubrum* (Geh.) P.C. Chen

Bryoerythrophyllum compactum J. Froehl., Ann. Naturhistor. Mus. Wien 67: 152. 1964. *syn. nov.*

Type: Afghanistan, Prov. Ghorat, in faucibus sept. versus spectantibus Mollah Allah, 12 km SW of Taiwara, c. 33°30' N, 64°24' E, c. 2200-2300 m, non fruiting, substr. calc., 29 VII 1962,

K.H. Rechner no. 19.778, det. J. Fröhlich (W!).

One additional number was studied, viz. *K.H. Rechner* no. 19.774, with the same data as the type reported above. Both collections are identical. These are large plants, to about 3 cm. The better developed leaves have a broader, hollow base, tapering often towards a smaller apex. In some leaves the apex is acute, no dentations are seen, only sometimes with somewhat bulging cells. The larger leaves are canaliculate with a rather strong costa. These two numbers contain also younger shoots with (much) smaller leaves. Many keeled leaves are present. I consider both collections to be *Bryoerythrophyllum rubrum*.

Based on several collections made by G. and S. Miehe, *Bryoerythrophyllum rubrum* is here reported new for Mongolia. This taxon is not listed in Tsegmed (2001). Their materials are preserved at L.

(7) *Bryoerythrophyllum wallichii* (Mitt.) P.C. Chen

Erythrophyllum hostile Herzog, Hedwigia 65: 151. 1925. *syn. nov.*

Bryoerythrophyllum hostile (Herzog) P.C. Chen, Hedwigia 80: 5, 264, 1941.

Type: (China, Prov. Yunnan), Pe yen tsin, c. 3000 m, fruiting, auf Erde, 1921, *S. Ten* no. 74 (JE, holo!).

The cauline leaves are broadly rounded at apex. The leaf margins in the apex region are irregularly dentate. The leaf margins show a weakly marginal bordering, sometimes nearly absent. The perichaetial leaves are differentiated, narrower, with the apex more acute. I have identified many collections from the Himalaya region as *Bryoerythrophyllum wallichii*. In my opinion the type material of *Erythrophyllum hostile* falls within the range of variation seen in *Bryoerythrophyllum wallichii*.

(8) *Didymodon aaronis* (Lorentz) J. Guerra
Tortula cucullifolia J. Froehl., Mitt. Thüring. Bot. Ges. 1 (2-3): 62. 1955. *syn. nov.*

Types: Afghanistan, „Berg bei der Hängebrücke über den Kabelfluss zwischen Dschelalabad und Laghman“, non fruiting, 650 m, 14.2.1950, *A. Gilli M 31*, Hb. J. Froehlich (S, holo!);

„Felswand am W. Hang des Scher Darwasah, bei Kabul“, 1800 m, non fruiting, 23.4.1950, *A. Gilli M 47*, Hb. J. Froehlich (S!).

Both collections are identical. The leaf apex is often broadly cucullate and hollow. The strong costa disappears just before apex. The leaf margins are plane, often with two layers of cells, especially near the apex. The lamina cells are more or less smooth. Small rhizoidal tubers are present. Specialized leaves with a gemma cup at apex were seen. All these points of observation lead me to the conclusion that the plants belong to *Didymodon aaronis*.

(9) *Didymodon asperifolius* (Mitt.) H.A. Crum, Steere and L.E. Anderson

Fruiting plants of this species were mentioned only by Dixon (1927) from the Himalayas as *Didymodon rufus* Lorentz. The latter is now a synonym of *Didymodon asperifolius*. In my case, I only saw non fruiting plant material from this region.

(10) *Didymodon giganteus* (Funck) Jur.

In herbarium D.G. Long (E), several fruiting collections of this species, labeled „*Didymodon* sp.“ from the Himalayas are found. The peristome teeth, when moist, are nearly straight.

(11) *Didymodon leskeoides* K. Saito

This taxon is likely not very rare in the Himalayas. It often grows intermixed with other mosses. I came across fruiting plants collected in Nepal, mixed inside the packet of *D.G. Long* no. 30.421 (E, L), which was preliminarily identified as *Didymodon* sp. The peristome teeth, when moist, are approximately straight. I have seen several collections of this species from the Himalayan region (Bhutan, China, India, Nepal) and also from Japan.

(12) *Didymodon hastatus* (Mitt.) R.H. Zander - *Didymodon hastatus* (Mitt.) R.H. Zander, Bull. Buffalo Soc. Nat. Sci. 32: 162. 1993.

Barbula hastata Mitt., J. Linn. Soc. Bot. Suppl. 1: 34. 1859.

Type: (India), in Himalayae orient. reg. Sikkim, fruiting, *J.D. Hooker* no. 185 (NY, holo!).

- *Barbula maschalogenae* Renaud & Cardot,

Bull. Soc. R. Bot. Belg. 41 (1): 53. 1905. *syn. nov.*

Didymodon maschalogenae (Renauld & Cardot) Broth., Nat. Pfl. 1 (3): 1192. 1909.

Type: (India), Sikkim, Darjeeling, non fruiting, G.A. Miller (Hb. Cardot, PC!).

I consider the type material of *Barbula hastata* to be fruiting plants of *Didymodon maschalogenae* (Renauld & Cardot) Broth. This name is identical with *Didymodon michiganensis* (Steere) K. Saito (Sollman, in Frahm et al., 1996: 137). *Didymodon hastatus* is the oldest name. A few non type collections of *Didymodon hastatus* were studied, leading me to this conclusion. One non type India collection studied proved to be *Bryoerythrophyllum ferruginascens* (Stirt.) Giacom., with setae and many large rhizoidal tubers. The data of this material are as follows: India ..., Simla, no date, Griffith s.n., (NY!, as *Barbula hastata* Mitt.).

In my opinion, in Gangulee's flora (1972: 697), the text and plate of this species do not agree well. For instance, the passage, „upper lamina cells ... coarse papillose“, is not accurate when comparing with the type material. The type collection of *Didymodon hastatus* is the only fruiting plant that I have seen.

(13) *Didymodon subandreaeoides* (Kindb.) R.H. Zander

Judging from the collections present in the Miehe material and also those in D.G. Long herbarium (E), this taxon is apparently not uncommon at higher altitudes in the Himalayas. Surprisingly enough, I came across also fruiting material from Nepal (D.G. Long 20.993, E, L). As a species of *Didymodon*, the peristome teeth are straight when moist. Additional specimens of this species are from the Himalayan region collected in Bhutan, China, India (Kashmir) and Nepal.

I also came across the following collection of this species from Mongolia: S. Gobi Aimag, Gobi Altai, Bayan Tsagaan summit area, coörd. 43°41'N 103°12'E, alt 2600 m, *Agropyron Poa* grassland on wind exposed upper N. facing slope, ground mosses, non fruiting, with *Didymodon tectorum*, 8 Jan. 1996, G. & S. Miehe

96.097.06.1, veg. rec. no. 84 (det. Ph. Sollman, Nov. 2003, Hb. L). This taxon was not listed in Ignatov (1994), nor by Tsegmed (2001).

(14) *Didymodon tectorum* (Müll. Hal.) K. Saito *Barbula subcontorta* Broth., Sitzungsber. Ak. Wiss. Wien 133: 565, 1924. *syn. nov.*

Type: China, Prov. Yunnan, in regio calide temperate prope urbem Yünnanfu. in fossis erosis, silvae ad templum Schili ngam, c. 2200 m, fruiting, 27 Feb. 1914, Leg. Handel Mazzetti no. 317, det. Brotherus (H, holo!).

This species is not uncommon at higher altitudes in the Himalayas. In total, I had studied about 60 collections from this region. This taxon is not closely related or identical with *Didymodon vinealis* (Brid.) R.H. Zander (Sollman, 1994). *Didymodon tectorum* is more closely related to *Didymodon rigidulus* Hedw., although *Didymodon acutus* (Brid.) K. Saito and its nearest allies bear no axillary gemmae.

Recently, I restudied the type material of *Barbula subcontorta* Broth. This taxon fits the studied material of *Didymodon tectorum* rather easily, in my opinion. Chen (1941: 200) mentioned no axillary gemmae for *Barbula tectorum*. In the non fruiting material that I studied, the gemmae are, however, infrequently present, ranging from a few to many.

The occurrence of *Didymodon tectorum* in Japan is still doubtful. Several years ago, I was unsuccessful in obtaining on loan the cited materials in Saito (1975: 517), which were reportedly preserved in TNS (see also Noguchi 1988: 316).

At present, I have seen Asian collections of *Didymodon tectorum* from the Himalaya region (Bhutan, China, India and Nepal), Central Asia and Mongolia. These materials are preserved in E, H, and L.

(15) *Didymodon tophaceus* (Brid.) Lisa *Didymodon planifolius* J. Froehl., Ann. Naturhistor. Mus. Wien 57: 38, 1950. *hom. illeg. syn. nov.*

Didymodon planotophaceus J. Froehl., Ann. Naturhistor. Mus. Wien 59: 118. 1953.

Type: Iran, Prov. Luristan, Bisleh, 50 km östlich

von Khorammabad, c. 1200-1400 m, substr. calc., non fruiting, 14-16 July 1948, *K.H. & F. Rechner* no. 7407 (S, holo!)

The lamina of this specimen is constantly unistratose. The leaf margins are often narrowly recurved below. The ventral superficial cells of the costa are mostly elongate (ca. 3:1) above mid leaf. The lamina cells are mostly 1:1, thick walled, irregular, papillae very low, conical, not obscuring the lumen. The anatomy of sections of the costa and stem leads me to the conclusion that the plants belong to the rather variable *Didymodon tophaceus*.

(16) *Grimmia crassifolia* Broth.

Gyroweisia shansiensis Sakurai, Bot. Mag. Tokyo 62: 104 + fig. 3. 1949. *syn. nov.*

Type: China, Prov. Shansi, non fruiting, Leg. *M. Sato* no. 46 (TNS, iso!)

This collection was also studied by H.C. Greven (2002). The plants have sometimes small and hyaline, excurrent leaf apices. H.C. Greven identified the material as *Grimmia crassifolia*.

(17) *Hymenostyliella llanosii* (Broth.) H. Rob.

Hymenostylium grandirete Dixon, in K. Biswas (ed.), 150th Anniv. Vol. Roy. Bot. Garden Calcutta: 178. 1942. *syn. nov.*

Types: (India), Kamaon, Kapkate, 1100-1200 m, fruiting, July 1899, *T.L. Walker* (377) (Hb. Dixon, BM, holo!); India, Dehra Dun, U.P., s. alt, fruiting, 1925, *A. Sawhney* (264) (Hb. H.N. Dixon, BM, paratype!)

These two collections are identical. The lamina is strongly involute when wet. The lamina cells are clearly bulging on the ventral side. Older parts of the stem are tomentose. The observation has led me to the conclusion that the plants from Kamaon belong to *Hymenostyliella llanosii*.

(18) *Hymenostylium recurvirostrum* (Hedw.) Dixon

(18a) *Hymenostylium diversifolium* J. Froehl., Ann. Naturhistor. Mus. Wien 67: 152. 1964. *syn. nov.*

Type: Afghanistan, sine loco speciali, non

fruiting, June-July 1962, *K.H. Rechner* 19.882 (W!).

In my opinion, this collection is a rather common form of the variable *Hymenostylium recurvirostrum*. Younger shoots are also present with more blunt leaf apices. The lamina papillae are low, not obscuring the lumen. There is some leaf shape variation present in the apical part, ranging from rather blunt to more acute, acuminate. The upper part of the lamina cells shows the characteristic, irregular cell pattern. The leaves are narrowly revolute in the lower portion. Sections through the stem show no central strand. The leaves are v-shaped.

(18b) *Hymenostylium sinense* Sakurai, Bot. Mag. Tokyo 62: 104 + fig. 4. 1949. *syn. nov.*

Type: China, North, Prov. Shansi, non fruiting, leg. *M. Sato* no. 17 (TNS, iso!).

These are brownish plants preserved in a bad condition, with smaller, younger shoots. The leaves are in rows along the stem, clearly v-shaped. The leaf margins are often recurved below. The lamina papillae on the cells are tiny, conical, not obscuring the lumen. The cell pattern in the apical part of the leaf is rather irregular. Sections through the stem are often approximately triangular in outline; no central strand was found.

These characters lead me to the conclusion that the plants belong to the rather variable *Hymenostylium recurvirostrum*.

(19) *Tortella tortuosa* (Hedw.) Limpr.

Tortella undulatifolia Dixon, in K. Biswas (Ed.), 150th Anniv. Vol. Bot. Garden Calcutta: 180. 1942. *syn. nov.*

Type: (India), Kashmir, Lidar and Sind valleys, non fruiting, alt 2200-4200 m, Aug. 1931, coll. *J. Garrett and W. Lillie* (2453) (Hb. H.N. Dixon, BM, holo!).

Only one collection was sent to me on loan. It fits *Tortella tortuosa* rather easily. Chopra (1975: 122) gives this name as a *nom. nud.* under *Tortella tortuosa*. However, *Tortella undulatifolia* was validly published in Dixon (1942).

(20) *Tortula fragilis* Taylor

Trichostomum persicum Jur. & Milde, Verh. Zool. Bot. Ges. Wien 20: 592. 1870. *syn. nov.*
Type: (Iran), Pers. austr., Schahpur, ad rupes, non fruiting, 3000 ft, 1868, *C. Haussknecht (51)*, with *Didymodon*, (Hb. J. Juratzka, W!).

Two collections, with the same data and the penciled numbers 51 and 122, were sent to me on loan. Number 51 comes from the herbarium of J. Juratzka. Both agree very well with the protologue. The plants are essentially the same. At first I had the impression that the material belonged to an *Encalypta* species. However, the details of the leaf base and the leaf margins fit *Tortula* much better. The lamina is (very) brittle or fragile. Sections through the costa show the Tortuloid anatomy. The costa nearly always ends near the apex. The leaf margins are plane. A weakly demarcated hyaline area near base is present. I only found some male plants in the material. The observation has led me to the conclusion that the plants belong to *Tortula fragilis* Taylor.

(21) *Tortula ruraliformis* (Besch.) Ingham

This taxon is reported here new for China. The species is not listed in the recent moss checklist for this country (Redfearn et al., 1996). I agree, e.g., with Kramer (1980) and Nyholm (1989) that this taxon is distinct at the species level. The data for this collection are as follows: China, Tibet, Thian Schan (= Tien Shan), ad flumen Narin Gol, regio alpina, non fruiting, 27 July 1896, leg. *V.F. Brotherus*, *R. 4952-A*, det. Ph. Sollman, 2002 (H!).

Acknowledgements

I wish to thank, X.L. Bai (Hohhot, China), for the information on the location of Dgin; H.C. Greven (Doorn, The Netherlands) for studying *Gyroweisia shansiensis*; D.G. Long (Edinburgh, U.K.) and the staff for making available the material for identifications; G. and S. Mieke (Marburg, Germany) for making available their (large) collections. I thank A. Touw (Leiden, Netherlands) for taxonomic advice on *Barbula pugionata* and *Streblotrichum gracillimum*.

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