

Three new species records of Orthotrichaceae (Bryopsida) in China, with comments on their type specimens

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Abstract – The descriptions and line drawings of three Orthotrichaceous species, *Macromitrium comatum* Mitt., *M. clastophyllum* Card., and *Ulota reptans* Mitt., are provided based on the type materials. Our study of specimens preserved at FH, NY, ALTA, IFP and H shows that they represent new species records for the Chinese moss flora.

New records / Bryopsida / Orthotrichaceae / *Macromitrium comatum* / *Macromitrium clastophyllum* / *Ulota reptans*

INTRODUCTION

According to the checklist of Chinese mosses by Redfearn *et al.* (1996) and the recent reports on Chinese Orthotrichaceae (Guo *et al.*, 2004; Mantimin *et al.*, 2004; Xiong, 2000), there are six *Ulota* species and 42 *Macromitrium* species in China. During a recent revision on the Chinese Orthotrichaceae flora, we found that some specimens collected from China and preserved in FH, NY, H, ALTA and IFP, agree with the descriptions of *Macromitrium comatum* Mitt. (recorded from Japan and Korea, see Noguchi 1994), *M. clastophyllum* Card. (recorded from Korea, see Cardot, 1904), and *Ulota reptans* Mitt. (recorded from Japan and western regions of N. America, see Noguchi, 1994) respectively. In order to make sure of the correct identity of these taxa as new records for China, we have properly re-examined the types of these three species.

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DESCRIPTION

Macromitrium comatum Mitt., *Trans. Linn. Soc. London Bot. Ser. 2, 3: 163, 1891.*

(Figs 1-2)

Type: Japan, Umagayeshi to Chiusenjj, Sept. 1886, *Bisset J.* (holotype, NY!).

Plants medium-sized, forming dense yellowish-green mats, dark-brown below. Stems creeping, the upper part slender, with a few branches; branches erect, densely leaved, to 15 mm long, with a few branchlets. Stem leaves entire, 1.0-1.4 mm long, 0.25-0.45 mm wide, spreading when moist, yellowish, ovate-lanceolate, the apex acute, incurved, keeled, costa single, extending to the leaf apex, yellowish to yellowish-brown. Branch leaves crisped and moderately twisted when dry, widely spreading and somewhat recurved when moist, entire, ovate-oblong, (1.5) 2.0-3.0 mm long, 0.4-0.5 mm wide, the apex acute, obtuse or acuminate, somewhat incurved, keeled, slightly plicate below; margins plane or recurved on one side. Costae single, extending to the leaf apex, yellowish-brown. Median laminal cells 9-12 μ m wide, pellucid, hexagonal, long, with rather thin walls, strongly inflated, smooth or with 3-4 small papillae, or with a single, large horn-like or forked papilla; upper cells similar to the median cells in size and in papillosity; lower cells rectangular to sublinear, 22-30 μ m long, 6.5-8.5 μ m wide, with thick yellowish-brown walls, smooth. Autoicous. Sporophytes lateral on branches. Inner perichaetial leaves ovate-oblong, acuminate, 2.0-2.5 mm long, keeled, shorter than branch leaves, the costa

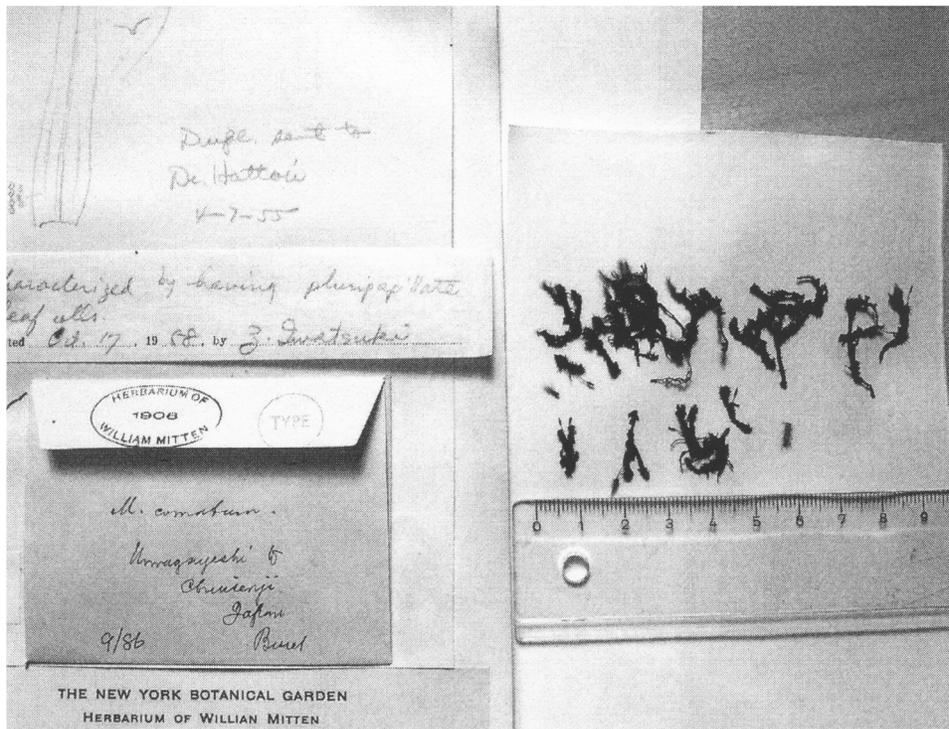


Fig. 1. Holotype of *Macromitrium comatum* Mitt. (NY).

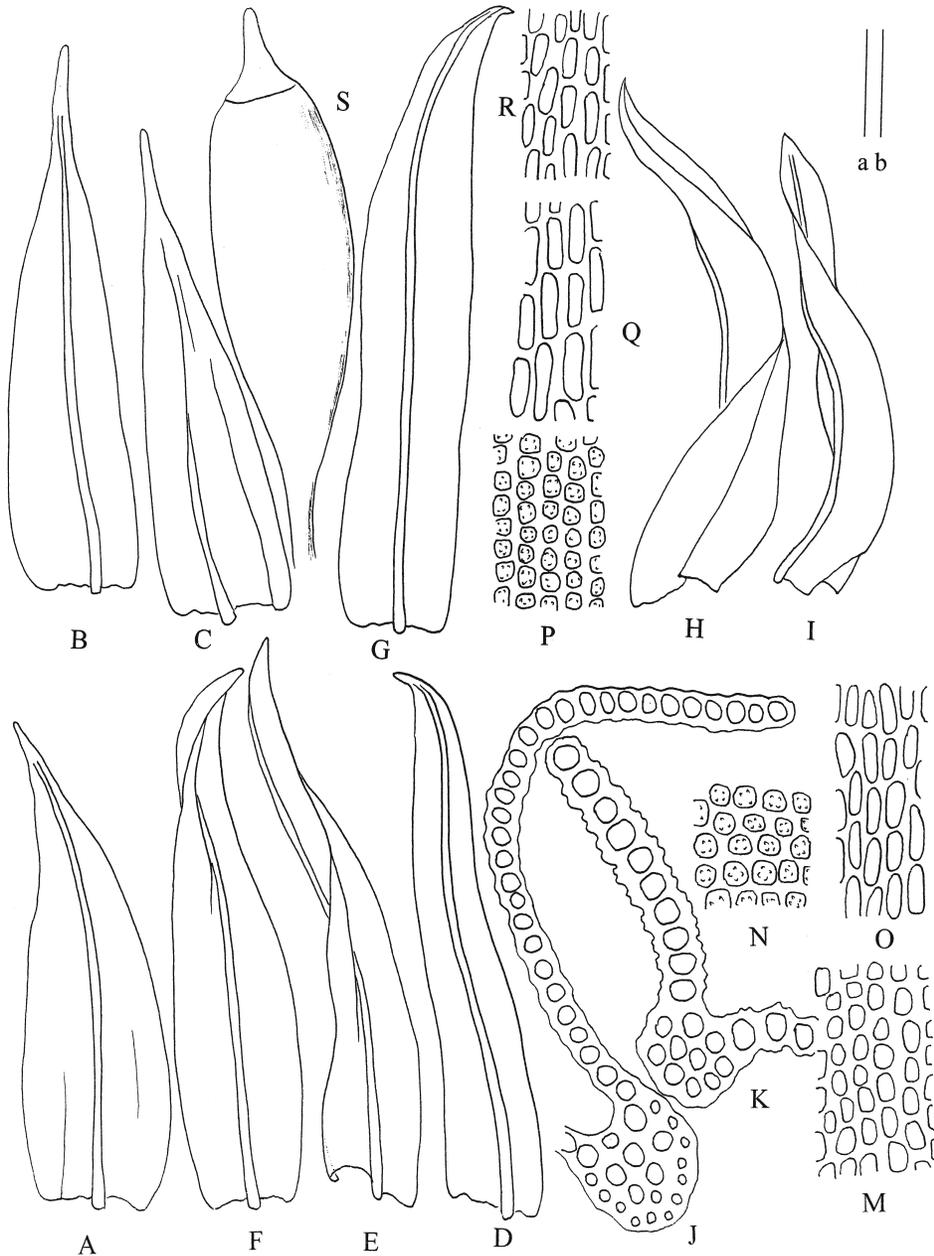


Fig. 2. *Macromitrium comatum* Mitt. **A – C**: perichaetial leaves; **D-I**: vegetative leaves; **J**: transverse sections of leaf base; **K**: transverse section of the upper part of leaf; **M**: medium laminal cells; **N, P**: upper laminal cells; **O, Q, R**: basal laminal cells; **S**: capsule. [B-C, G-I, P-S, from holotype of *M. comatum* (NY); A, D-F, J-O, from Fukian, *Chung no. m 4*. Line scale: a = 0.50 mm (A-I, S); b = 50 μ m (J-R)].

vanishing far below the leaf apex, the laminal cells oblong, with or without papillae, the walls thick; papaphyses numerous. Setae (2.5) 3.5-4.0 mm, occasionally up to 5.0 mm long, smooth. Capsules oblong-cylindric, 2.0-2.3 mm long, 0.65-0.85 mm wide, brown. Peristome single, exostome teeth linear-lanceolate, translucent, obtuse, densely pillose. Spores 20-40 μm wide, finely papillose. Calyptra large, campanulate, 2.0-2.5 mm long, with many long, brown-yellowish hairs.

It should be mentioned that the holotype of *M. comatum* Mitt. has strongly inflated cell wall with 3-4 small papillae wall. There is a specimen, "Japan, Nikko, Sept. 1886, *J. Bisset. no. 10*", preserved at H, identified as *M. comatum* by Mitten, with a single, large horn like, or forked, papilla on median and upper laminal cells. Noguchi (1994) once pointed out that this leaf cell character could be used to identify *M. comatum* from its allies in Japan.

Macromitrium commatum shows considerable variation in plant size, the shape of branch leaves, the papillosity of median laminal cells, and the length of seta. Based on the type specimen and the other specimens checked by us, this species is characterized by the following characteristics: 1) plant medium-sized among the members of the genus; 2) branch leaves crisped and moderately twisted; 3) median laminal cells vary to a great extent, with rather thin, strongly inflated walls, smooth, or with 3-4 small papillae, or with a single, large horn-like or forked papilla, 4) basal laminal cells with smooth walls, 5) inner perichaetial leaves ovate-oblong, shorter than branch leaves, abruptly narrow to an acuminate upper parts; 6) calyptra large, campanulate, with many long, brown-yellowish hairs. 7) seta usually 3.5-4 mm long.

When Mitten (1891) described *Macromitrium comatum*, he mentioned that *M. comatum* was similar to *M. prolongatum*, but the perichaetial leaves of the former are very different from those of the latter. In *M. comatum*, the perichaetial leaves are shorter than the branch leaves, and the sporophytes are exerted from the perichaetial leaves, whereas in *M. prolongatum*, the perichaetial leaves reach the neck of the capsule and are longer than those of the branch leaves, and its setae are rather short, only 1.5-2.0 mm in length, thus making the sporophytes slightly exerted from perichaetial leaves.

Macromitrium comatum is also similar to *M. tosae* Besch., however, the basal laminal cells of *M. comatum* have no papilla, while those of *M. tosae* often have a single, large papilla. *Macromitrium comatum* is sometimes confused with *M. japonicum*, but in China, *M. comatum* is not so common as *M. japonicum*. In our observation, *M. japonicum* could be separated from *M. comatum* by: (1) its strong incurved to contorted dry leaves, but with spreading, still incurved, wet leaf apices; (2) relatively obtuse leaf apex; and 3) rather obscure median laminal cells with 3-5, small to large, papillae.

Macromitrium comatum has been reported from Japan and Korea (Noguchi, 1994). We studied a specimen collected from Fujian Province preserved at NY (distributed by Farlow Herbarium at Harvard University) with an annotation, "China, Fukian, Omoy, *Chung no. m4*". Our comparison of the specimen, although without a sporophyte, with the holotype of *M. comatum*, shows these two specimens to have the same gametophyte features (Fig. 2). We report, therefore, *M. comatum* new to China.

Specimen examined: China, Fukian: Omoy, coll: *Chung no. m4*, NY! (ex Farlow Herbarium). Japan, Honshu: Hiroshima Pref., Mt. Rakan, 7 May 1961, *H. Ando* (H, H 3090196); Yamanashi Pref., Kita-koma-gun, Takane-cho, Kiyosato-Kogen plateau, 9 Apr 1978, *T. Osada & N. Suzuki* (H, H3090198); Hiroshima Pref., Mt. Kammuri, 1 May 1964, *H. Ando* (H, H3090197); Iwate Prefecture, Hanamaki, Kitatoyosawa National Forest, 30 Aug 1958, *Z. Iwatsuki* (H, H3090199).

***Macromitrium clastophyllum* Card., Beih. Bot. Centralbl. 17: 12. 7. 1904. (Figs 3-4)**

Type: Coree, Seoul, Jun 1901, *Faurie no. 94* (isotype, H!).

Plants relatively small, forming dense mats, brown-yellowish above, brown-blackish below. Stems creeping, with erect to ascending branches, usually up to 4.0-8.0 mm high. Branch leaves strongly twisted toward to the same direction when dry, long linear-lanceolate, entire, 2.6-4.0 mm long, 0.25-0.35 mm wide, gradually narrow to the apex forming a long and narrow acute or acuminate apex, and the leaves easily broken in the narrow upper parts; upper and median laminal cells quadrate-rounded, 4.0-5.5 μm wide, rather obscure, multi-papillose, basal and lower laminal cells elongate-rectangular, smooth, 9.0-18.0 μm long, 4.0-6.0 μm wide. Costa strong, end in or just below, the apex, often nearly filling the acumen, sometime excurrent. Sporophyte not seen.

Cardot (1904) published *Macromitrium clastophyllum* based on the gametophyte material collected from Seoul, South Korea. Since then, no taxonomical study on this species has been reported (Crosby *et al.*, 1999). *Macromitrium clastophyllum* is somewhat similar to *M. longirostre* (Hook.) Schwaegr., an Australian species, in their rather narrowly lanceolate and spirally twisted leaves. However, *M. longirostre* are characterized by their leaves with partially bistratose upper portions and slightly bulging or plane, smooth, leaf cells. Morphologically, *M. clastophyllum* is also similar to *M. ferriei*, however, *M. clastophyllum* could be distinguished from *M. ferriei* by its rather narrow and long leaves with easily broken upper parts and its basal laminal cells with smooth wall.

Cardot (1904) once mentioned that *M. clastophyllum* was somewhat similar to *M. caducipilum* Lindb., the latter was combined as *Macromitrium longirostre* (Hook.) Schwaegr. var. *caducipilum* (Lindb.) Mart. & Sainsb. (Sainsbury, 1952). According to the description by Sainsbury (1955), *M. longirostre* var. *caducipilum* was characterized by having oblong-ligulate, carinate, branch

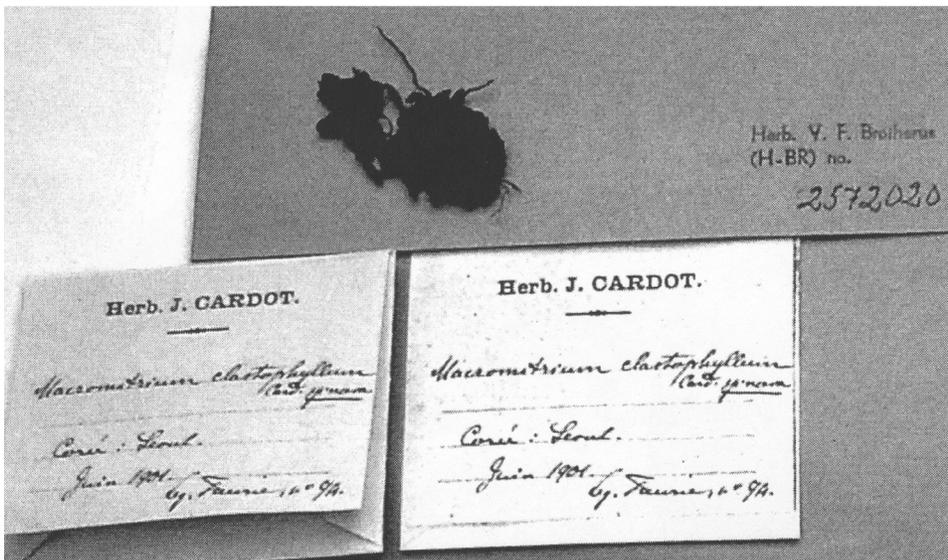


Fig. 3. Isotype of *Macromitrium clastophyllum* Card. (H).

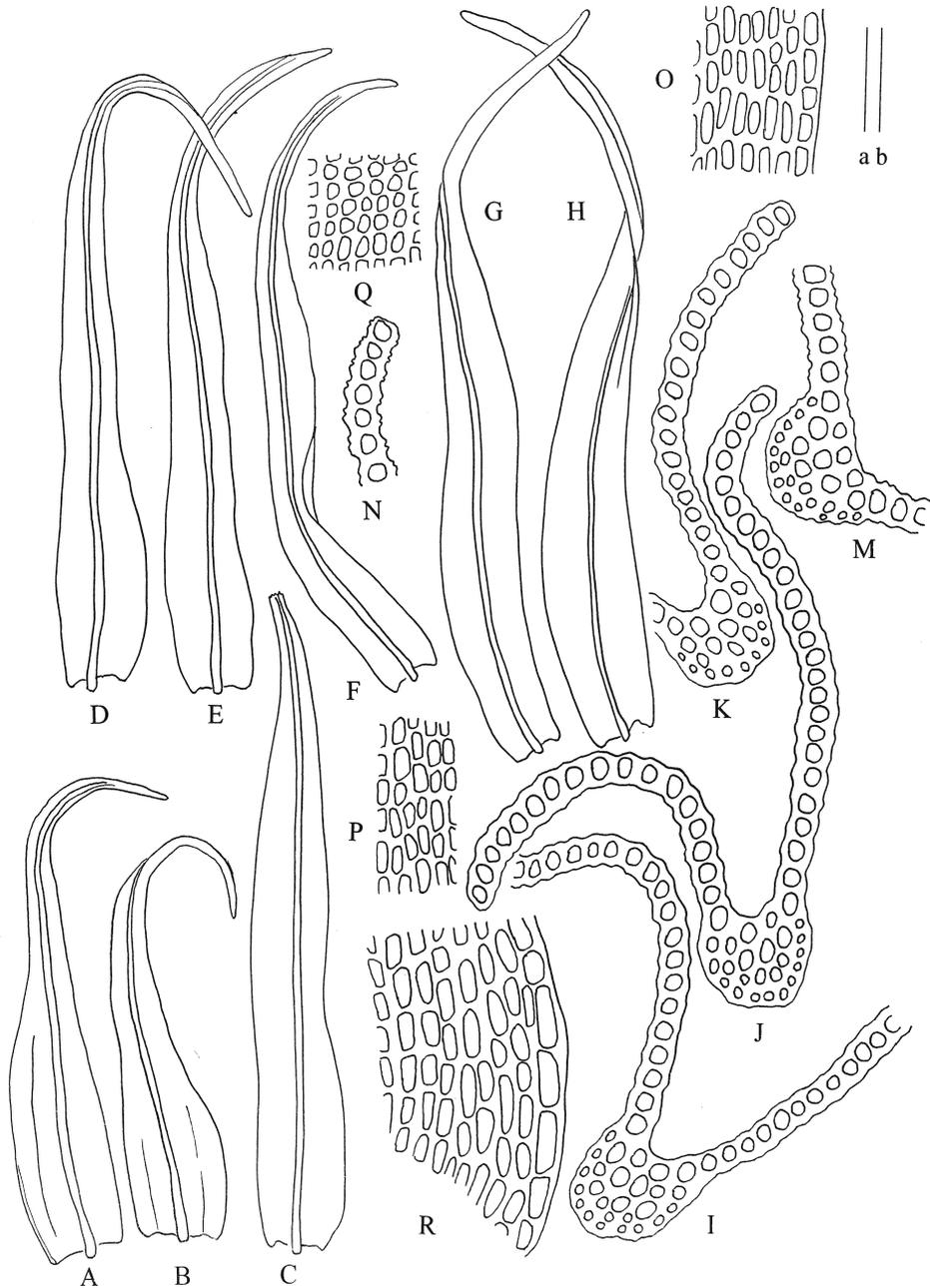


Fig. 4. *Macromitrium clastophyllum* Card. **A-H**: vegetative leaves; **I-J**: transverse of the basal part of leaf; **K**: transverse of the lower part of leaf; **M-N**: transverse sections of the upper part of leaf; **O, R**: basal laminal cells near margins; **P**: lower laminal cells; **Q**: upper laminal cells. [A-C, I-J, P, R, from isotype of *M. clastophyllum* (H), H; D-H, K-O, Q, from *Zhu Youchung* 940 (006445) (ALTA). Line scale: a = 0.50 mm (A-H); b = 50 μ m (I-R)].

leaves with obtuse or retuse apex, and terminal leaves with long projecting fragile arista. This last mentioned character also differentiates the *var. caducipilum* from *M. clastophyllum*. A recent specimen collected from Liaoning Province, China, which was preserved in IFP and ALTA, agrees well with the type specimen of *M. clastophyllum*, and differs only with the leaves of the specimen from Liaoning being slightly longer than those of the latter. Though the specimen is somewhat similar to *Groustiella tomentosa* (Hornsch.) Wijk & Marg. in leaf shape, the latter is characterized by its several rows of linear cells at the basal margins which continue upward as a narrow border as far as the leaf middle. We conclude, therefore, that *M. clastophyllum* is also a new species record for China (Fig. 4).

Specimen examined: *Macromitrium clastophyllum*: China, Liaoning Province, YouYan County, Longtan, on slope, 30 Jun 1957, *Zhu Youchung* 940 (006445) (IFP orig., ALTA dup.). – *Groustiella tomentosa*: Indonesia, Batudulang, *Lostermans* 18316 (H 3068936); Papua New Guinea, New Britain, 05° 36' S, 151° 55' E, *H. Streimann* 41618 (H3207145).

Ulota reptans Mitt., *Trans. Linn. Soc. London Bot. Ser. 2*, 3: 161. 1891. (Figs 5-6)

Type: Japan, Fujisan, on branches, May 1869, *J. Bisset* (isotype, E!).

Plants small and slender, 10-20 mm high, brownish-green above, blackish below. Stems prostrate, sparsely branched; branches suberect. Leaves appressed and slightly flexuose when dry, lanceolate from an ovate, concave base, entire, 1.5-2.0 mm long, 0.35-0.50 mm wide, acute to somewhat obtuse; margins plane; costa rather slender. Median laminal cells subquadrate, or ovate. 5.0-7.0 μ m wide, inflated, often papillose; Cells toward the leaf base elongate; lower internal cells linear or narrowly rectangular, 12.0-28.0 μ m long, 4.0-5.0 μ m wide, hyaline; cells at the basal corner in 3-6 rows, rectangular, 11-18.0 μ m long, 4.0-6.0 μ m wide, the longitudinal walls thin, the transverse walls strongly thick. Inner perichaetial leaves to 2.2 mm long. Paraphyses absent. Setae erect, 1.5-2.0 mm long. Capsules 1.2-1.5 mm long, 0.5-0.6 mm wide; urn oblong-cylindric to oblong. Operculum *ca* 0.6 mm long. Peristome teeth double, exostome teeth 8, pale, finely papillose, recurved when dry; endostome segments one cell wide. Spores 22-25 μ m, papillose. Calyptra mitrate, *ca* 1.5 mm long, with yellowish hairs.

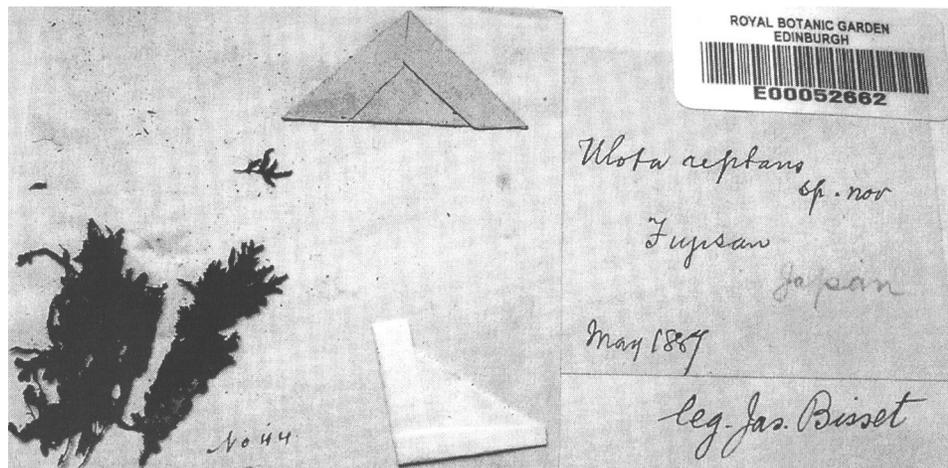


Fig. 5. Isotype of *Ulota reptans* Mitt. (E).

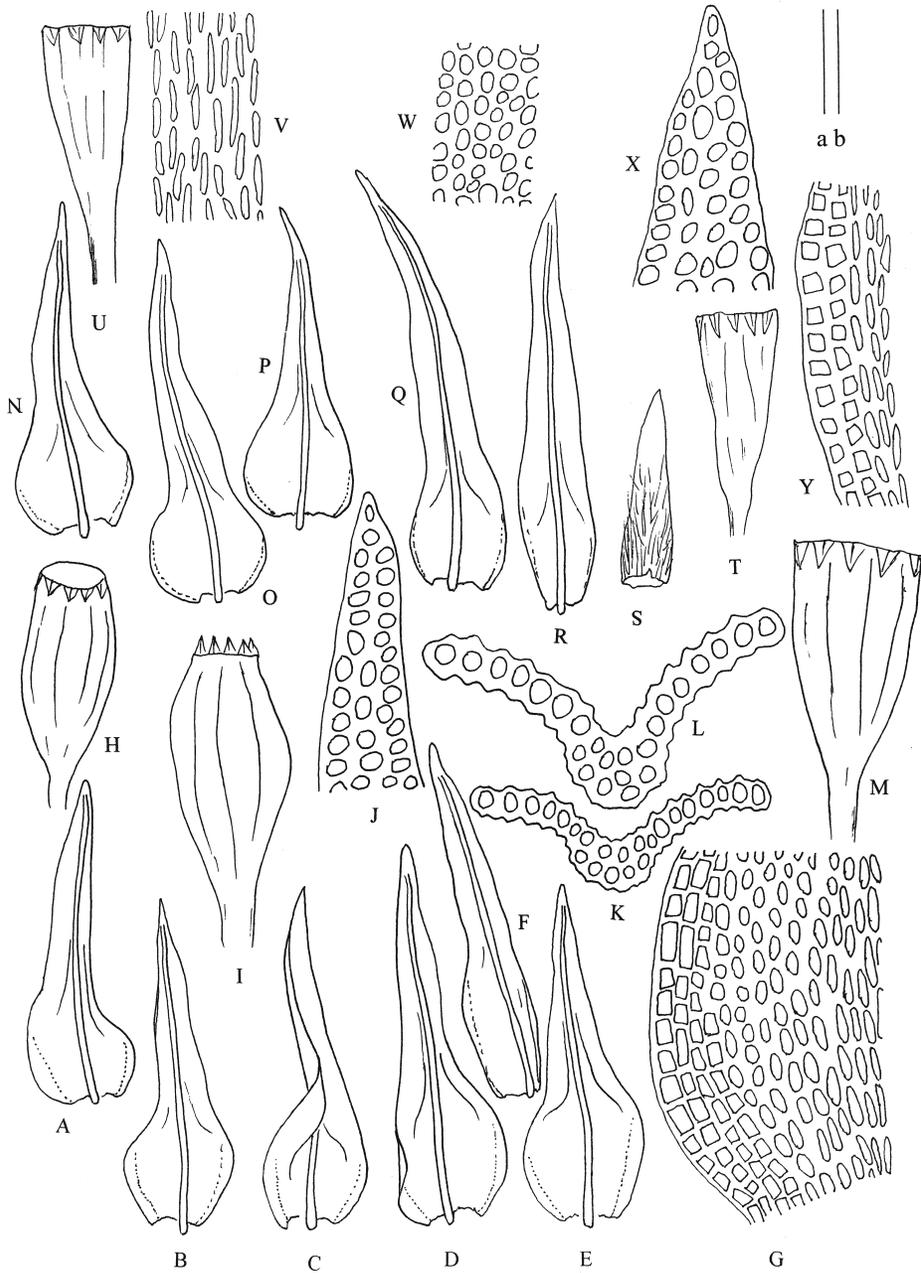


Fig. 6. *Ulota reptans* Mitten. **A-F, N-R**: vegetative leaves; **G, Y**: basal laminal cells near margins; **H, I, M, T, U**: capsules; **J, X**: leaf apices; **K, L**: transverse sections of the middle part of leaf; **S**: immature calyptra; **V**: basal laminal cells near costa; **W**: upper laminal cells. [A-M, from *Gao Chien 7507*, IFP; N-Y, from isotype, E. Line scale: a = 0.50 mm (A-F, H-I, M-U); b = 50 μ m (G, J-L, V-Y)].

Uloa reptans has been reported from Japan, western regions of N. America (Noguchi 1994). Three specimens collected from Mt. Changbai, northeast China, proved to be *U. reptans*, a new species record for China (Fig. 6).

Lawton (1971) once pointed out that *Uloa reptans* could not be separated from *U. megalospora* Venturi in Röhl and treated the former as a synonym of the latter. Noguchi, however, disagreed (Noguchi, 1994), and Crosby *et al.* (1999) still treated *U. reptans* as a valid species.

Uloa reptans is morphologically similar to *U. megalospora*, but the endostome segment of *U. megalospora* is of two rows of cells wide at base, while that of *U. reptans* is a single row of cells wide at base (Lawton, 1971; Noguchi, 1994). According to Iwatsuki (1959), *Uloa reptans* is also near to *U. barclayi* Mitt. in North American and *U. japonica* (Sull. & Lesq.) Mitt. in Japan & Korea. Later, *U. barclayi* was synonymized with *U. japonica* (Anderson *et al.*, 1990). Our comparison of *U. reptans* with *U. japonica* and other members of the genus show this species to be characterized further by its shorter leaves with a wider and rounded leaf base, and a suddenly narrowed middle part from below.

Specimens examined: *Uloa reptans*: China, Jilin Province, Mt. Changbai: Xiao Baishan between Hengshan forest and Sky Lake, alt. 1940m, on trunks of *Betula ermanii*, 25 Aug 1963, *Gao Chien* 7507 (IFP 002423; dupl. ALTA); Hengshan forest, alt. 1180m, on trunks of *Larix olgensis*, 23 Aug 1963, *Gao Chien*, 7281 (IFP 002426; dupl. ALTA); *ibid.*, alt. 1250m, on trunks of *Abies*, 24 Sep 1981, *T. Koponen* 37110 (IFP; ALTA dupl.). Japan, Nagano Prefecture, Mt. Kisokoma, alt. ca 2000m. on trunks of *Abies veitchii* and other conifers, 26 Aug 1955, *Z. Iwatsuki* 549 (H, H3205563). – *Uloa japonica*: Sitka, Barclay (holotype of *U. barclayi*, NY!); Japan, on trees in shaded ravines, Hakodadi (holotype of *U. japonica*, FH!); Japan, Akifa, *Ferrie* 2897 (H-BR 4340010); Japan, Yakuno-cho, Kyoto Prefecture, *M. Mizutani* 23 (H3205559).

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REFERENCES

- ANDERSON L. E., CRUM H. A. & BUCK W. R., 1990 — List of the Mosses of North America North of Mexico. *The bryologist* 93 (4): 448-499.
- CARDOT J., 1904 — Première contribution à la flore bryologique de la Corée. *Beibefte zum Botanischen Centralblatt* 17: 1-44.
- CROSBY M. R., MAGILL R. E., ALLEN B. & HE S., 1999 — *A Checklist of the Mosses*. St. Louis, Missouri Botanical Garden.
- GUO S. L., ENROTH J. & VIRTANEN V., 2004 — Bryophyte flora of Hunan Province, China 10: *Uloa gymnostoma* sp. nova (Orthotrichaceae). *Annales botanici Fennici* 41: 459-463.
- IWATSUKI Z., 1959 — A revision of the Japanese species of the genus *Uloa*. *Journal of Hattori botanical laboratory* 21: 138-256.
- LAWTON E., 1971 — *Moss flora of the Pacific Northwest*. Nichinan, Miyazaki (Japan), the Hattori botanical laboratory.
- MAMTIMIN S., WU P. C., DEGUCHI H., 2004 — New Records of the Mosses in Xinjiang, China *Acta botanica Yunnanica* 26: 19-22.
- MITTEN W., 1891 — An enumeration of all the species of Musci and Hepaticae recorded from Japan. *The transactions of the Linnean society of London, botany* 3 (2): 153-206.

- NOGUCHI A., 1994 — *Illustrated moss flora of Japan* (Part 3). Nichinan, Miyazaki (Japan), the Hattori botanical laboratory.
- REDFEARN P. L. Jr., TAN B. C. & HE S., 1996 — A newly updated and annotated checklist of Chinese mosses. *Journal of Hattori botanical laboratory* 79: 163-357.
- SAINSBURY G. O. K., 1952 — Critical New Zealand Mosses. *Revue bryologique et lichénologique* 75 (3-4): 213-225.
- SAINSBURY G. O. K., 1955 — *A Handbook of the New Zealand Mosses*. Wellington: The Royal Society of New Zealand.
- XIONG Y.-X., 2000 — A new species of the genus *Macromitrium* (Orthotrichaceae) from Guizhou, China. *Acta botanica Yunannica* 22: 405-407.