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A new synonym of *Weissia jamaicensis* (*Pottiaceae*, *Bryophyta*), and extension of its range from the Neotropics to the Palaeotropics

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Abstract. *Tortella opaca*, an African moss species described from Victoria Falls in Zimbabwe, is taxonomically assessed and stated to be conspecific with Neotropical *Weissia jamaicensis*. A lectotype of *Tortella opaca* is selected. The discovery of *Weissia jamaicensis* in Uíge Province, northern Angola, and in Lusaka Province, Zambia, is reported. Diagnostic features of *W. jamaicensis* are given in relation to similar species and are illustrated, and the phytogeographic importance of its records in the Palaeotropics is highlighted.

Key words: Africa, Angola, diversity, mosses, *Tortella*, *Weissia*

Introduction

In recent years, the bryophyte flora of Uíge Province in northern Angola has been studied extensively, resulting in the discovery of 94 bryophyte species new for Angola (Müller 2015). Angola has long been one of the African countries least known bryologically. Previously, fewer species were recorded there (O'Shea 2006; Wigginton 2009) than in adjacent countries, and most of the records of Angolan bryophytes were very old. In the course of additional field work and ongoing determination of the material collected so far, a *Weissia* species at hand was confirmed to be *Weissia jamaicensis*, a species unknown from Africa and hitherto known only from the Americas. This finding offered an occasion to evaluate whether there are other African *Weissia* species with combinations of characteristics similar to those observed in *Weissia jamaicensis*. Some information given in the description of *Weissia opaca* (Dixon) Magill (basionym: *Tortella opaca* Dixon) (Sim & Dixon 1922; Sim 1926) was similar to that of this species; for example, 'Cellulae basilares *hyalinae*, …; marginales supra basi *haud ascendentibus*' (Sim & Dixon 1922: 311) could be interpreted to mean that the basal leaf cells are hyaline, thin-walled, often running up the margins in a V-shaped pattern, as in *Tortella*. However, these character states are typical for *Weissia jamaicensis* as well. The type material of *Tortella opaca* was therefore checked and is asserted to be conspecific with the Neotropical *Weissia jamaicensis.*

In this report the new synonymy and the new African records are presented in detail, the phytogeographic importance of this record is highlighted, and the diagnostic features of *W. jamaicensis* are described in relation to similar species and are illustrated.

Taxonomic assessment of *Tortella opaca*

Tortella opaca was described by Dixon in Sim and Dixon (1922) from two specimens collected by T. R. Sim at Victoria Falls in the former Rhodesia, now Zimbabwe. The type material was without sporophytes, making its taxonomic placement in *Tortella* uncertain. Dixon wrote that 'this might be placed equally in *Trichostomum*', and also found similarities with *Weissia* and *Hymenostomum* in the channelled leaves with widely involute margins, 'but the size and differentiated leaf base separates it from these'. Dixon observed terminal rosettes of elliptical brood-leaves, but these may not be constantly present. On the basis of the type material, Sim (1926) gave a description and illustration of the species but did not discuss brood-leaves when reporting the examination of the type collections.

Magill in Magill and Schelpe (1979) transferred *Tortella opaca* to the genus *Weissia* as *Weissia opaca* (Dixon) Magill. Magill provided reasons for the new combination: 'The differentiation of the leaf base is not representative of the condition presently ascribed to *Tortella*.

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Although the sporophyte is not known, the small plants, linear-channelled leaves and widely involute margins clearly indicate its relationship to *Weissia*'.

Besides the type, the species is mentioned from only a few additional African records (O'Shea 2006). For Tanzania it was recorded from the Uluguru Mts by Bizot and Pócs (1974), and from Zambia from the Central and South Provinces by Phiri and Ochyra (1985). As it is not known from southern Africa (in the sense of the Flora of Southern Africa series), it is not treated in the flora of Magill (1981).

Three collections of *Tortella opaca* were sent on loan from the Dixon herbarium in BM and were studied by the second author. Sim numbers 8884 and 8890 are type material. All collections are without sporophytes. The studied material proved to be identical. The plants have lamina often with fragile parts, the marginal borders are clearly involute, and the section through the lamina clearly shows the characteristic bulging costa on the adaxial side. *Tortella opaca* was illustrated in Sim's moss flora (Sim 1926: 240) but the characteristic section of the costa was there figured as being flat; these should be clearly bulging on the adaxial side of the costa.

The second author compared the *Tortella opaca* collections with American material identified as *Weissia jamaicensis*. They agree well. Therefore, these two names are considered synonymous, the latter name having priority.

Weissia jamaicensis (Mitt.) Grout, Moss Fl. N. Am. 1(3): 157, pl. 82A. 1938.

Basionym: *Tortula jamaicensis* Mitt., J. Linn. Soc. Bot. 12: 147. 1869.

≡ *Trichostomum jamaicense* (Mitt.) A. Jaeger, Ber. S. Gall. Naturw. Ges. 1871–1872: 397. 1873.

= *Tortella opaca* Dixon, S. African J. Sci. 18: 311. 1922.

≡ *Weissia opaca* (Dixon) Magill in Magill & Schelpe, Mem. Bot. Surv. S. Africa 43: 7. 1979, syn. nov.

Type citation: [Southern Rhodesia (now Zimbabwe)] 'Victoria Falls, alt. 3,000 feet (Sim, 8884, 8890)'.

Type: 'Herb. H. N. DIXON, Tortella opaca Dixon sp. nov. {S. Afr. Journ. of Science, xviii, 311 (1922)} Loc. Victoria Falls, Rhodesia, 3000' alt., July 1920, Coll. T. R. Sim 8884, Type' (BM-Dixon! – lectotype designated here; PRE – isotype); 'Herb. H. N. DIXON, Tortella opaca Dixon sp. nov. Loc. Victoria Falls, Rhodesia, alt. 3000' alt. (?, 5000' in sched.), July 1920, Coll. T. R. Sim 8890, Co-type' (BM-Dixon!, PRE, MO – syntypes).

Good illustrations of *Weissia jamaicensis* can be found in works by Allen (2002), Crum and Anderson (1981), Pinheiro da Costa (2016) and Zander (1993, 1994). Diagnostically important features of *W. jamaicenses* (Fig. 3) include: (a) long, linear-lanceolate leaves mostly more than 3 mm and to 4 mm in length, with a strongly differentiated, usually abruptly broadened base with prominent shoulders, and the upper lamina being often irregularly fragile and eroded; (b) a cucullate leaf apex; (c) a leaf costa with an adaxial stereid band almost as large as or larger than the abaxial one, so that the adaxial surface of the costa bulges strongly; (d) outer basal leaf cells that are hyaline, thin-walled, often running up the margins in a V-shaped pattern as in *Tortella*; and (e) dioicous sexual condition. Besides the sexual condition, all features characteristic for *W. jamaicensis* are shared by the type material of *Tortella opaca*.

The sub-Saharan members of the genus *Weissia* are in need of a critical taxonomic revision. O'Shea (2006) cited 21 species and three varieties for the area. This number is certainly overstated. The real number of species is apparently much lower, because many species are insufficiently known and have not been included in more recent revisions. Many species are local 'endemics' known exclusively from type collections. The only available regional treatment is for southern Africa (Sim 1926; Magill 1981). Magill (1981) recorded five species in Flora of Southern Africa (*Weissia controversa*, *W. cucullata*, *W. dieterlenii*, *W. humicola*, *W. latiuscula*). *Weissia controversa* is differentiated from *W. jamaicensis* by its autoicous sexual condition, shorter leaves with a less clearly defined leaf base, and ventral stereid band smaller than the dorsal one or even absent. All African collections of *W. jamaicensis* seen are without sporophytes, but archegoniate plants were found at least in the collection from Bombo (T. Lautenschläger 44405), and the lack of antheridia implies a good possibility of a dioicous condition. *Weissia cucullata*, *W. dieterlenii*, *W. humicola* and *W. latiuscula* differ from *W. jamaicensis* by having a leaf costa with the adaxial stereid band smaller than the abaxial band and consequently a nearly flat or only slightly bulging adaxial surface of the costa. *Weissia cucullata*, *W. dieterlenii* and *W. latiuscula* also differ by having shorter leaves (to 2.5 mm long) and not as prominent and not as abruptly broadened leaf base. *W. socotrana* Mitt. was recorded from Zimbabwe (O'Shea 2006). This species can be separated from *W. jamaicensis* by its smaller leaves (to 2 mm) and by its leaf base not being sheathed.

The marginal basal cells of *W. jamaicensis* may be thin-walled, giving the appearance of *Tortella* species, which, however, have plane to erect, not inrolled, upper leaf margins. *Weissia jamaicensis* shares the strongly differentiated leaf costa with *Pseudosymblepharis*, but *W. jamaicensis* can be easily distinguished from species of the latter genus by its narrowly inrolled upper leaf margin instead of the leaf margin being erect but not involute. From *Trichostomum crispulum*, *W. jamaicensis* is distinguished by its sharply incurved distal leaf margins and bulging adaxial costal surface.

Current African distribution and ecology of *Weissia jamaicensis*

O'Shea (2006) cited *Weissia opaca* from Tanzania, Zambia and Zimbabwe. The record for Zimbabwe is based on the type (see above). The record for Tanzania is from the Uluguru Mts and is based on Bizot and Pócs (1974), and that from Zambia is from the Central and South Provinces and refers to Phiri and Ochyra (1985).

All of the new Angolan collections of *Weissia jamaicensis* were made in Uíge Province in the far north of Angola, about 200 km northeast of the capital Luanda. Uíge Province is bordered to the north and east by the

Figure 1. *Weissia jamaicensis* on limestone rock bands near Bombo village in Uíge Province, Angola. Photo: T. Lautenschläger, 19 Nov. 2015.

Democratic Republic of the Congo, to the south by the provinces of Malanje, Cuanza Norte and Bengo, and to the west by the province of Zaire. All of the records are from areas primarily of tropical rainforest. Due to hundreds of years of intensive land use, the vegetation is nowadays more open and can be characterized as a mixture of forest remnants and savanna. Most of the new records of *Weissia jamaicensis* are sites with special conditions differing from the general vegetation; there is a preference for rock formations. In Bombo and Caquenge the species was found in crevices and bands of calcareous rock of the Xisto-Calcário-formation (Figs 1, 2). In Alto Camboma the species grows on rocky slopes along an earthen road, and near Catambi on concrete of a bridge.

Associated bryophytes near Bombo include *Pelekium gratum*, *Philonotis dregeana*, *Gymnostomum calcareum* and *Trichostomum brachydontium*. At Caquenge the associates are *Gymnostomum calcareum* and *Philonotis dregeana*. Associated bryophytes at the Alto Camboma site include *Cephaloziella transvaalensis*, *Campylopus obrutus* and *Garckea moenkemeyeri*, and on the concrete bridge near Catambi, *Barbula consanguinea*, *Bryum apiculatum* and *Hyophila involuta*.

The record in Zambia adds the province of Lusaka to the previously known distribution in that country.

Specimens examined. ANGOLA: Uíge Province, Uíge 53 km WNW, near Bombo village, on rocks, 628 m, 07°31′04.0″S, 14°34′07.4″E, 19 Nov. 2015, T. Lautenschläger 44405 (DR, L, MO); Uíge Province, Uíge 10.5 km NE, Alto Camboma, slopes in burned land, c. 1050 m, 07°33′15″S, 015°07′49″E, 12 Oct. 2013, F. Müller 41868 (DR); Uíge Province, Uíge 10 km NE, Caquenge N, on seep-damp rocks in burned land, c. 990 m, 07°31′44″S, 015°08′39″E, 12 Oct. 2013, F. Müller 41575 & 41576 (DR); Uíge Province, Uíge 14 km NE, Río Lucunga near Catambi, on concrete of a bridge, c. 875 m, 07°31′44″S, 15°08′39″E, 12 Oct. 2013, F. Müller 41792 (DR). ZAMBIA: Lusaka District, on damp, vertical earth bank in *Syzygium* thicket by Bothasrus road 8 km from the Wilfried Watson turn-off from the Lusaka/Mumbwa road, c. 1275 m, 10 Feb. 1975, C. C. Townsend 75/22 (L, MO, herb. C. C. Townsend).

Biogeographical remarks

Weissia jamaicensis is widely distributed, though scattered, in the West Indies and Latin America (Stoneburner 1985; Zander 1994, 2007; Delgadillo et al. 1995; Churchill et al. 2000; Allen 2002; Tropicos.org). It has its most common occurrence in the Neotropics, where its range extends from Mexico and the West Indies (Bermuda, Cuba, Dominican Republic, Jamaica, Puerto Rico, Virgin Islands) through the Central American isthmus (Belize, Costa Rica, Guatemala, Honduras, Panama) to South America (Bolivia, Brazil, Colombia, Venezuela). In addition, it penetrates subtropical the north-central, southwestern, south-central and southeastern U.S.A.

The new records in Angola and the subsequent investigation of the type of *Tortella opaca*, resulting in its conspecifity with *W. jamaicensis*, give the first indication of the occurrence of *Weissia jamaicensis* in Africa and the Old World. The representation of *Weissia jamaicensis* in sub-Saharan Africa provides an additional example of the intercontinental phytogeographical relationships between America and Africa. They are well documented for vascular plants (Thorne 1973) and liverworts (Gradstein et al. 1983; Gradstein 2013) but have not been fully reported for mosses, although Ochyra and Ireland (2016) provide a good overview of previously known

Figure 2. Rock formation with *Weissia jamaicensis* near Bombo, 53 km WNW of Uíge in Angola. In damp rock crevices there is also the rare cycad *Encephalartos laurentianus*. Photo: T. Lautenschläger, 19 Nov. 2015.

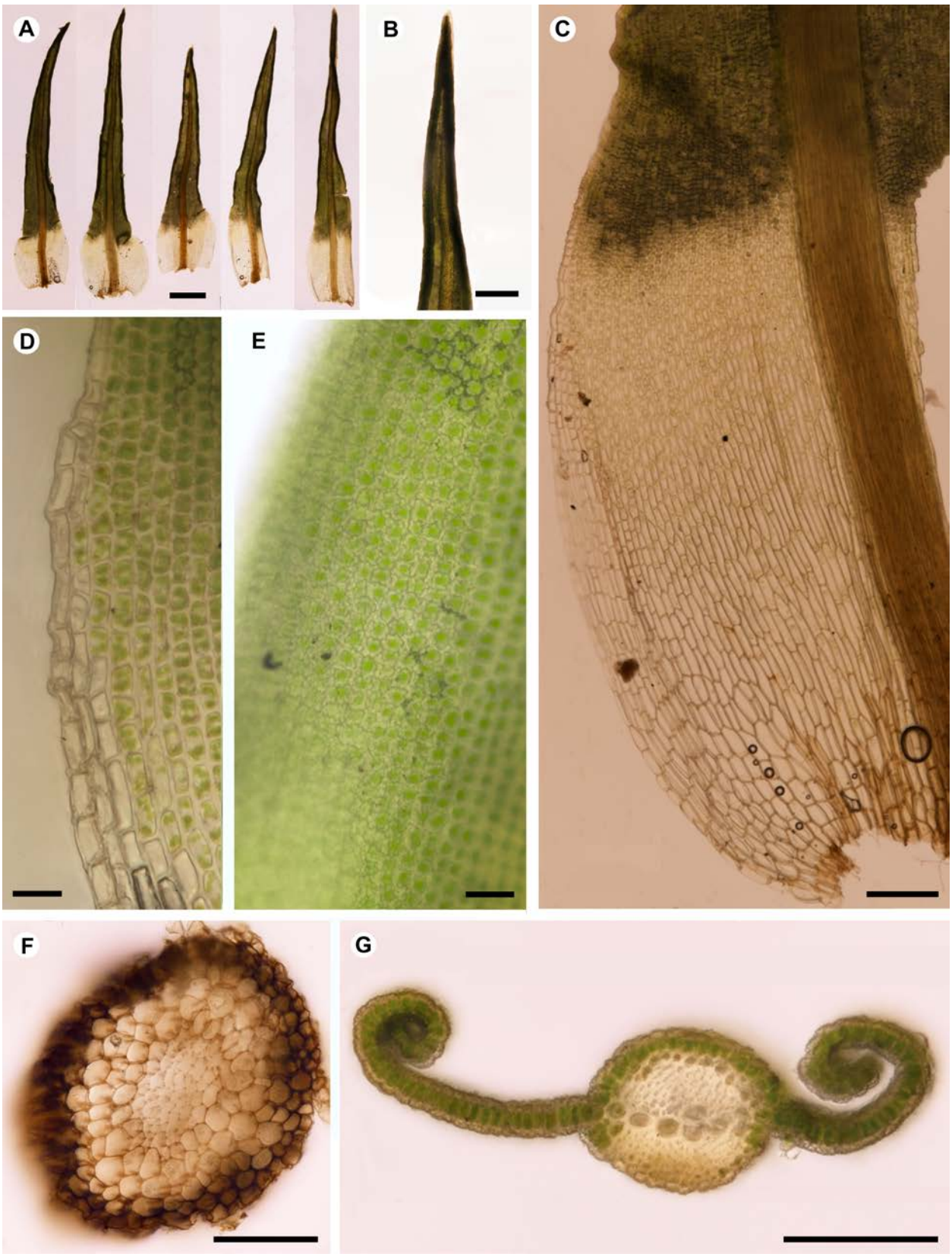

Figure 3. *Weissia jamaicensis*. A – leaves; B – leaf apex; C – basal leaf area; D – leaf margin at junction of sheath and limb; E – upper leaf cells; F – stem cross section; G – leaf cross section. All from T. Lautenschläger 44405 (DR). Scales: A = 0.5 mm; B = 200 µm; C, F, G = 100 µm; D, E = 20 µm.

information on this topic. They give many examples of this type of distribution and they estimate the number of known examples of this distribution pattern to be about 80 species. The number is increasing with progress in exploration of under-investigated regions in the Americas and Africa, as well as taxonomic studies of tropical and temperate mosses on these continents (Ochyra & Ireland 2016). With the new record of *Weissia jamaicensis* in sub-Saharan Africa we can add one more species with this distribution pattern.

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