



Marchesinia principensis (Marchantiophyta, Lejeuneaceae), a new liverwort species from Príncipe, West Africa

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Abstract

A new species, *Marchesinia principensis* (Marchantiophyta, Lejeuneaceae), is described and illustrated from Príncipe, Republic of São Tomé and Príncipe, West Africa. It was discovered in cloud-mist hardwood forests at elevations of 500–690 m. This new species most closely resembles *Marchesinia excavata*, but differs in the broad reniform underleaves, 5–6 × as wide as the stem, >2 × as wide as long, the narrow angle (< 90°) that the ventral margin of the lobe makes with the keel, and the usually flat ventral margin of the lobe. *M. principensis* is, furthermore, a more robust plant than *M. excavata*.

Key words: Africa, Hepaticae, liverworts, *Marchesinia excavata*, São Tomé and Príncipe, taxonomy

Introduction

The genus *Marchesinia* Gray (1821: 679) is a small genus of Lejeuneaceae subfam. Ptychanthoideae with eight species in two subgenera (Gradstein 2012, Söderström *et al.* 2016). The genus is characterized by smooth, strongly flattened perianths subtended by a pair of innovations, by ovate-oblong leaves with ± isodiametric cells and radiate trigones, by small and rather flat lobules with 1–4 teeth, and by large, strongly decurrent underleaves with a deeply arched insertion line (Wigginton 2004, Gradstein *et al.* 2001). The subgenus *Marchesinia* contains only *Marchesinia mackaii* (Hooker 1813: pl. 53) Gray (1821: 689), an Atlantic-Mediterranean taxon of western and southern Europe and Macaronesia, reaching southwards to the Cape Verde Islands. The record of that species from Socotra was later assigned to *M. excavata* (Mitten 1860: 58) Schiffner (1893: 128) (Kürschner 2001: 197). All other species belong to the tropical Afro-American subgenus *Marchesiniopsis* Schuster (1992: 358).

The African *Marchesinia* were dealt with by Vanden Berghen (1948, 1976), Jones (1970) and Jones in Wigginton (2004). Five species are known from sub-Saharan Africa (Wigginton 2009): *Marchesinia brachiata* (Swartz 1788: 144) Schiffner (1893: 128), *M. deslooveri* Vanden Berghen (1976: 926), *M. excavata*, *M. mackaii*, and *M. nobilis* (Gottsche 1882: 353) Shi, Zhu *et al.* Gradstein (2015: 249) (syn. *M. madagassa* Stephani (1912: 144)). The most common African species of the genus is *M. excavata*, known from West Africa, the Congo Basin, from East Africa southwards to Zambia, and from Madagascar and Socotra (Wigginton 2009). This is a rather variable species described under several synonyms (*Dicranolejeunea annobonensis* Arnell (1957: 531), *Homalolejeunea henriquesii* Stephani (1888: 112), *Archilejeunea apiculata* Pearson (1931: 61)).

This paper is based on specimens collected by the second author in the Republic of São Tomé and Príncipe during April–May, 2012 and 2013. During determination of the liverwort collections, a robust *Marchesinia* came to our attention. This material, originating from Príncipe, most closely resembles *M. excavata* as it has leaf lobules with only one tooth. As it differs morphologically from *M. excavata* and all other described species, it is here described as a new species. These Príncipe collections were also shared with Rui-Liang Zhu (HSNU) who included it in a molecular study, the results supporting the recognition of this taxon as new at species level (Rui-Liang Zhu, in litt.). The results of the molecular research will be published elsewhere.

The new species

Marchesinia principensis Frank Müll. et Shevock *sp. nov.* Figs. 1–3

Type:—SÃO TOMÉ AND PRÍNCIPE. Príncipe Island, Obô Natural Park de Príncipe. Along trail to Pico Papagaio above roça Santa Trindade, summit ridge of peak, 690 m, mixed hardwood tropical forest with ferns, on hardwood trunk in filtered light, 01°36'38.8"N, 07°23'32.0"E, 24 April 2012, *Shevock 40193* (holotype DR, isotypes CAS, EGR, HSNU, STPH).

Diagnosis: *Marchesinia principensis* is similar to *Marchesinia excavata*, but differs in the broad reniform underleaves, 5–6 × as wide as the stem, >2 × as wide as long; the narrow angle that the ventral margin of the lobe makes with the keel (< 90°), and the usually flat ventral margin of the lobe. Furthermore *M. principensis* is more robust than *M. excavata* (lobe length 1.0–1.2 mm, lobe width 0.7–0.9 mm, leaf lobule length 280–350 µm, leaf lobule width 250–300 µm, underleaf width 1–1.3 mm).



FIGURE 1. *Marchesinia principensis*. **A.** Shoots in dry condition. **B.** Shoots in wet condition, ventral view. **C.** Stem in dorsal view. **D.** Stem in ventral view. All from *Shevock 40260*. Photos by F. Müller.

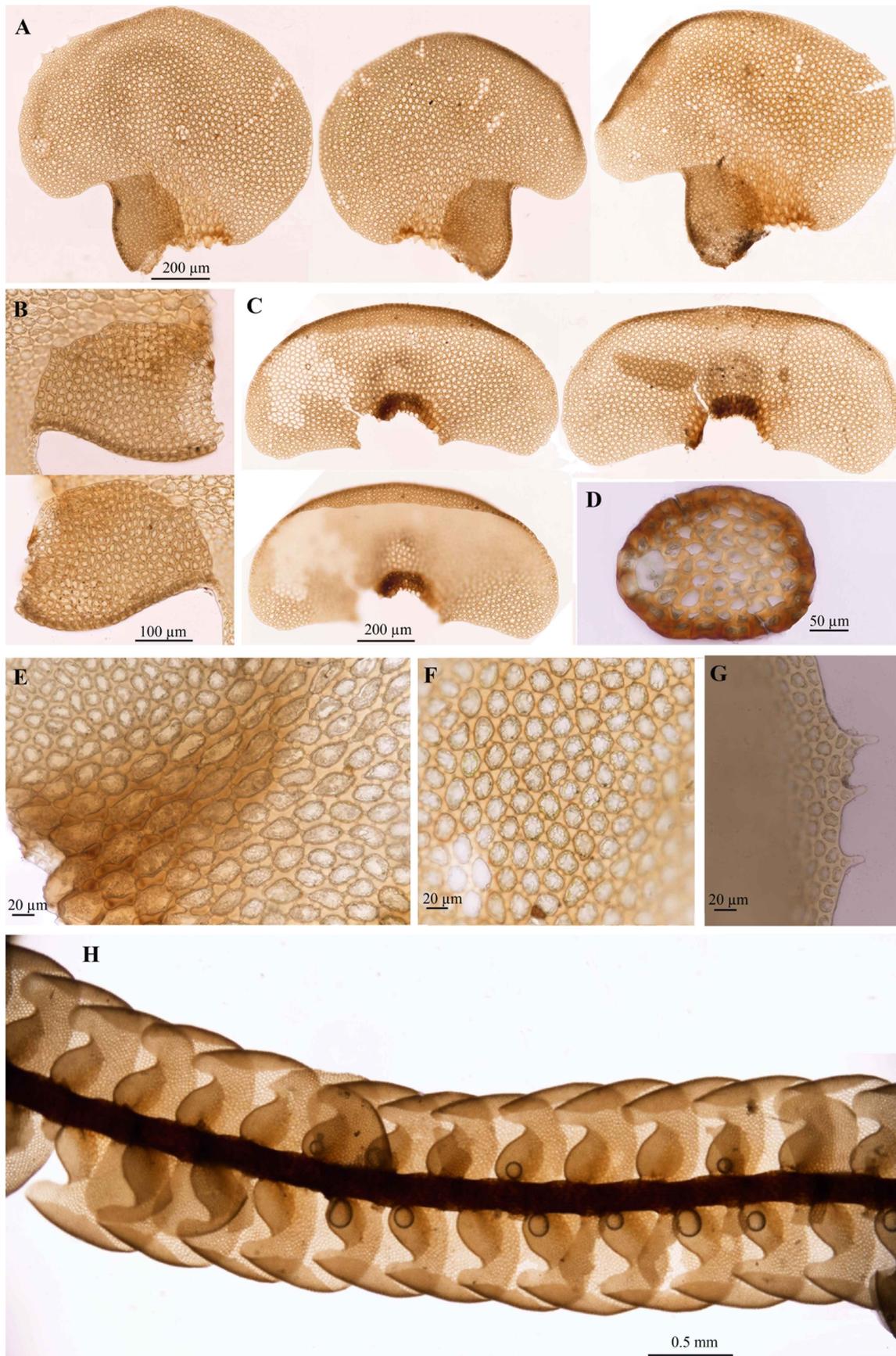


FIGURE 2. *Marchesinia principensis*. **A.** Lobes. **B.** Lobules. **C.** Underleaves. **D.** Stem cross section. **E.** Basal lobe cells. **F.** Mid-lobe cells. **G.** Cells at lobe apex. **H.** Stem in ventral view, underleaves are detached. All from *Shevock 40260*. Photos by F. Müller.

Description: Shoots brown, to 8 cm long and 1.0–2.2 mm wide, often forming extensive sheets. Stems 210–270 μm in diameter, with 22–24 cortical cells of brown colour and with equally strongly thickened walls, inner cells in 7–8 rows, lighter in colour, cells with very well developed radiate trigones; ventral merophyte 6–8 cell rows wide.

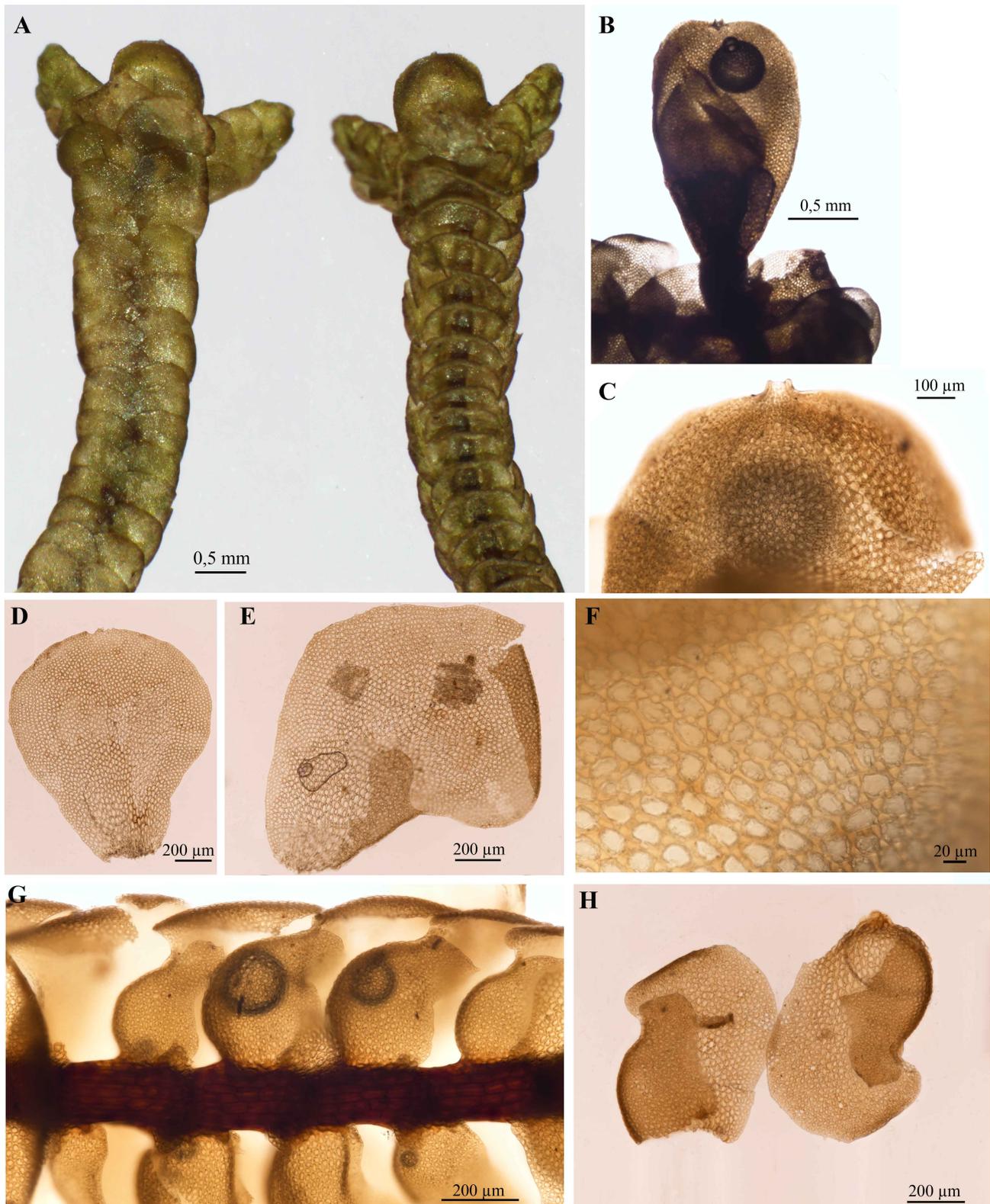


FIGURE 3. *Marchesinia principensis*. **A.** Stem with perianths and innovations in dorsal (left) and ventral (right) view. **B.** Perianth in dorsal view. **C.** Perianth apex. **D.** Bracteole. **E.** Bract. **F.** Cells in middle part of perianth. **G.** Secondary shoot with androecia. **H.** Male bracts. All from *Shevock 40193*. Photos by F. Müller.

Leaves imbricate; lobes oval, 1.0–1.2 mm long, 0.7–0.9 mm wide, convex, the apex rounded, but usually with 1–3 apical teeth, teeth 1–3 cells long, ventral margin arched, flat, and forming a well marked narrow angle ($< 90^\circ$, range $70\text{--}83^\circ$) with the keel. Cells in basal area elongate, $29\text{--}45 \times 20\text{--}26 \mu\text{m}$, cells in mid-lobe \pm isodiametric, c. $18\text{--}30 \mu\text{m}$, all cells with very well developed radiate trigones (edge length c. $7\text{--}10 \mu\text{m}$) and intermediate thickenings; oil bodies not observed. Leaf lobules, when well developed, 0.2–0.35 times the length of the lobe, nearly flat, with a single, short 1–2-celled tooth, length of the lobules $280\text{--}350 \mu\text{m}$, width $250\text{--}300 \mu\text{m}$, cells smaller than lobe cells, \pm isodiametric, $11\text{--}16 \mu\text{m}$.

Underleaves reniform, $5\text{--}6 \times$ as wide as the stem, imbricate, recurved around the apex, $>2 \times$ as wide as long, width $1\text{--}1.3 \text{ mm}$, length $0.45\text{--}0.5 \text{ mm}$, the insertion line deeply arched, cells at insertion line brown, forming a small differentiated group, cells in the mid and upper part \pm isodiametric, $17\text{--}26 \mu\text{m}$, basal cells elongated $27\text{--}36 \times 18\text{--}22 \mu\text{m}$, all with well-developed radiate trigones and intermediate thickenings.

Dioicous. Androecia intercalary on secondary shoots, bracts in 4–9 pairs. Gynoecia almost always with 2 equally long innovations, with the perianths lying in the bifurcations; bracts oval, $1.0\text{--}1.5 \text{ mm}$ long, $0.9\text{--}1.2 \text{ mm}$ wide, convex, the apex rounded, but usually with 1–3 apical teeth, ventral margin arched, flat, and forming a wide angle with the keel ($125\text{--}145^\circ$); bracteoles obovate, 1.2 mm long, $1.0\text{--}1.1 \text{ mm}$ wide, about as long as the bracts, apex rounded, apically with a few (1–4) distant teeth; perianths $1.3\text{--}1.8 \text{ mm}$ long \times $0.9\text{--}1.1 \text{ mm}$ wide, oblong-obovate, plane or concave above, keeled laterally but not winged, moderately convex ventrally; rostrum very short, ca. $30 \mu\text{m}$.

Etymology: The new species is named after the island on which it occurs.

Habitat and distribution: The species is known from only a few sites on Príncipe, at elevations of $500\text{--}690 \text{ m}$. It grows on hardwood trunks and branches as well as on volcanic boulders in filtered light in mixed hardwood tropical forests.

Additional material seen (paratypes): SÃO TOMÉ AND PRÍNCIPE. Príncipe Island, Obô Natural Park de Príncipe: along trail to Pico Papagaio above roça Santa Trindade along ridge section of trail above the rope area, 550 m , mixed hardwood tropical forest, on volcanic boulders in filtered light, $01^\circ36'45.0''\text{N}$, $07^\circ23'28.4''\text{E}$, 24 April 2012, *Shevock 40196* (DR, CAS, EGR, HSNU), on trail about the summit plateau of Pico Mesa accessed via the abandoned roça of Maria Correia, 500 m , mixed hardwood tropical forest with abundant bryophyte cover, on hardwood branch in filtered light, $01^\circ34'55.5''\text{N}$, $07^\circ21'34.7''\text{E}$, 28 April 2012, *Shevock 40260* (DR, CAS, EGR, BOL, LISU, HSNU), along trail on rim of the Mesa in watershed of Ribeira Macoia above the old roça of Maria Correia, $01^\circ34'53.4''\text{N}$, $07^\circ21'15.0''\text{E}$, elev: 500 m , 23 April 2013, *Shevock 42152A* (CAS, DR, EGR).

Discussion

The new species most closely resembles *Marchesinia excavata* as both have leaf lobules with only one tooth. It differs from *M. excavata* in the reniform underleaves, $5\text{--}6 \times$ as wide as the stem, $>2 \times$ as wide as long; the narrow ($< 90^\circ$) angle the ventral margin of lobe makes with the keel and the usually flat ventral margin of the lobe. *Marchesinia principensis* is furthermore a more robust plant than *M. excavata* (lobe length $1.0\text{--}1.2 \text{ mm}$, lobe width $0.7\text{--}0.9 \text{ mm}$, leaf lobule length $280\text{--}350 \mu\text{m}$, leaf lobule width $250\text{--}300 \mu\text{m}$, underleaf width $1\text{--}1.3 \text{ mm}$). The main differences of both species are summarized in Table 1. *M. principensis* seems to be further differentiated from *M. excavata* in the intensity of the dentation of the female bracteole. As described above, in *M. principensis* the bracteoles are rounded at the apex, and apically with only a few (1–4) distant, mostly indistinct teeth (Fig. 3D). In *M. excavata* the apex of the bracteole is usually more dentate with at least four principal teeth, of which the two central are often the largest and closer together, rendering the apex shortly incised-bilobed (Jones 1970). Investigation of many samples of *M. excavata* and indications in the literature (e. g. Vanden Berghen 1948, Wigginton 2004) shows variability in the dentation of the bracteole, but in general the bracteoles of *M. excavata* seem to be more strongly dentate than those of *M. principensis*.

Two of the specimens of *Marchesinia principensis* (*Shevock 40196* & *40260*) were included in molecular studies carried out in the laboratory of Rui-Liang Zhu and were compared at the molecular level with African specimens of *M. excavata*. The preliminary DNA sequences indicate that *M. principensis* and typical *M. excavata* can be separated at DNA level (Rui-Liang Zhu, in litt.). This molecular evidence reinforces the morphological data for the recognition of this new species.

Príncipe and São Tomé are only 220 to 240 km from the African mainland and this small distance may, therefore, be the reason for the low number of endemic bryophytes reported from these islands. Sérgio & Garcia (2011) recognize only 11 endemic mosses and 2 endemic liverworts for São Tomé, and one endemic liverwort (*Prionolejeunea*

principensis Vanden Berghen (1960: 65)) for Príncipe. Nevertheless, in the past the level of bryological exploration of these islands was low and more detailed recent investigations have revealed many hitherto unrecorded species (Müller *et al.* 2011, Pócs *et al.* 2015, Sollman *et al.* 2016) including newly described species, e. g. *Porotrichum saotomense* Enroth & Shevock (2011: 7) and *Dendroceros paivae* Garcia, Sérgio & Villarreal in Garcia *et al.* (2012: 5). All of the occurrences of *M. principensis* are within protected areas of Obô Natural Park. At these sites, cloud-mist forests occur at significantly lower elevations than on neighbouring São Tomé island. The remnants of hardwood tropical rainforests on Príncipe are exceptionally rich areas for bryophytes even though the highest peak ascends to only 928 m. It is likely that *M. principensis* occurs in other cloud forest environments in the Pico de Príncipe area and other high ground in the southern part of the island.

TABLE 1. Differences between *Marchesinia principensis* and *Marchesinia excavata*. The diagnostic features of *M. excavata* are compiled *fide* Vanden Berghen (1948), Jones (1970), Wigginton (2004) and own observations.

	<i>Marchesinia principensis</i>	<i>Marchesinia excavata</i>
underleaves	reniform, 5–6 × as wide as the stem, >2 × as wide as long, width 1–1.3 mm, length 0.45–0.5 mm	obovate-reniform, 3–4(–5) × as wide as the stem, <2 × as wide as long, width 0.55–0.72(–1.0) mm, length 0.47–0.58 (–0.75) mm
angle of ventral margin of lobe with the keel	narrow, < 90°, ventral margin flat	wide, > 120°, ventral margin often incurved
lobe length	1.0–1.2 mm	0.75–1.0(–1.15) mm
lobe width	0.7–0.9 mm	0.45–0.72(–0.83) mm
leaf lobules	length 280–350 µm, width 250–300 µm	length 160–250 µm, width 100–230 µm

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