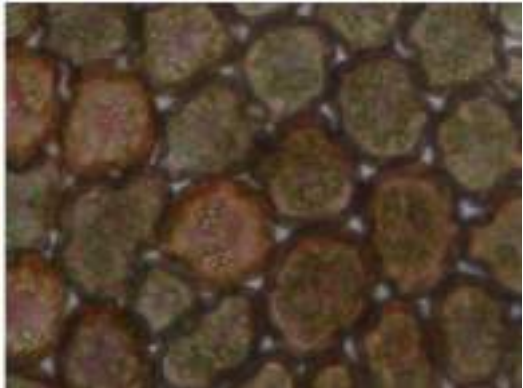
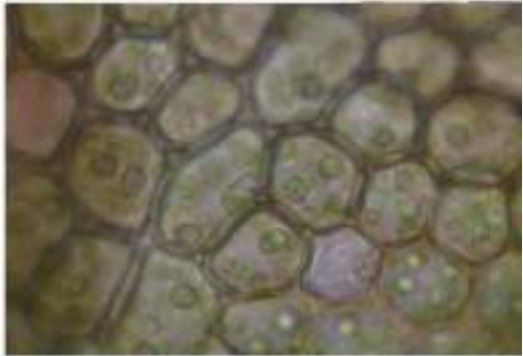
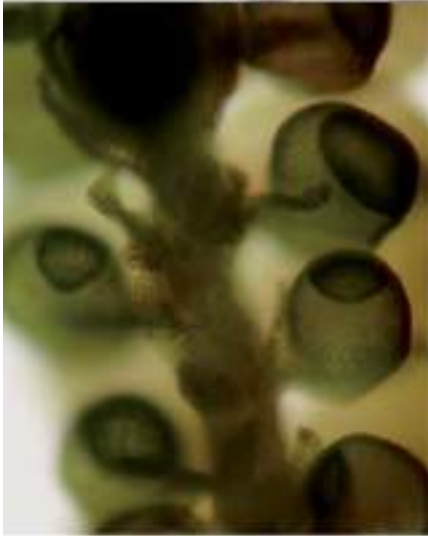
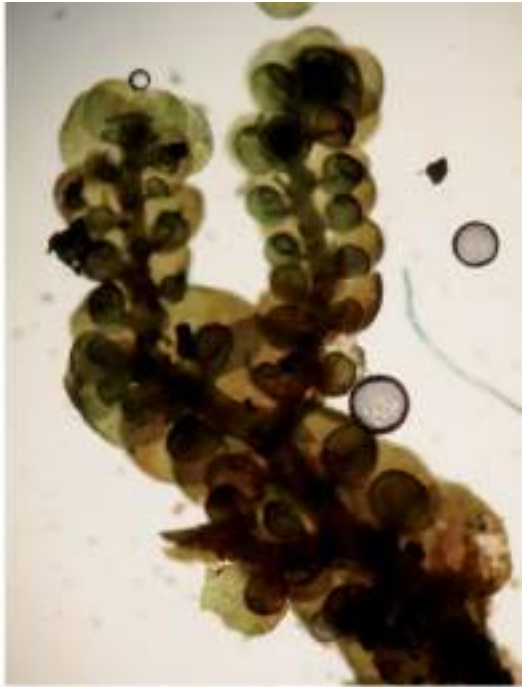
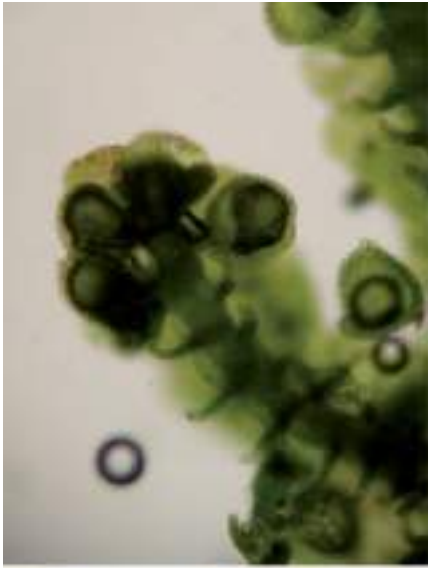
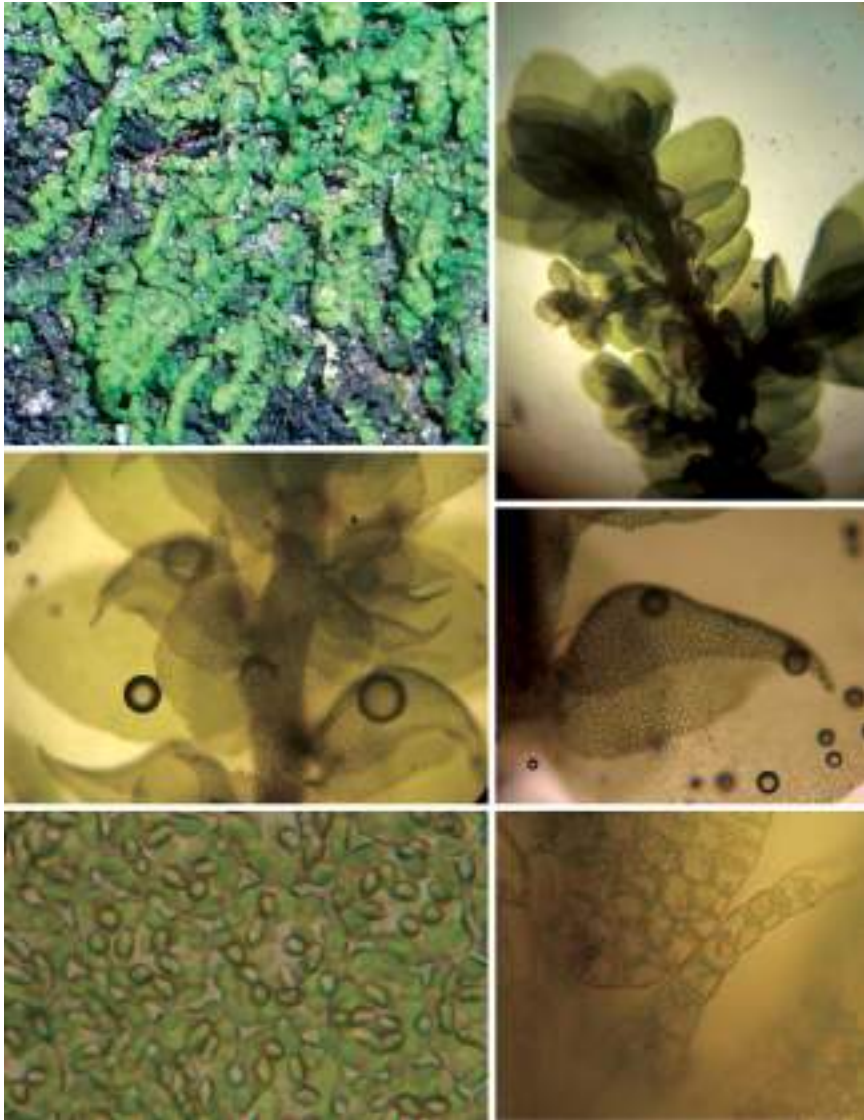


**Figs 216 and 217 (next page). *Frullania socotrana* Steph.**

Plants small, greenish-brown, irregularly branched, main axes forming fronds up to 10 cm long. Leaves contiguous to imbricate. Leaf lobes ovate, 0.4-0.65(-0.75) x 0.3-0.5(-0.65) mm, flat or concave, rounded at apex. Lobules large relative to lobe, 0.17-0.3(-0.4) mm long, usually contracted towards mouth, 1-1.4 x as long as wide. Underleaves small, 0.12-0.22 mm long, 1.5 x as wide as the stem, bilobed for 0.4 of their length. Autoicous.

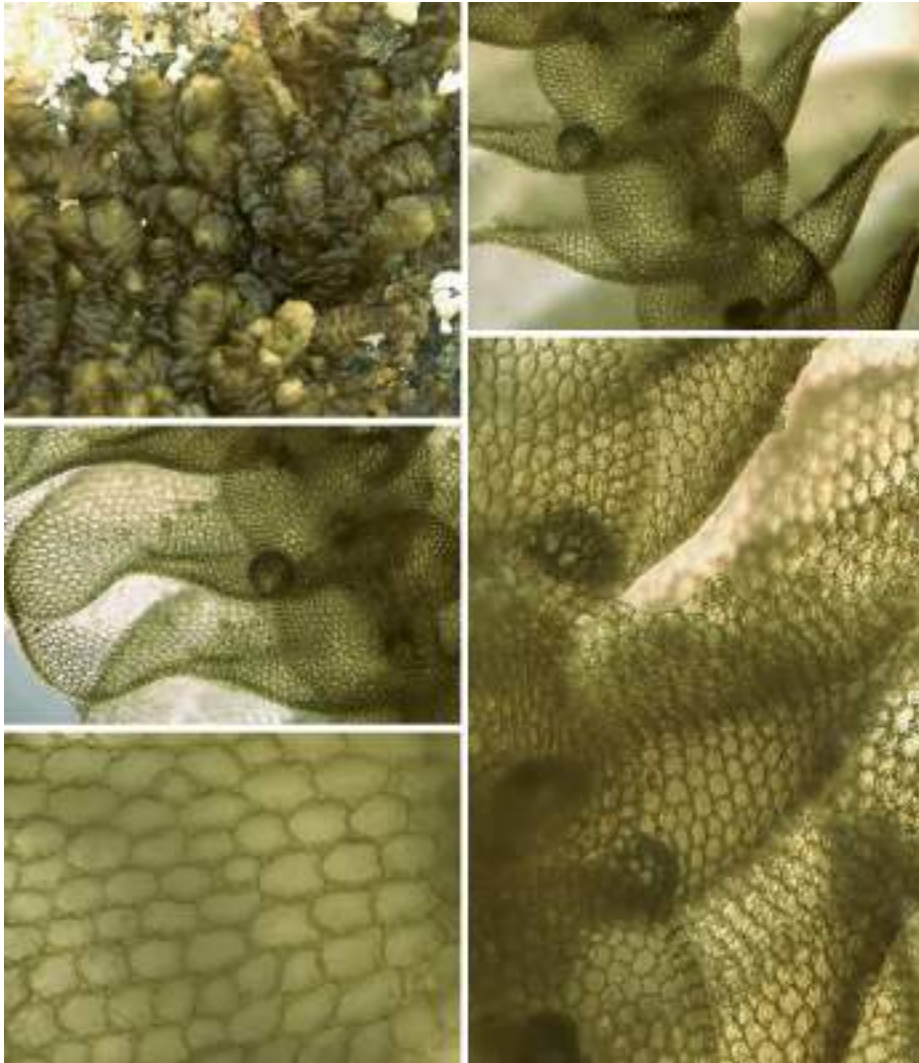
Perianths ovoid, with 2-3(-5) ventral keels, 2 lateral keels and 0-3 obscure dorsal keels.  
**Habitat:** Epiphytic on exotic trees, probably also in montane forest, 1750 m. **Distribution in Rwanda:** Central Rwanda: Huye (Butare). **Distribution in Africa:** Cameroon, Kenya, Tanzania. Also Cape Verde, Socotra, Madagascar.





**Fig. 218. *Frullania spongiosa* Steph.**

Plants green to light red-brown, complanate. Leaves imbricate, not squarrose when moist. Leaf lobes ovate, 0.9-1.2 x 0.7-0.9 mm, flat or weakly convex, with basal auricle, rounded at apex. Lobules 0.35-0.55 mm long, about as wide as long, with a strong rostrum that projects beyond ventral margin of lobe. Underleaves orbicular, 3-6 x as wide as the stem, wider than long, bilobed for 0.1-0.2 of their length. Dioicous. Perianths claviform, trigonous. **Habitat:** Epiphytic on exotic trees, probably also in montane forest, 1750 m. **Distribution in Rwanda:** Central Rwanda: Huye (Butare). **Distribution in Africa:** Ivory Coast, Cameroon, Rio Muni, Gabon, scattered in East Africa (Tanzania). Also Cape Verde, Madagascar.



**Fig. 219. *Frullanoides tristis* (Steph.) Slageren**

Synonym: *Brachiolejeunea tristis* Steph. Plants robust, blackish green, shoots 1.4-2.5 mm wide. Stem 0.15-0.2 mm in diameter. Leaves densely imbricate, 0.95-1.4 × 0.6-0.9 mm. Lobes ovate, entire, base arching across the stem, apex rounded to acute, ventral margin nearly straight. Lobules large, keel extending 0.5 the distance to lobe apex, apex and free margin arched, with 3-6 incurved papilla-like teeth of 2-3 cells. Underleaves imbricate, c. 4 x as wide as the stem, rounded, apex rounded to slightly retuse, base decurrent in narrow wings. Paroicous. Perianths 1.4-2 mm long, cylindrical to claviform, with 10 keels. **Habitat:** Epiphytic in montane forest, 2000-2200 m. **Distribution in Rwanda:** Gishwati Forest: Gikungu. **Nyungwe NP:** Cyamudongo. **Distribution in Africa:** Sierra Leone, Ivory Coast, Nigeria, Cameroon, Central African Republic, DR Congo, Burundi, Ethiopia, Uganda, Kenya, Tanzania, Angola, South Africa. Also Madagascar, Réunion.



**Fig. 220. *Gongylanthus ericetorum*** (Raddi) Nees

Plants terrestrial, light-green, up to 3 mm wide. Stems prostrate. Leaves opposite, connate on dorsal side, imbricate, up to 1(-1.5) mm long. Cells thin-walled, 25-30 x 30-45  $\mu\text{m}$ , trigones distinct, with a band of elongate cells 15-25 x 40-90  $\mu\text{m}$ , cuticle slightly papillose, oil bodies granular (*Jungermannia*-type), 2-4 per cell. Underleaves lacking. Asexual reproduction by buds in leaf-axils. **Habitat:** On soil in ericaceous forest, 3400 m. **Distribution in Rwanda: Volcano NP:** Muhavura. **Distribution in Africa:** Sierra Leone, Cameroon, DR Congo, Burundi, Ethiopia, Kenya, Tanzania, Malawi, Zambia, Zimbabwe, Lesotho, South Africa. Also Western Europe, Azores, Madeira, Canaries, Madagascar, Réunion.



**Fig. 221. *Gymnomitrium laceratum* (Steph.) Horik.**

Plants greyish-green, whitish-green to glaucous, in dense tufts, 4-10 mm high and 0.2-0.4 mm wide. Stems ascending or erect. Leaves loosely imbricate-squarrose, with decolorate margin, ovate to oblong-ovate, bilobed to 0.3-0.45 of their length. Cells thick-walled, 15-22 x 12-16  $\mu\text{m}$ , without trigones. **Habitat:** On rocks in the paramo, 3600-4300 m. **Distribution in Rwanda: Volcano NP:** Karisimbi, Bisoke. **Distribution in Africa:** DR Congo (Ruwenzori, Virunga), Uganda (Ruwenzori), Kenya, Tanzania, South Africa. Also North, Central and South America, Russia, Nepal, Japan, Borneo.



**Fig. 222. *Haplomitrium blumei* (Nees) R.M.Schust.**

Plants grass-green. Stems erect, more or less radially symmetrical, arising from horizontal rhizome lacking rhizoids. Leaves in 3 similar ranks, subrotund to obovate, up to 5 x 5 mm. Cells thin-walled, without trigones, 50-125 x 40-80  $\mu\text{m}$ . **Habitat:** *Lobelia mildbraedii*-*Cyperus denudatus* bogs in montane forest, 2200-2300 m. **Distribution in Rwanda:** **Gishwati Forest:** Gakeri. **Nyungwe NP:** 1.5 km S of Pindura. **Distribution in Africa:** DR Congo (Kahuzi-Biéga). Also South America (Caribbean, Ecuador, Peru), Asia (Java, Sumatra, Philippines, Papua New Guinea, China).



**Figs 223 and 224 (next page). *Harpalejeunea fischeri* Tixier**

Plants yellowish green, up to 3(-5) mm long and 0.3-0.4 mm wide. Leaves mostly imbricate, entire, (0.3-)0.35-0.4 mm long x (0.25-)0.3(-0.35) mm wide with acute apex. Ocelli present in most leaves, 2 in a single line at the base of the lobe or 3 with 2 adjacent ocelli at apex of line. Lobules  $\pm$  ovate, 200-250  $\mu$ m long x 95-100  $\mu$ m wide, 0.4-0.5 x the length of the lobe, apical tooth 1-celled, curved towards lower margin of lobe. Median cells of lobe 22.5-30  $\mu$ m x 15-17.5(-22.5)  $\mu$ m, walls thin without thickenings, with indistinct trigones. Underleaves 1.5-2 x as wide as the stem, 112.5-137.5  $\mu$ m x 100-125  $\mu$ m, with diverging, rounded-obtuse lobes ending often in a 2-celled apex, separated by a shallow to rounded sinus. Perianths 0.4(-0.5) mm x 0.2(-0.3) mm, obovoid with 5 long deep equal keels and a strong rostrum. **Habitat:** Epiphytic or epiphyllous in the *Hagenia-Hypericum* zone, 3000-3300 m. **Distribution in Rwanda: Volcano NP:** Karisoke. **Distribution in Africa:** DR Congo (Mt. Kahuzi), Uganda side of Mt. Elgon.

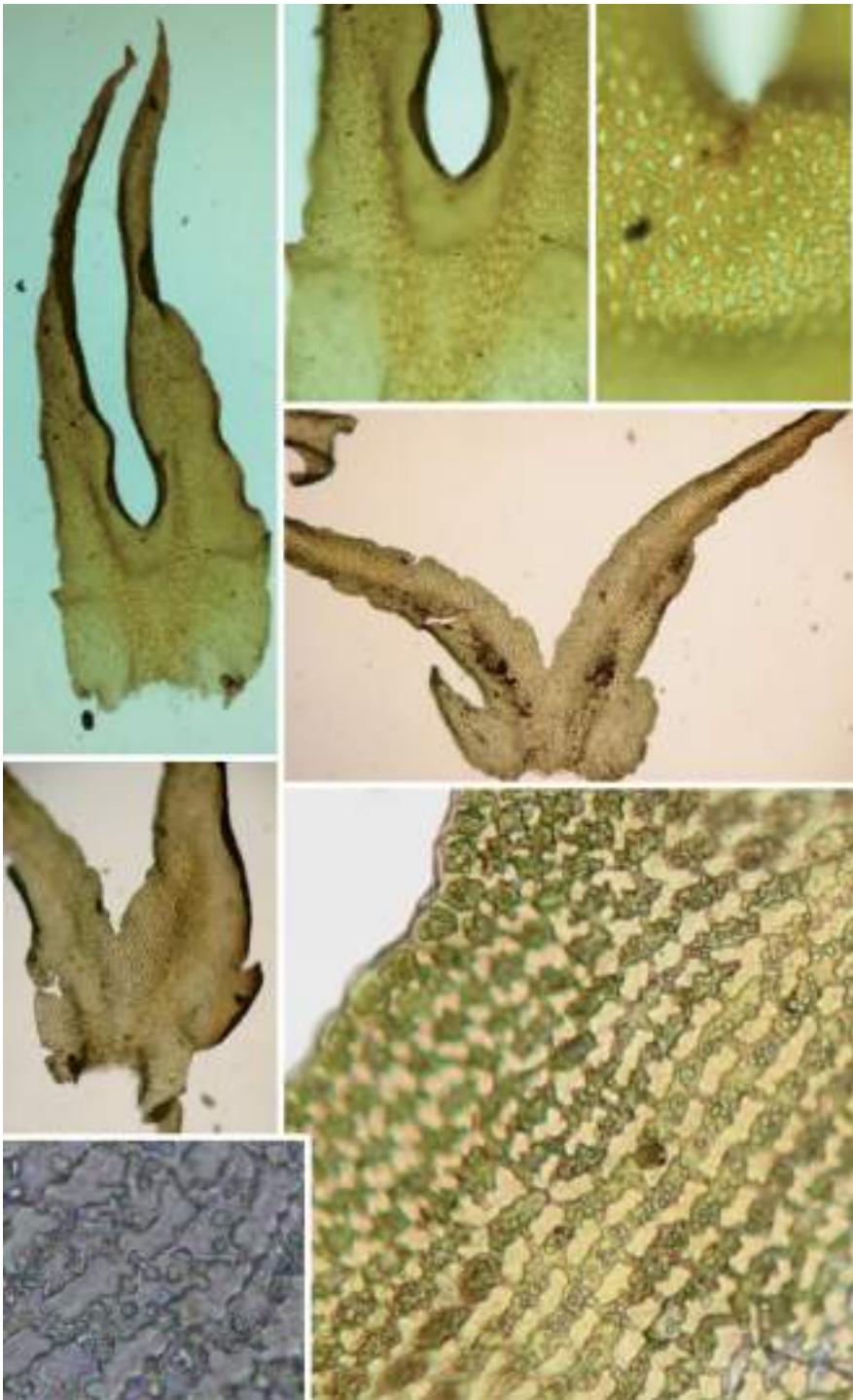






**Figs 225 and 226 (next page). *Herbertus dicranus*** (Tayl. ex Gottsche, Lindenb. & Nees) Trev.

Synonyms: *Herbertus doggeltianus* (Steph.) Demaret; *H. lobatus* (Steph.) Demaret; *H. stuhlmannii* (Steph.) Demaret. Plants slender to robust, shoots 3-20 cm long and 1-4 mm wide, orange-brown, green, olive or reddish. Leaves 1.5-4(-5) mm long and 0.4-2 mm wide, usually bilobed to 0.6 of total leaf-length. Leaf base 1-2 x longer than wide, lobes 0.75-2(-3) mm long, 2-4 x longer than wide. Vitta bifurcating less than half way up to basal disc and reaching up to 3/4 of the lobes, not excurrent. Lamina cells isodiametric to elongate, 14-40(-46) x 10-25(-27)  $\mu\text{m}$ , very thick-walled, with stellate lumina. Vitta cells 19-105 x 14-28  $\mu\text{m}$ . Underleaves similar to lateral leaves but smaller, 1.2-3 x 0.3-1.2 mm. Dioicous. **Habitat:** Epiphytic or on rocks in montane forest and ericaceous forest, 2700-3500 m. **Distribution in Rwanda: Volcano NP:** Bisoke, Sabinyo, Gahinga. **Nyungwe NP:** Mt. Bigugu. **Distribution in Africa:** Liberia, São Tomé, Bioko, Cameroon, DR Congo, Ethiopia, Uganda, Kenya, Tanzania, Malawi, Lesotho, South Africa. Also Comoros, Madagascar, Réunion.





**Fig. 227. *Herbertus juniperoides* (Sw.) Grolle**

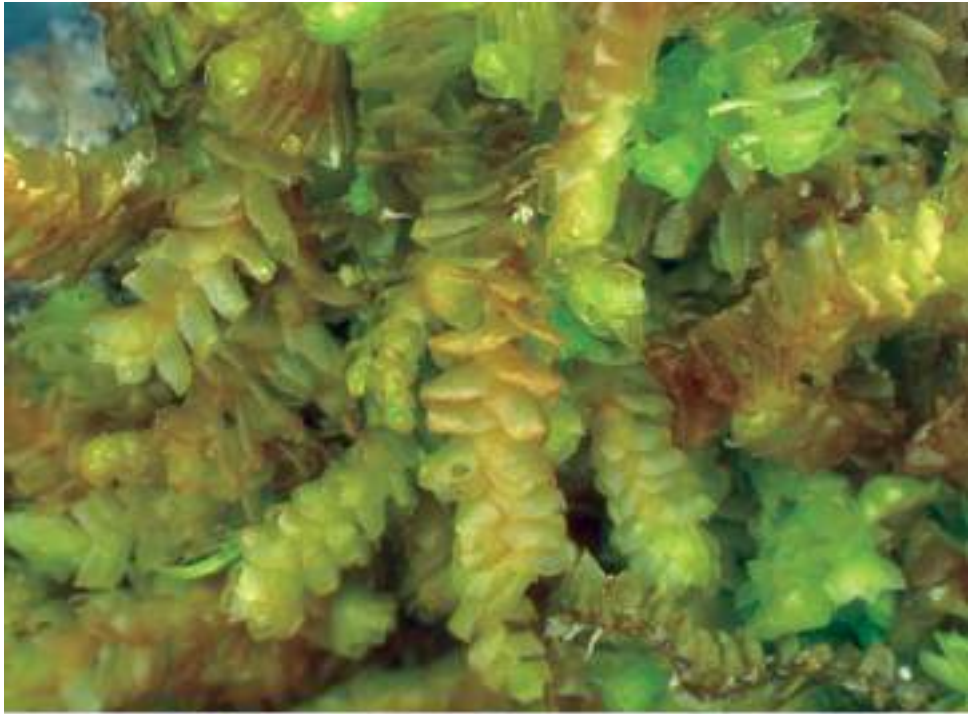
Plants medium-sized, robust, shoots up to 15 cm long and 1.5-4 mm wide, ochraceous to orange-brown. Leaves (1.5-)2-4 mm long and 0.7-1.3 mm wide, closely imbricate, distinctly decurrent ventrally and dorsally, usually bilobed to 0.6 of total leaf-length. Leaf base 1-2 x longer than wide, lobes 1.2-2.3 mm long, 3-5 x longer than wide. Vitta bifurcating just below sinus (or a little lower) and reaching up to 3/4 of the lobes, not excurrent. Lamina cells elongate, 20-40 × 10-27 μm, very thick-walled, with stellate lumina. Vitta cells 40-88 × 12-20 μm. Underleaves similar to lateral leaves but smaller, lobes 1.3-2 mm long, 5- x longer than wide. Dioicous. **Habitat:** Epiphytic or on rocks in montane forest and ericaceous forest, 2000-2500 m. **Distribution in Rwanda: Nyungwe NP:** Gisakura, Karamba. **Distribution in Africa:** Cameroon (Mt. Kupe), Tanzania (Uluguru, Usambara). Also Madagascar, Central and South America.

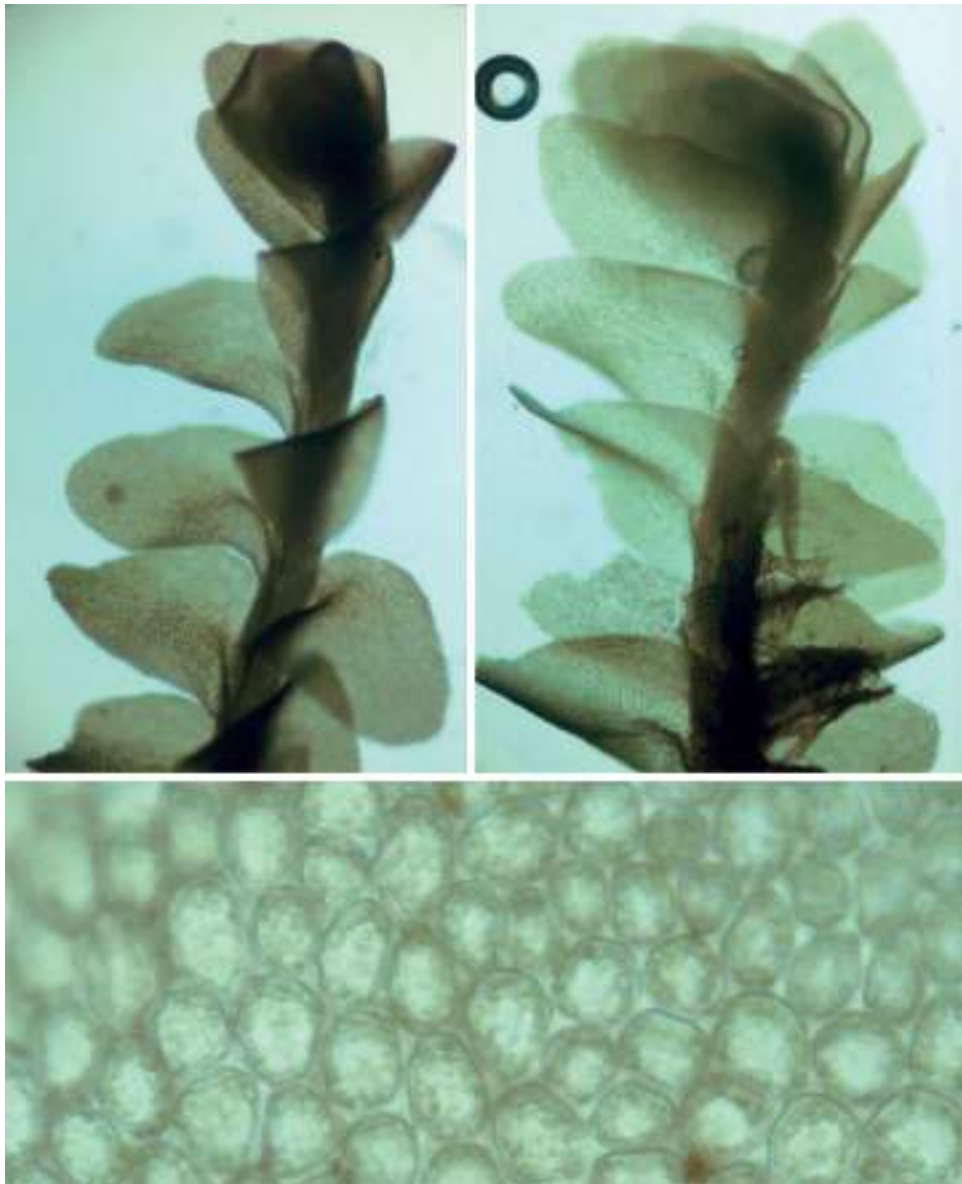


**Figs 228 and 229 (next page). *Isotachis aubertii* (Schwaegr.) Steph.**

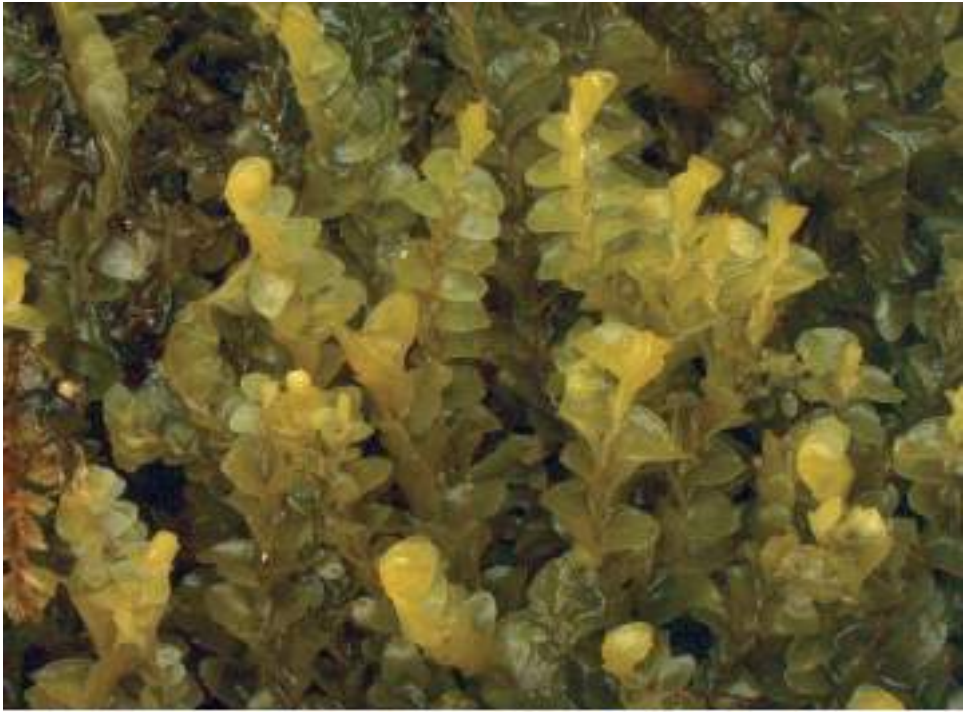
Synonyms: *Isotachis conistipula* Steph.; *I. renistipula* Steph.; *I. aspera* Steph. Plants terrestrial, whitish-green to red or brown. Stems with a thick-walled cortex, erect or creeping, 0.3 mm in diameter. Leaves transverse, strongly concave, 1-1.5 x 1-1.5 mm, amplexicaul, bilobed to 0.25-0.35 of their length, the lobe with 1-2-celled incurved apiculi, leaf margin entire except for 1-2 teeth towards base of ventral margin. Cells rectangular, 25-30 x 30-40  $\mu$ m in mid-leaf, 20 x 60  $\mu$ m near leaf insertion, thin-walled or slightly thickened, cuticle striate-verruculose. Underleaves similar to leaves, 0.6 x 0.6 mm, bilobed for 0.3-0.5 of their length, lobes acuminate, margins entire except for 1-2 teeth or laciniae.

**Habitat:** on ground and on roadcuts, montane forest, *Cyperus* bogs ("Waldmoor" in Stephani, 1914), to the Ericaceous belt, 2000-3500 m. **Distribution in Rwanda: Volcano NP:** Karisimbi, Bisoke. **Nyungwe NP:** Rwasenkokoko, c. 7 km E of Pindura, Karamba, rocky slopes along abandoned road to Burundi. **Distribution in Africa:** Cameroon, DR Congo, Burundi, Uganda, Kenya, Tanzania, Malawi, Zimbabwe, South Africa. Also Ascension, Comoros, Madagascar, Mauritius, Rodriguez, Réunion, Central and South America.





**Figs 230 and 231 (next page). *Jamesoniella purpurascens* Steph.**  
 Plants large, reddish brown to purple. Stems prostrate, up to 2.5 cm long. Stolons lacking.  
 Leaves ovate-orbicular, 1.4 x 1.4-1.7 mm, apex broadly rounded, margins entire and usually somewhat incurved, bases decurrent. Cells elongate at the base, purple, usually with large trigones, 24-30 x 24-30  $\mu\text{m}$ , cuticle smooth. Dioicous. Perianths indistinctly 3-4-plicate in upper half. **Habitat:** Quartzitic rocks in montane forest, 2000 m. **Distribution in Rwanda:** Nyungwe NP: Karamba. **Distribution in Africa:** DR Congo, Tanzania, Malawi, Zambia, South Africa. Also Madagascar, Mauritius, Réunion.



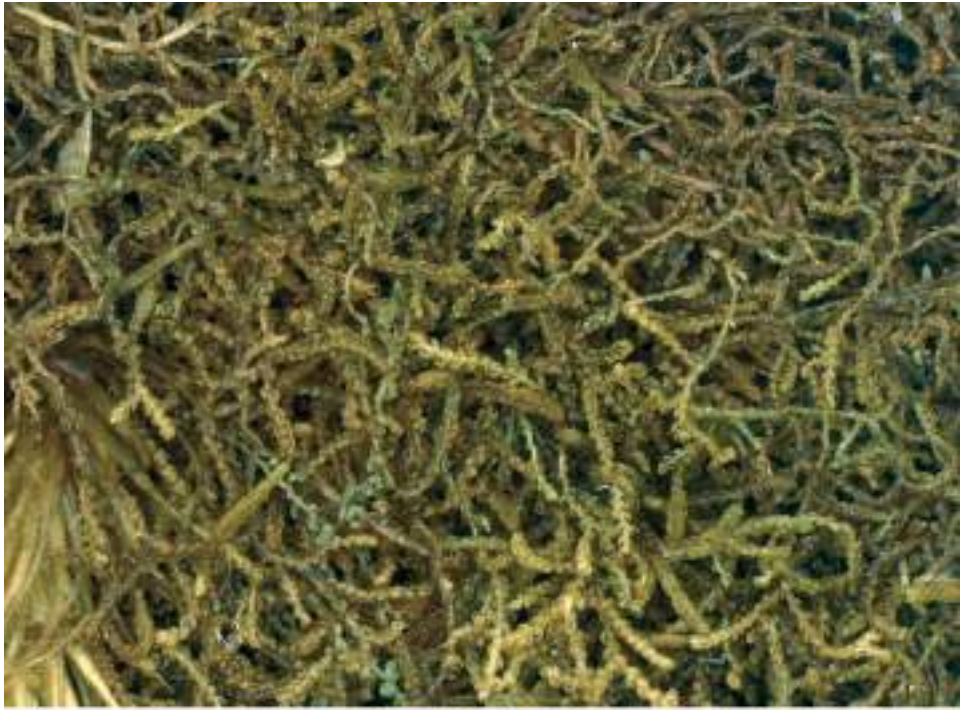




**Figs 232 and 233 (next page). *Kurzia capillaris* (Sw.) Grolle**

Synonym: *Kurzia tabularis* (Steph.) Grolle. Plants minute to medium-sized, dull green to brownish. Stems up to 4 cm long, 1-2-pinnate. Leaves asymmetrically quadrate, up to 0.2 mm long, deeply 4-lobed, lobes incurved, at base almost 2 cells wide and with 3-44 cells long uniseriate end, dorsal lobe shorter. Cells thick-walled, without trigones. Underleaves smaller than lateral leaves, 3-4-lobed, 0.08-0.09 mm wide, as wide as the stem. Dioicous.

**Habitat:** Terrestrial or on decaying wood, 2400 m. **Distribution in Rwanda:** Nyungwe NP: Rugege. **Distribution in Africa:** Tanzania, Malawi, South Africa. Also Madagascar, Mauritius, Réunion, Seychelles.

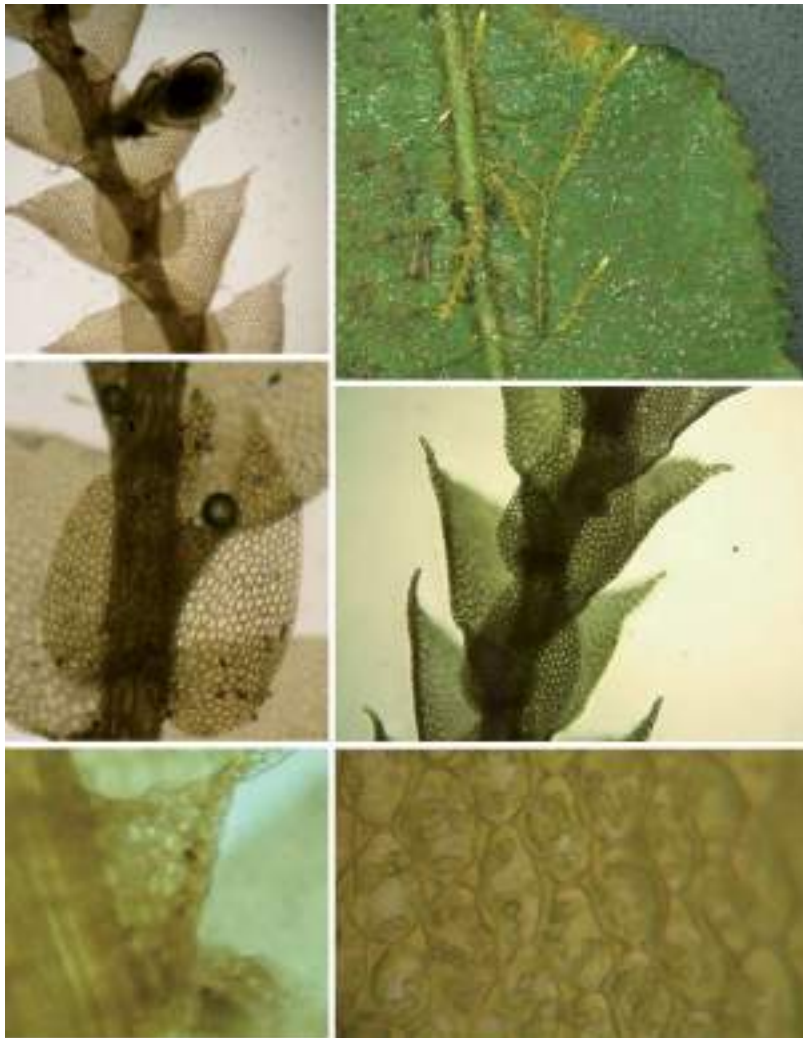




**Figs 234 and 235 (next page). *Kurzia irregularis* (Steph.) Grolle**

Synonym: *Lepidozia irregularis* Steph. Plants minute to medium-sized, dull green to brownish. Stems up to 3-4 cm long, 1-2-pinnate. Leaves asymmetrically quadrate, up to 0.27 x 0.17 mm, deeply 4-lobed, lobes incurved, at base almost 3 cells wide and with long uniseriate end, up to 0.14 mm long and 0.04 mm wide at base, dorsal lobe shorter. Cells thick-walled, without trigones, 17-20 x 16-17  $\mu$ m. Underleaves smaller than lateral leaves, 3-4-lobed, 0.1 x 0.11 mm, as wide as the stem. **Habitat:** On rocks and dead wood in the paramo, 3500 m. **Distribution in Rwanda: Volcano NP:** Karisimbi. **Distribution in Africa:** DR Congo, Uganda, Kenya, Tanzania, South Africa.



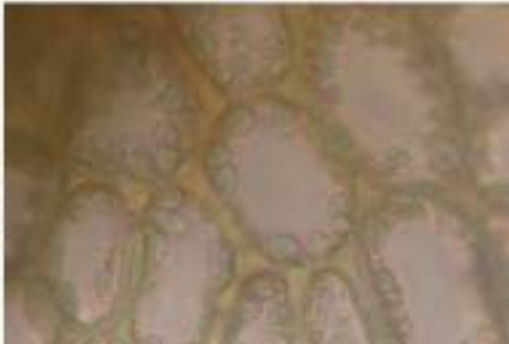
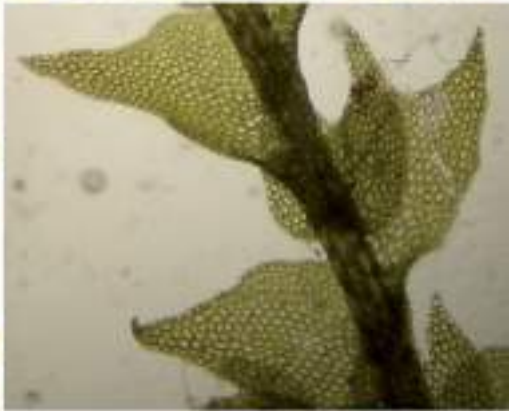


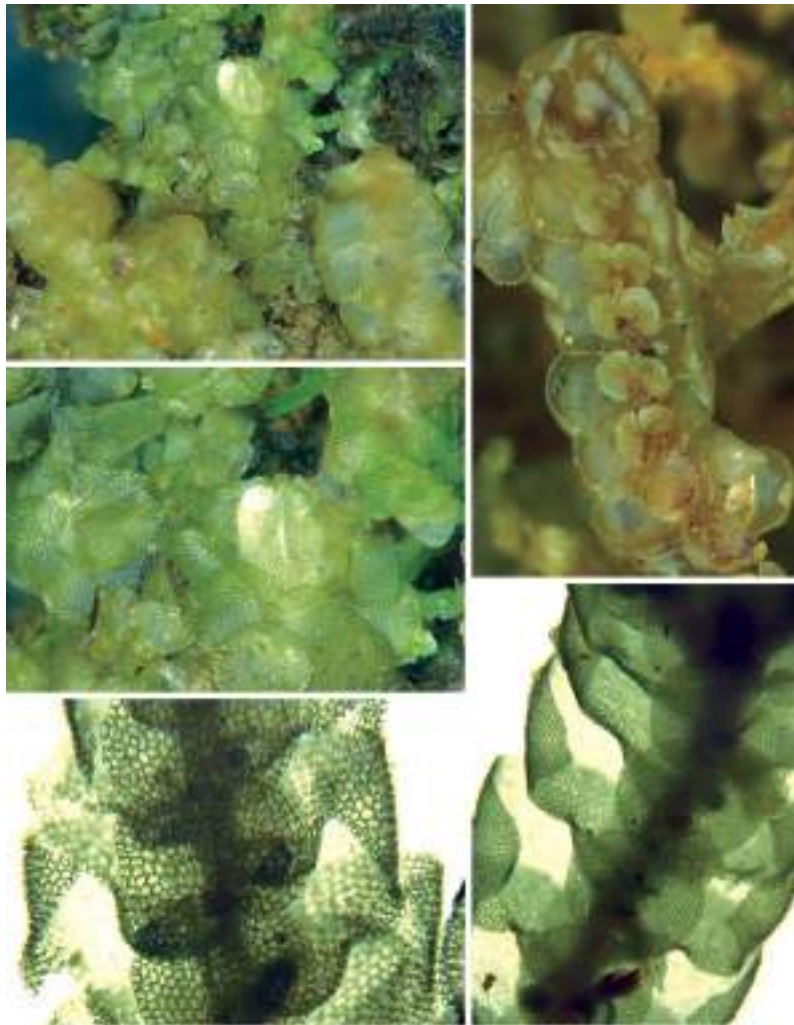
**Figs 236 and 237 (next page). *Lejeunea acuta* Mitt.**

Synonyms: *Stenolejeunea acuta* (Mitt.) Tixier; *Hygrolejeunea acuta* (Mitt.) Vanden Berghen. Plants variable, up to 2-3 cm long and 1-1.8 mm wide. Leaves approximate or slightly imbricate, ovate, acuminate at apex, deflexed when dry. Lobes 1 x 0.65 mm, lobule when well developed c. 0.25 the length of the lobe, free margin of 4 cells, involute, apical tooth short. Underleaves large, ovate, cordate at base, 0.6 x 0.4 mm, c. 4 x as wide as the stem, bilobed to 0.65 into narrow acuminate lobes with wide sinus. Cells 18-22 x 21-28  $\mu$ m, walls distinctly thickened, with large nodulose trigones and intermediate thickenings, oil bodies 2-6 per cell. Dioicous. Perianth clavate or fusiform, c. 1 mm long, 5-keeled.

**Habitat:** Epiphytic in montane forest, also on rocky slopes in heath forest, 2000-2200 m.

**Distribution in Rwanda:** Nyungwe NP: Karamba, Kamiranzovu, Gisakura. **Distribution in Africa:** Annobón, São Tomé, Bioko, Cameroon, Rio Muni, DR Congo, Burundi, Uganda, Kenya, Tanzania.





**Fig. 238. *Lejeunea amaniensis* E.W.Jones**

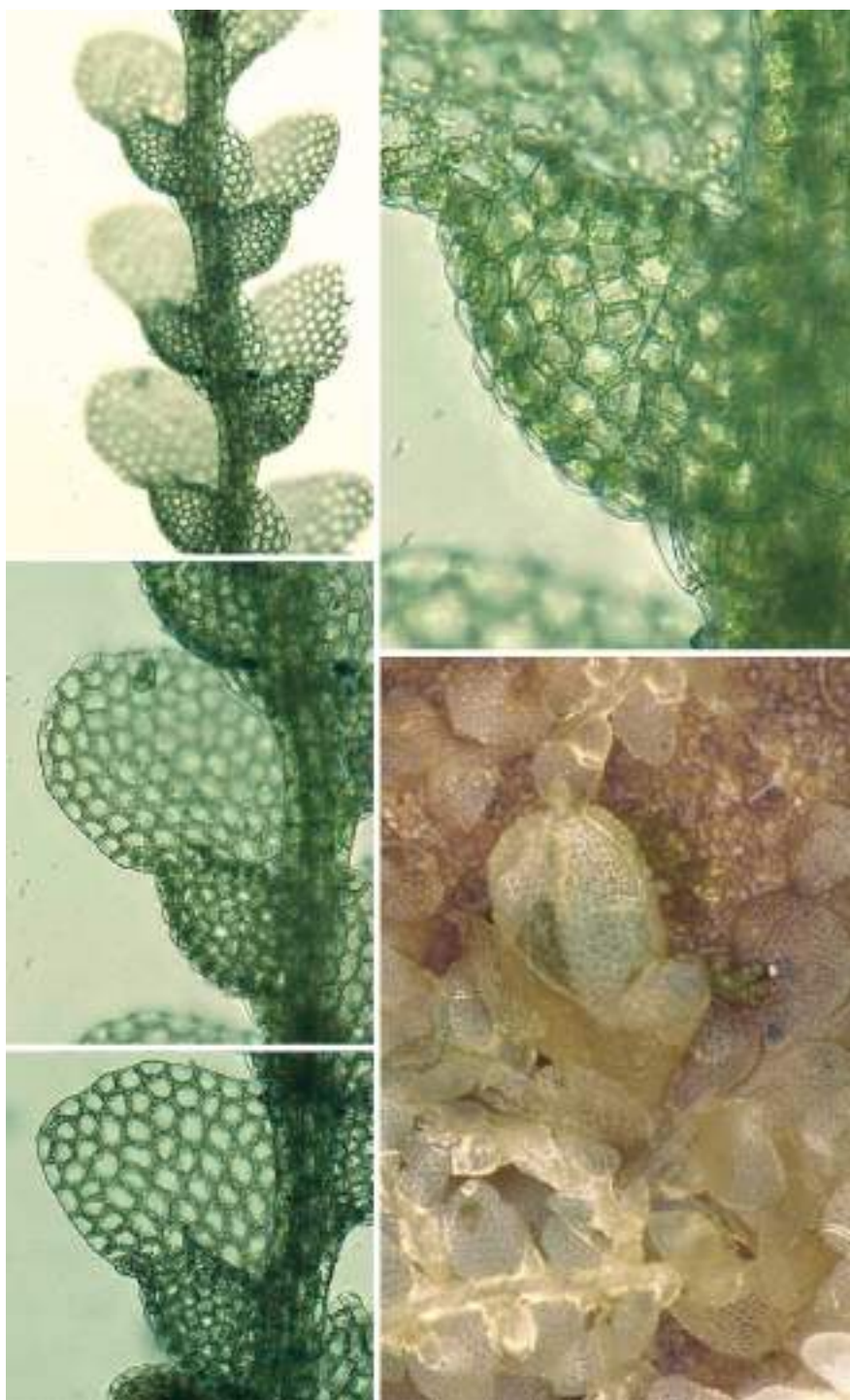
Plants with a glossy metallic sheen, c. 1 mm wide. Leaves imbricate, 0.6-1 x 0.4-0.7 mm, convex, ovate, acuminate, acumen strongly decurved, dorsal base straight near insertion and then arched across stem. Lobules large, 0.4-0.5 the length of the lobe, the keel strongly arched and forming an angle of 90° or more with ventral margin of lobe, strongly inflated, almost globose, apical tooth short, free margin of 6 or more cells. Underleaves broadly ovate, 3-5 x as wide as the stem, wider than long, shallowly 2-lobed to about 0.2 of their length, obtusely pointed or rounded. Cells large, isodiametric, 20-30 µm wide, very thin-walled but often with sharp trigones and intermediate thickenings, oil bodies numerous. Autoicous. Perianth 0.8-0.9 mm long, exserted from bracts to 0.5 of their length, with 5 equal keels. **Habitat:** Epiphytic in montane forest, 2000 m. **Distribution in Rwanda:** Nyungwe NP: Gisakura. **Distribution in Africa:** Cameroon, Kenya (Kakamega), Tanzania. Also Madagascar.

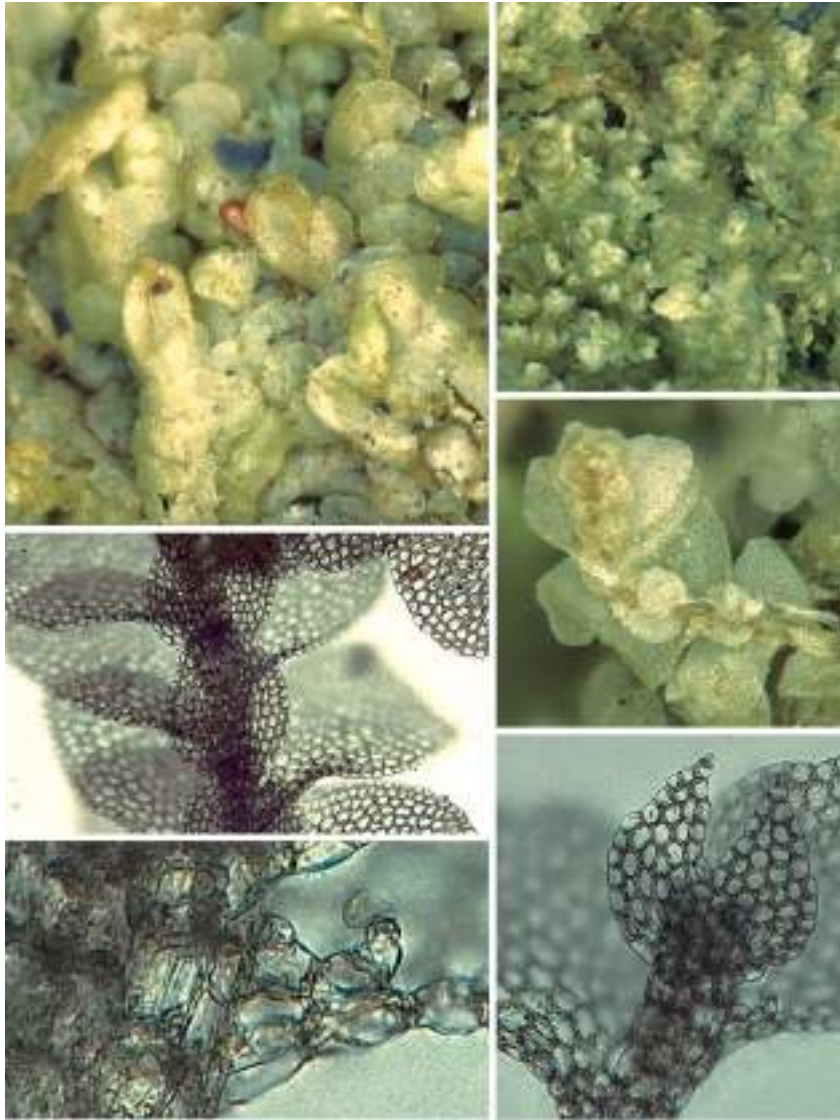


**Figs 239 and 240 (next page).** *Lejeunea caespitosa* Lindenb. in Gottsche, Lindenb. & Nees

Plants very variable, shoots 0.5-0.7(-1.2) mm wide. Leaves approximate, ovate to oval, 0.3-0.5 mm long, dorsal base truncate, apex broadly rounded, ventral margins nearly in line with the weakly arched keel. Lobules often reduced or lacking, when well developed 0.25-0.35 the length of the lobe, inflated, free margin inrolled, of 3-4 cells, apical tooth short. Underleaves 2-3 x as wide as the stem, oval, 2-lobed for 0.5-0.65 of their length, lobes narrowly triangular, (2-)4(-5) cells wide at base, acute, diverging, sinus wide, base rounded. Cells nearly isodiametric, (19-)25-27 x 25-30  $\mu\text{m}$ , walls thin, trigones and intermediate thickenings sharp or lacking. Autoicous. Perianths exerted to 0.5 of their length, compressed, obcordate, plane dorsally, with or without weak median keel, lateral keels wide around distal half of perianth, ventrally inflated, with 2 keels. **Habitat:** Epiphytic in montane forest, 2000-2500 m. **Distribution in Rwanda:** Nyungwe NP: Rwasenkoko, Karamba, Uwinka. **Distribution in Africa:** Sierra Leone, Ghana, Nigeria, Annobón, Príncipe, São Tomé, Bioko, Cameroon, Rio Muni, Central African Republic, Congo-Brazzaville, DR Congo, Uganda, Kenya, Angola, Malawi, Zimbabwe, South Africa. Also Cape Verde, Comoros, Madagascar, Mauritius, Réunion, Rodriguez, Seychelles.

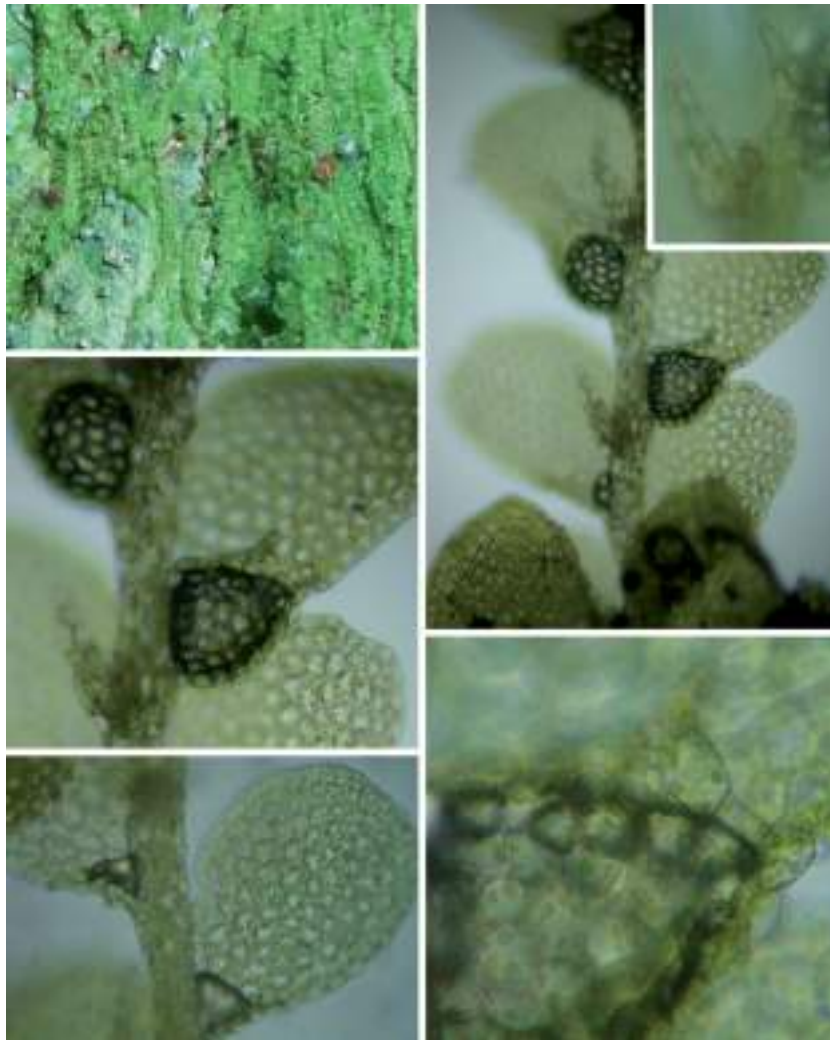






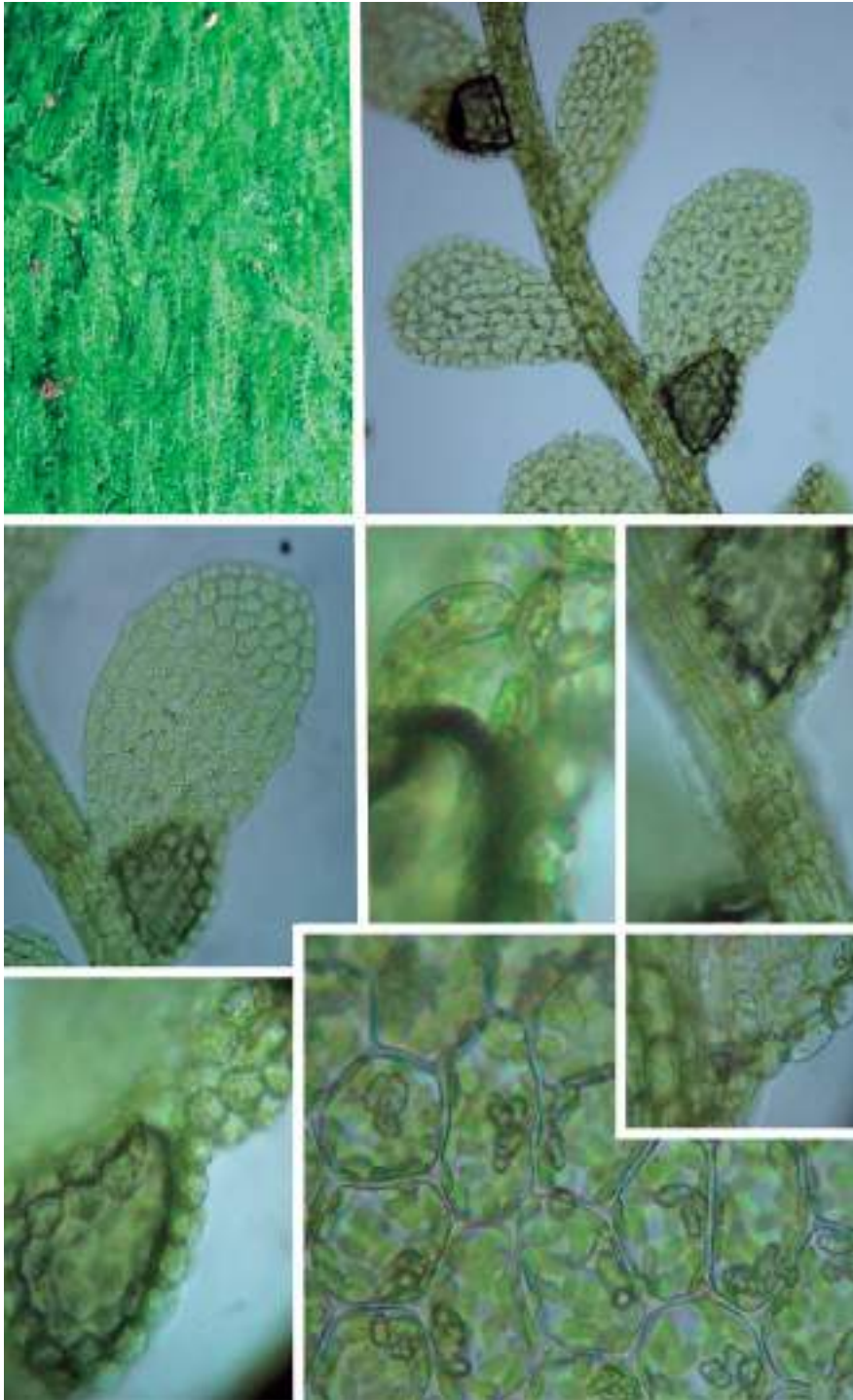
**Fig. 241. *Lejeunea capensis*** Gottsche in Gottsche, Lindenb. & Nees.

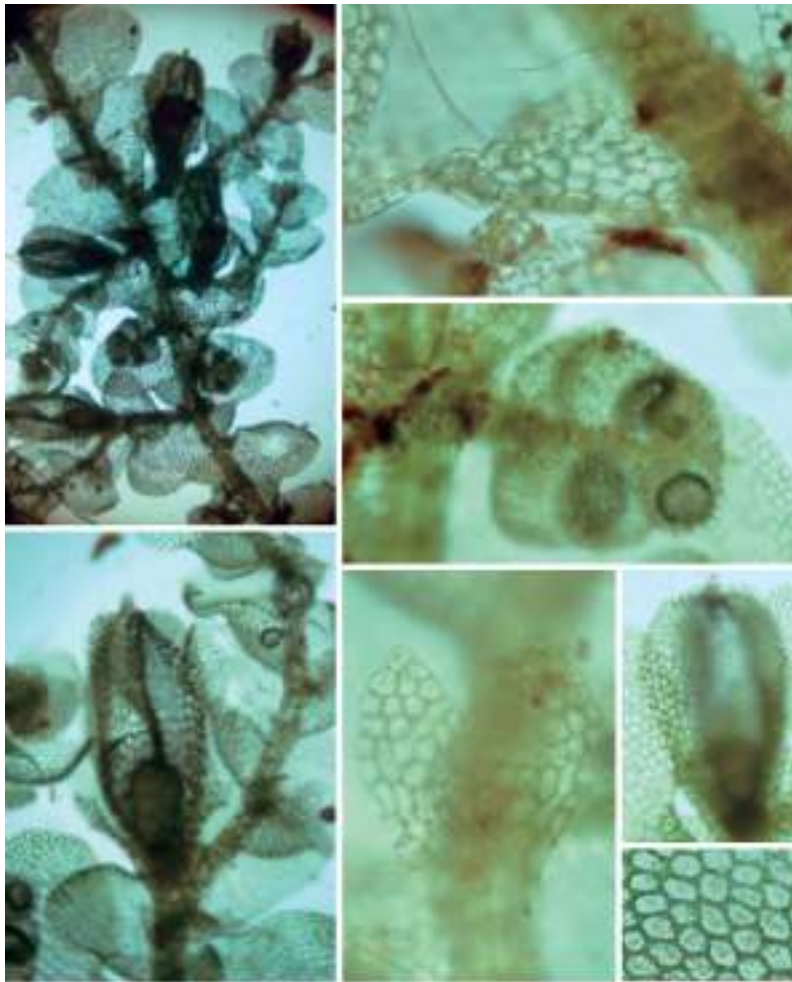
Synonym: *Inflatolejeunea capensis* (Gottsche) S.W.Arnell. Plants green, densely caespitose. Stems up to 10 mm long, 0.05 mm in diameter, richly and regularly branched. Leaves densely imbricate, orbicular, slightly concave, overlapping and crossing the stem. Lobule medium-sized to small, keel slightly arched, apex with 1-cellular apical tooth. Underleaves small, patent, bilobed to 1/2 of their length, lobes triangular, acute, sinus wide, obtuse to subacute. Cells 24 x 24  $\mu\text{m}$ , walls thin without or with small trigones. Monoicous. Perianth pyriform, inflated, not plicate. **Habitat:** Epiphytic in montane forest, 2600 m. **Distribution in Rwanda: Volcano NP:** Sabinyo. **Distribution in Africa:** DR Congo, Kenya, Tanzania, Malawi, Lesotho, South Africa. Also Madagascar.



**Figs 242 and 243 (next page). *Lejeunea confusa* E.W.Jones**

Plants small, shoots 0.4-0.8 mm wide, little branched. Leaves uniform in size, distant to approximate, oval, lobe 0.2-0.25 x 0.13-0.2 mm, convex, hardly changed when dry, dorsal base slightly arched but hardly crossing the stem, apex broadly rounded, ventral margin forming a deep sinus with the ventral margin of the lobule. Lobule, when well developed, inflated, with strongly arched keel, free margin incurved, of 4 cells, apical tooth c. 3 x as long as wide, strongly curved. Underleaves small and delicate, 1-1.5 x as wide as the stem, bilobed to 0.5 or more, lobes 2-4 cells wide. Cells 20-24 x 22-28  $\mu$ m, walls thin, trigones minute or absent. Dioicous. Perianths rare, 0.4-0.5 x 0.3-0.35 mm, oblong-oval, compressed, laterally with long narrow keels. **Habitat:** Epiphytic or epiphyllous in montane forest, 2000-2100 m. **Distribution in Rwanda:** Nyungwe NP: Kamiranzovu, Uwinka. **Distribution in Africa:** Sierra Leone, Ghana, Nigeria, Bioko, Cameroon, Central African Republic, Gabon, DR Congo, Kenya, Tanzania. Also Comoros, Madagascar, Seychelles.





**Figs 244 and 245 (next page).** *Lejeunea cyathearum* E.W.Jones

Plants small, light green, shoots up to 0.75-1.2 mm wide. Leaves contiguous to imbricate, convex, spreading at right angles to the stem, lobe complanate, oval, 0.55-0.8 x 0.4-0.55 mm, apex broadly rounded, postical margin slightly arched. Lobules often lacking, when well developed with a keel arching through a quadrate and forming an angle of 90° with the postical margin of the lobe, 0.2-0.25(-rarely 0.3) of lobe length, apical tooth slightly incurved. Underleaves large, orbicular, convex, 3-6 x as wide as the stem, 0.3-0.6 mm wide, apex bilobed to 0.6 of the length, sinus V-shaped, lobes acute, base rounded to subcordate. Cells thin-walled, almost without trigones, or with small trigones and intermediate thickenings, 25-33 x 30-45 µm, oil bodies numerous. Monoicous. Perianth exserted for 0.3-0.5 of its length, pyriform, terete, 0.6-0.9 x 0.3-0.5 mm, equally 5-keeled, keels tuberculate or dentate. **Habitat:** Epiphytic in montane forest, usually on tree ferns (*Cyathea manniana*), 2000-2450 m. **Distribution in Rwanda:** Nyungwe NP: Rwasekoko, Uwinka. **Distribution in Africa:** DR Congo, Tanzania, Malawi. Also Comoros.



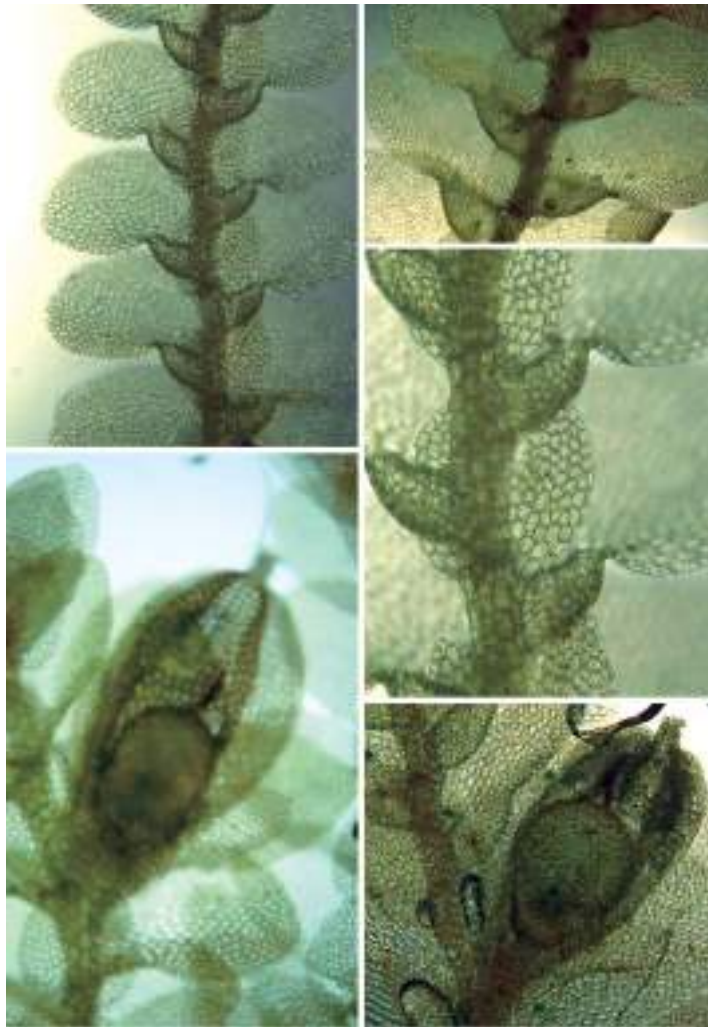


**Fig. 246. *Lejeunea eckloniana* Lindenb.**

Synonym: *Taxilejeunea heterofolia* Steph. Plants green. Shoots to 8 mm long and 0.8-1.4 mm wide. Leaves laxly imbricate, lobe ovate to orbicular, concave, apex rounded, ventral margin nearly straight, forming a wide angle with the keel or  $\pm$  in line with it. Lobule variable, 0.2-0.25 as long as the lobe, apex with an obtuse 2-celled tooth. Cells 25-30 x 21-27  $\mu\text{m}$ , walls thin, trigones small but distinct. Underleaves 2.5-3.5(-4) x as wide as the stem, 2-lobed to 0.4-0.5 of their length. Monoicous. Perianth pyriform, 0.5-0.75 mm long.

**Habitat:** Epiphytic in montane forest, 2100-2450 m. **Distribution in Rwanda:** Nyungwe

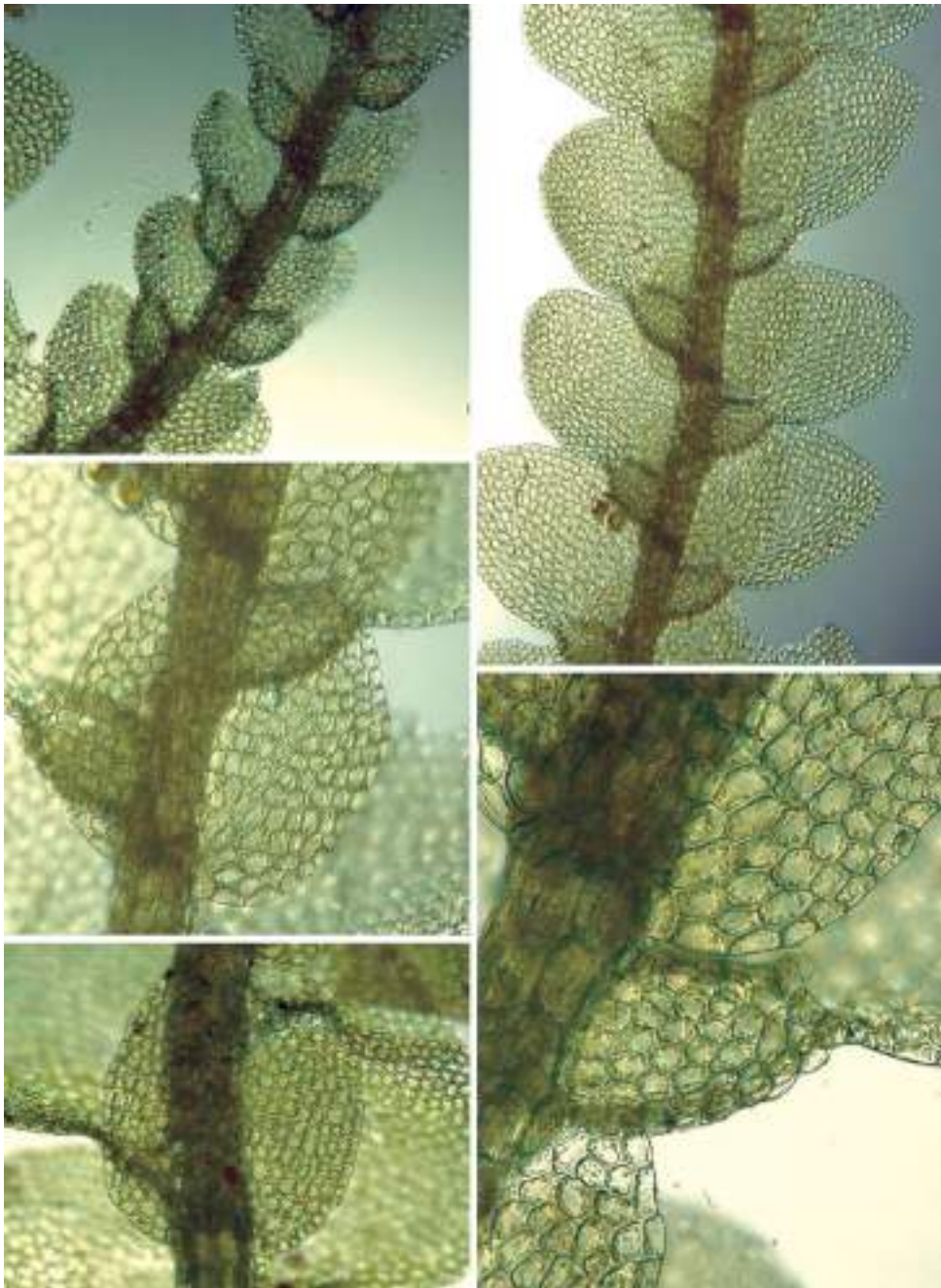
**NP:** Rwasekoko, Uwinka. **Distribution in Africa:** Guinea, Ghana, Togo, Nigeria, Bioko, Cameroon, Congo-Brazzaville, DR Congo, Djibouti, Uganda, Kenya, Tanzania, Angola, Malawi, Zambia, Zimbabwe, Lesotho, South Africa. Also Canaries, Cape Verde, Madagascar, Mauritius, Réunion.

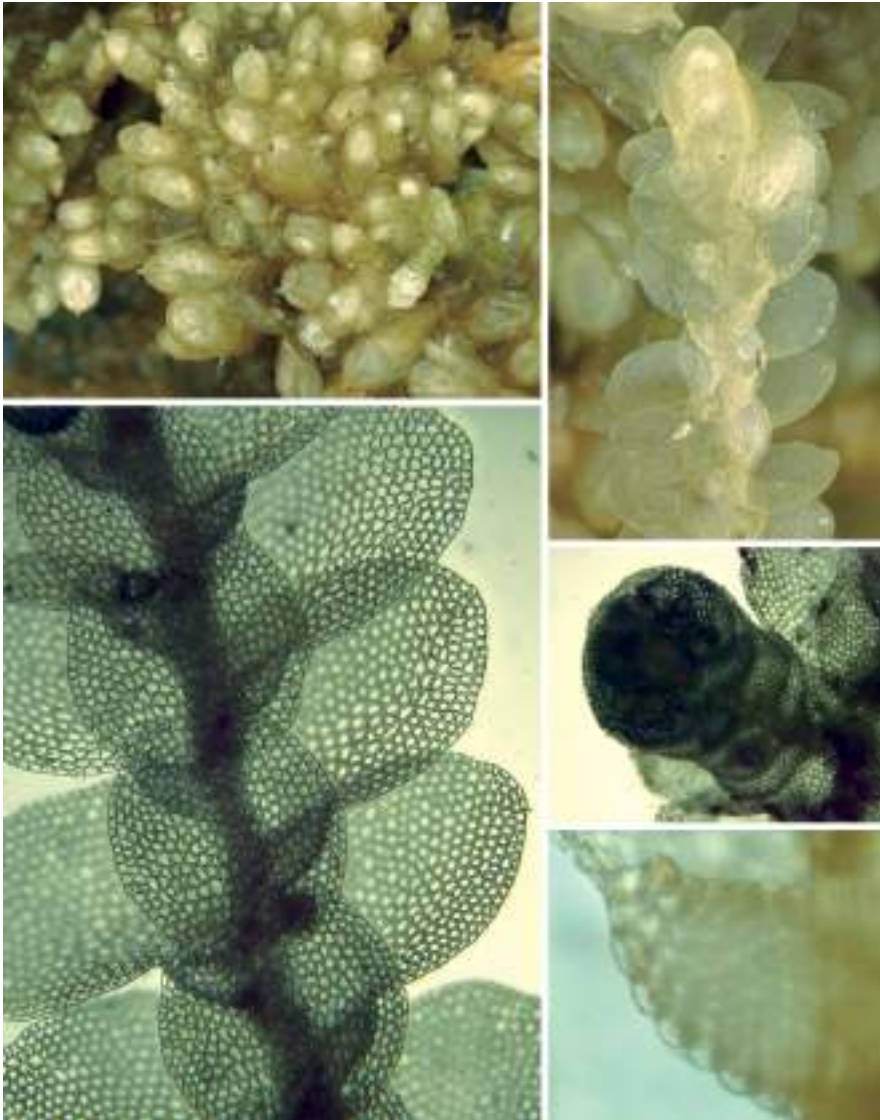


**Figs 247 and 248 (next page). *Lejeunea flava* (Sw.) Nees**

Synonym: *Lejeunea flava* ssp. *flava*. Plants similar to *L. tabularis*, medium-sized, shoots rarely more than 1 mm wide. Leaves 0.5-0.7 mm long, spreading nearly to right angle to the stem. Lobule 0.35 the length of the lobe, with free margin inrolled or incurved, of 4 cells, apical tooth short. Underleaves approximate to distant (not imbricate), ovate, truncate at the base (not cordate), 2.5-3 x as wide as the stem. Perianths pyriform, exerted from the bracts to about 0.35 of their length, keeled in the apical half, dorsal face usually plane with a low keel or without keel, lateral and ventral keels strong, rostrum variable in length. **Habitat:** Epiphytic in montane forest and ericaceous heath, 2000-2700 m. **Distribution in Rwanda: Volcano NP:** Sabinyo. **Gishwati Forest :** Gikungu. **Nyungwe NP:** Rwasenkoko, Uwinka, Mt. Muzimu. **Distribution in Africa:** Sierra Leone, Ghana, Togo, Bioko, Congo-Brazzaville, Central African Republic, DR Congo, Uganda, Kenya, Tanzania. Also Cape Verde, Comoros, Madagascar, Réunion, Seychelles.







**Fig. 249.** *Lejeunea flavovirens* Ångstr.

Plants yellowish green. Leaves densely imbricate. Lobe 0.5 x 0.3-0.4 mm, apex rounded.

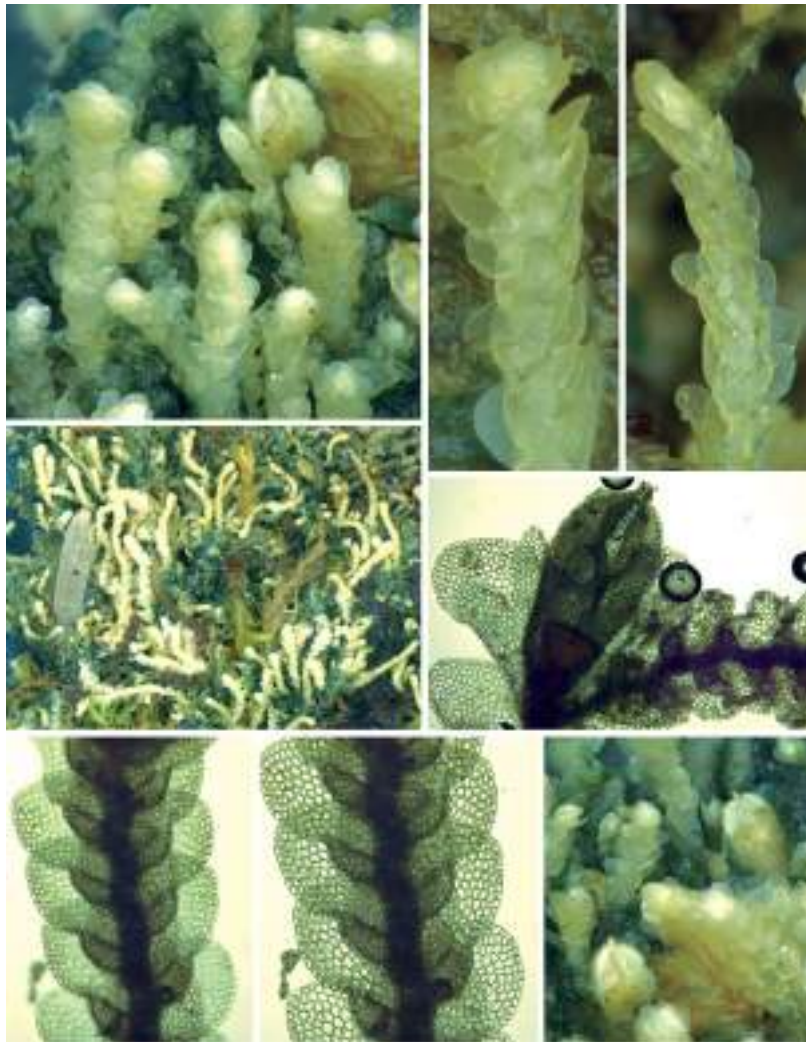
Lobule inflated, 0.13-0.15 x 0.08-0.09 mm. Cells with trigones, 22-35 x 19-23  $\mu$ m.

Underleaves nearly round, 4-5 x as wide as the stem, 0.4 x 0.39 mm, sinus 0.14 mm

long. Dioicous. Perianths terete, lacking keels. **Habitat:** Epiphytic in montane forest

up to *Hagenia-Hypericum* forest and the *Dendrosenecio-Lobelia stuhlmannii* paramo, 2450-3600 m. **Distribution in Rwanda:** **Volcano NP:** Karisimbi, at park gate, S-slope of Bisoke, in the saddle between Bisoke and Karisimbi, on the E-slopes along trail to summit.

**Nyungwe NP:** Rwaseankoko. **Distribution in Africa:** Sierra Leone, DR Congo, Uganda, Tanzania. Also Comoros, Madagascar, Mauritius, Réunion.

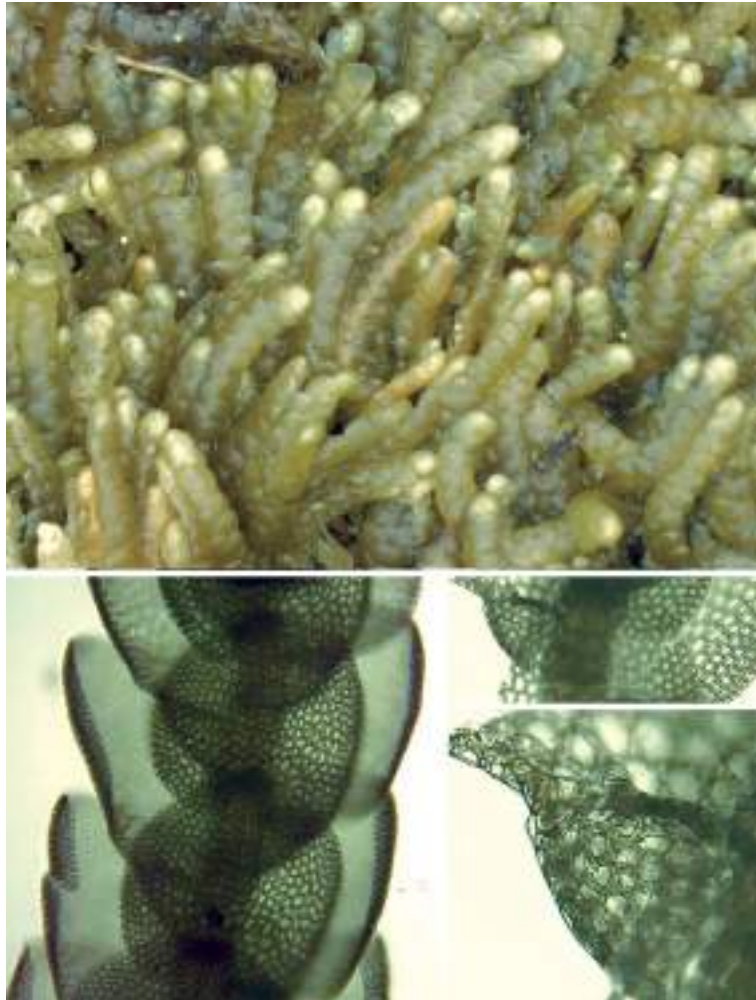


**Fig. 250.** *Lejeunea helenae* Pears.

Plants green, minute. Shoots to 8 mm long and 0.5-0.65 mm wide, subjulaceous.

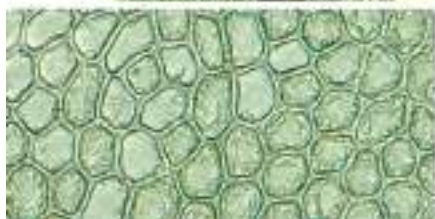
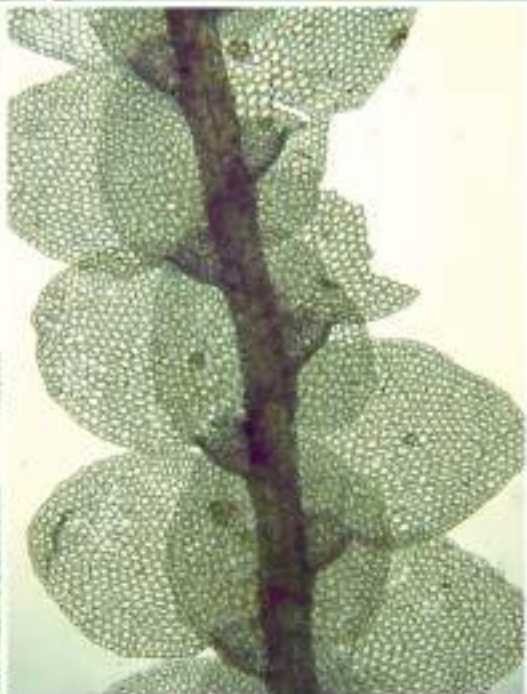
Leaves distant to approximate, erecto-patent, lobe slightly concave, 0.35 x 0.24 mm, asymmetrical, base rounded, covering the stem, apex obtuse and rounded, antical base arched, postical margin arched, forming a well defined sinus with the keel. Lobule often reduced to lacking, when well developed inflated, the keel extending c. 1/3 the distance from insertion to lobe apex, keel arching almost a quadrate, apical tooth curved, 2 x as long as wide. Underleaves oval, 2.5 x as wide as the stem, 0.1-0.12 x 0.17-0.2 mm, mostly longer than wide, 2-lobed to 0.5 of their length, lobes narrow triangular, acute, sinus acute. Dioicous. Perianth ovate to oblong, 5-keeled in upper half, rostrum short.

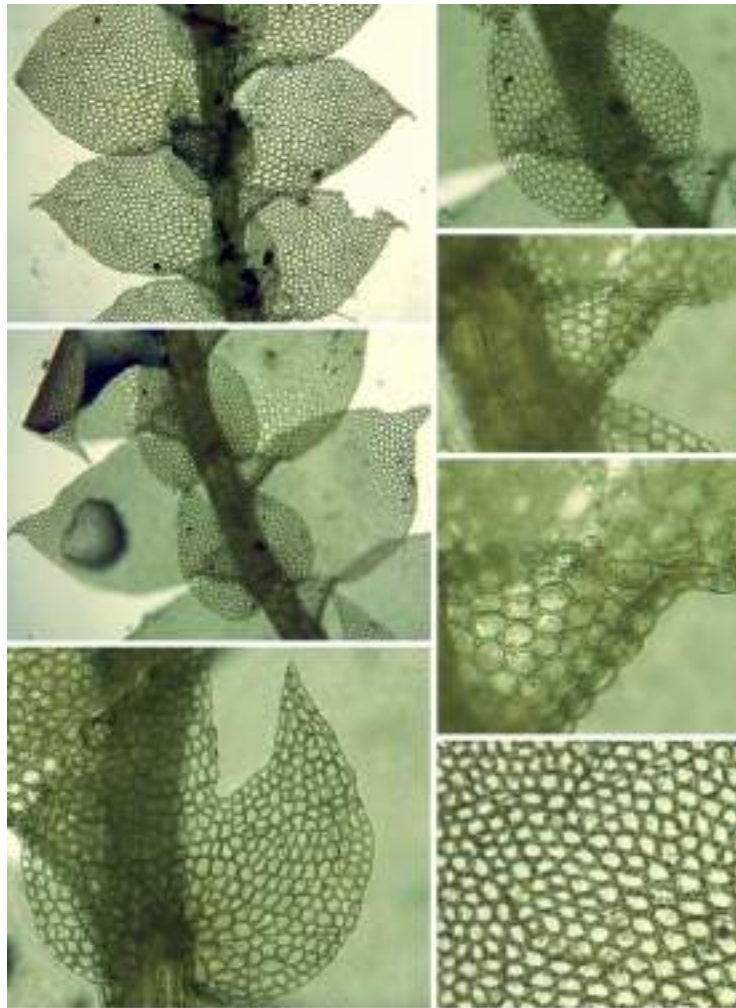
**Habitat:** Epiphytic in montane forest, 2300-2450 m. **Distribution in Rwanda:** Nyungwe NP: Rwasekoko, Uwinka. **Distribution in Africa:** DR Congo, Ethiopia, Uganda, Kenya, Tanzania, Angola, Malawi, Zimbabwe, South Africa.



**Figs 251 and 252 (next page). *Lejeunea isophylla* E.W.Jones**

Plants green. Shoots elongate, up to 4 cm long and 0.8-0.9 mm wide, shortly and irregularly pinnately branched. Leaves distant to slightly imbricate, 0.5-0.7 x 0.35-0.5 mm, forming an angle of c. 50° with the stem, convex, inrolled when dry, ovate, antical base broadly rounded, crossing the stem, apex rounded, postical margin arched forming a well defined sinus with the keel. Underleaves orbicular, imbricate, very large, nearly equalling the leaves in size, their length exceeding the width of the adjacent leaves, 4-5 x as wide as the stem, base deeply cordate with rounded auricles. Cells 18-21 x 20-25 µm, wall with large trigones and confluent intermediate thickenings. Dioicous. Perianth inflated, pyriform, dorsal surface plane with a weak keel, ventral and lateral keels distinct. **Habitat:** Epiphytic in montane forest, 2000-2700 m. **Distribution in Rwanda:** Nyungwe NP: Rwasenkoko, Karamba, Kamiranzovu, Uwinka, Mt. Muzimu. **Distribution in Africa:** Ivory Coast, DR Congo, Burundi, Kenya, Tanzania, Malawi, Zimbabwe, Mozambique, South Africa. Also Comoros, Madagascar, Mauritius, Réunion, Seychelles.

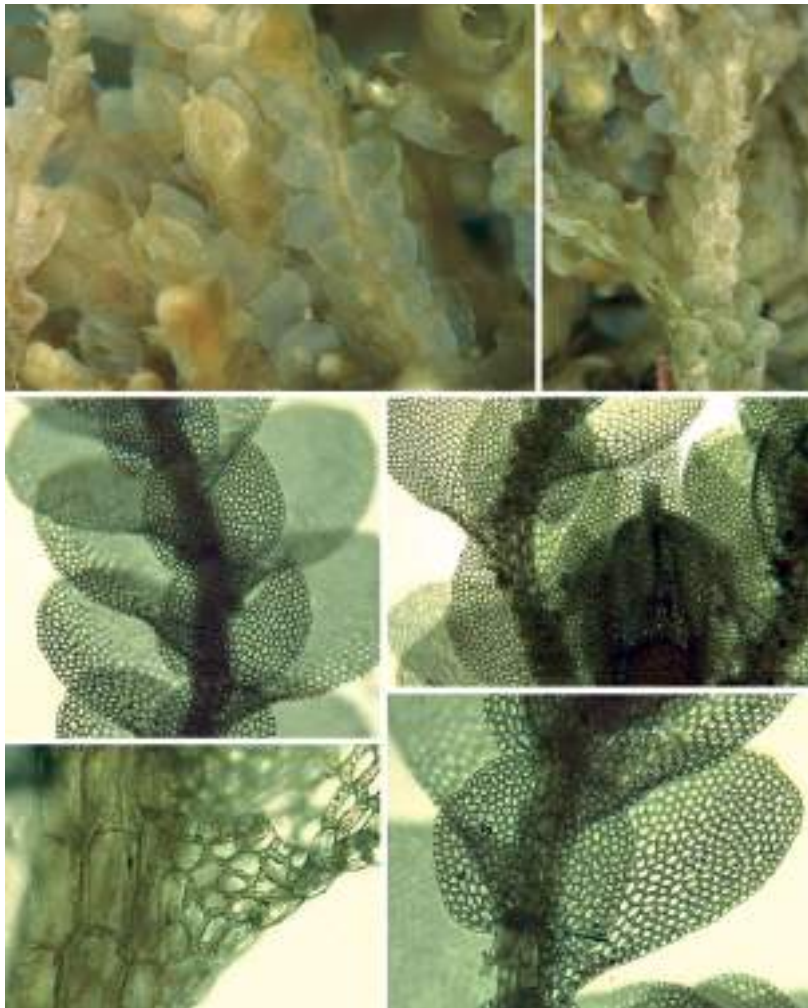




**Figs 253 and 254 (next page). *Lejeunea lyratiflora* Steph.**

Synonym: *Taxilejeunea lyratiflora* (Steph.) Tixier. Plants with shoots up to 1-2 mm wide. Leaves approximate, directed upwards and forwards when moist, spreading from stem at an angle of c. 50°, lobes asymmetrically ovate, 0.5-0.7(-0.8) x 0.5 mm, base and dorsal margin strongly arched, apex narrow, obtuse to pointed or shortly apiculate, ventral margin incurved or nearly straight. Lobules often reduced, when well developed 0.25 x the length of the lobe, keel nearly straight, apex flat, apical tooth short, free margin of c. 8 cells. Underleaves rounded, 0.2-0.35 mm wide, 2.5-3.5 x as wide as the stem, bilobed to 0.5 of their length. Cells 24-30 x 24-33 µm, thin-walled with small but distinct trigones and intermediate thickenings. Autoicous. Perianth exserted, 0.75-1 mm long, half 5-keeled, keels abruptly expanded into spreading and inflated wings. **Habitat:** Epiphyllous or epiphytic in montane forest, 1900-2000 m. **Distribution in Rwanda:** Nyungwe NP: Karamba, Kamiranzovu, Rwankuba, km106 Butare-Cyangugu. **Distribution in Africa:** Cameroon, Burundi, Uganda, Tanzania.

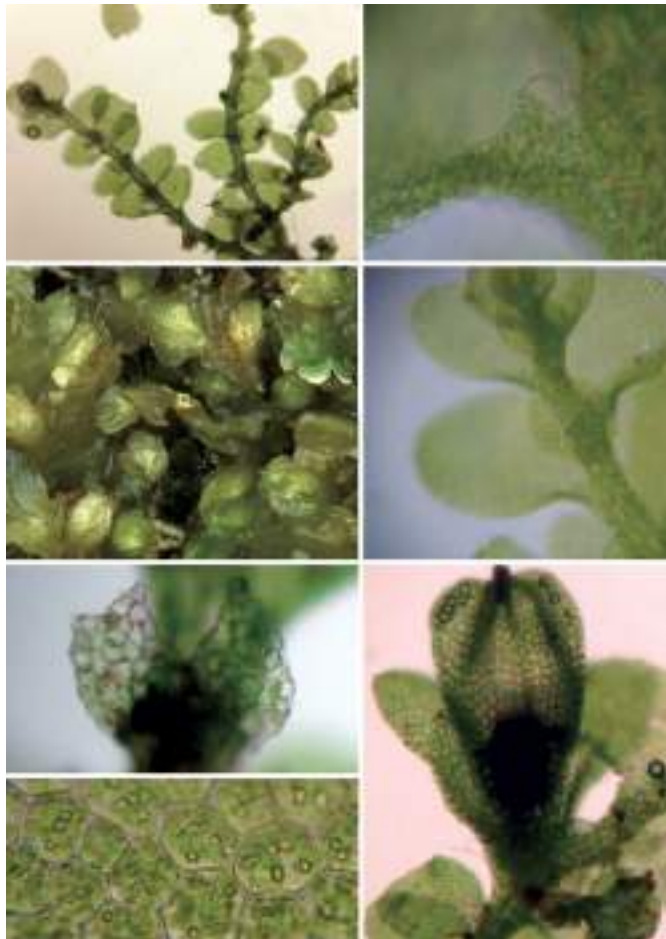




**Fig. 255. *Lejeunea ramosissima* Steph.**

Plants light green, pinnately branched. Shoots 0.8-1.2 mm wide. Leaves approximate, concave, decurved, broadly elliptic, lobe 0.6-0.7 x 0.4-0.5 mm, antical base broadly rounded, crossing the stem. Lobule when well developed 0.2 of lobe length, keel arched, forming a sinus of 90-100° with the lobe. Underleaves orbicular, 0.6 mm wide and 0.55 mm long, 4-5 x as wide as the stem, bilobed for half of their length, sinus narrow, lobes acute. Cells 18-24 x 20-26  $\mu\text{m}$ , walls thick, trigones medium, intermediate thickenings frequent but weakly defined, usually confluent with the trigones. Dioicous. Perianth longly exserted, clavate, completely without keels, with short cylindrical rostrum. **Habitat:** Epiphytic in montane forest, 2000 m. **Distribution in Rwanda: Nyungwe NP:** Gisakura. **Distribution in Africa:** Guinea, Sierra Leone, Togo, Annobon, Principe, São Tomé, Bioko, Cameroon, Congo-Brazzaville, DR Congo, Uganda, Tanzania. Also Seychelles. **Note:** Similar to *L. tabularis* but underleaves generally larger and round rather than ovate, 4-5 x as wide as the stem, strongly cordate at base.

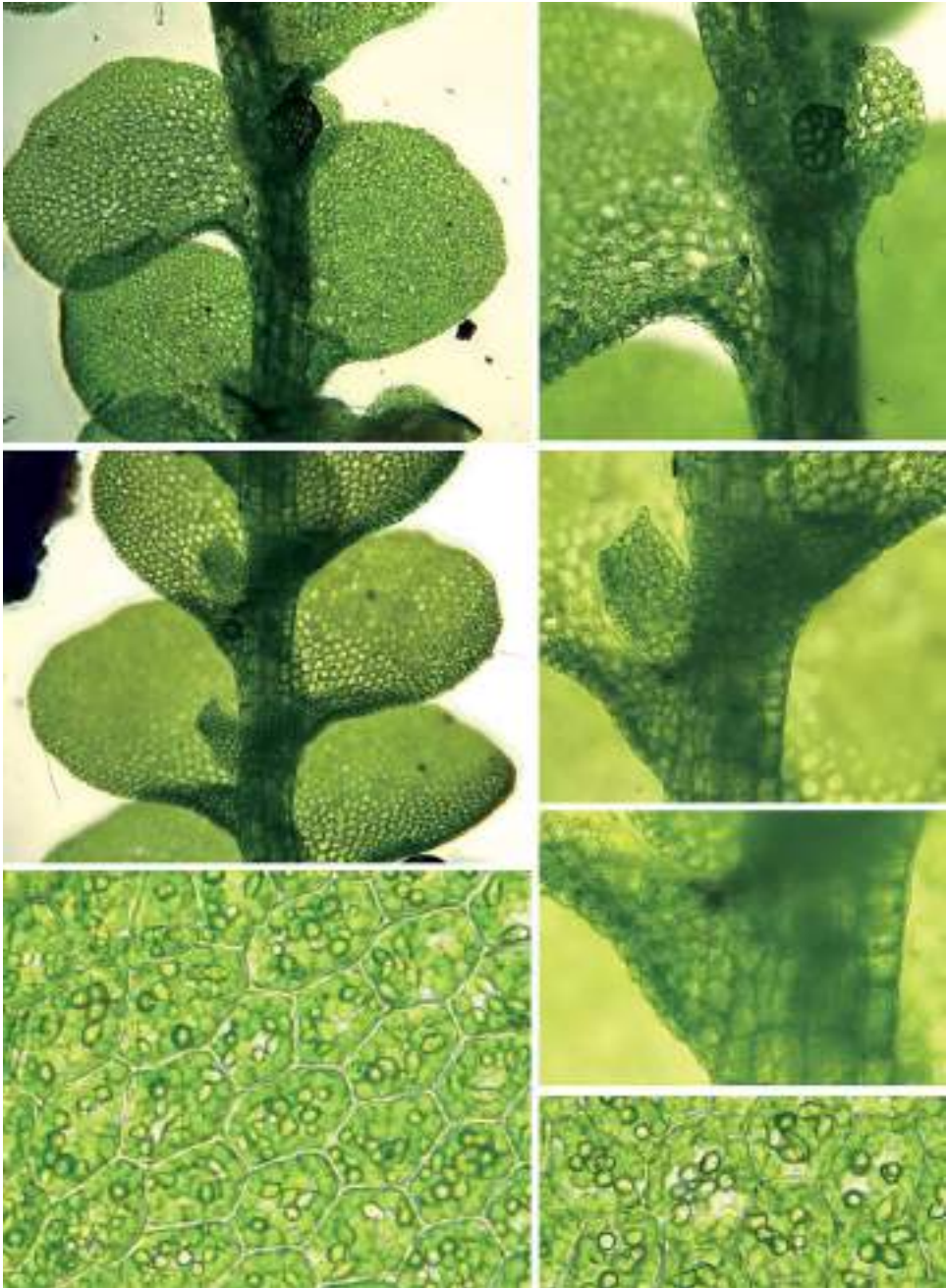


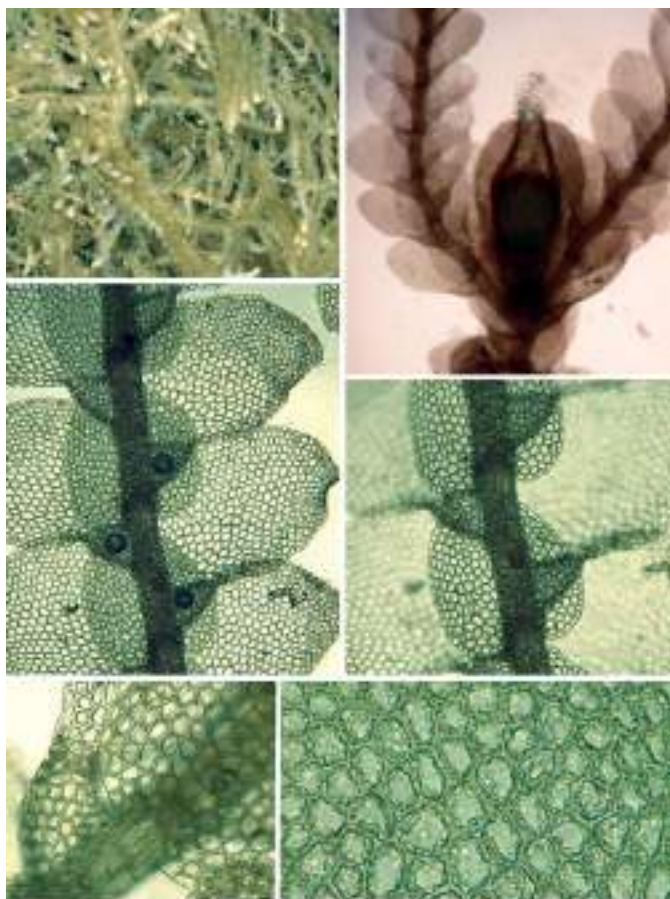


**Figs 256 and 257 (next page). *Lejeunea rhodesiae* (Sim) R.M.Schust.**

Synonyms: *Rectolejeunea rhodesiae* (Sim) S.W.Arnell; *Lejeunea letabaensis* S.W.Arnell.

Plants pale green. Stem up to 12 mm long, shoots 0.6-0.8 mm wide. Leaves laxly imbricate, caducuous, lobe 0.4-0.5 x 0.25-0.35 mm, flat, nearly complanate, apex rounded, base 10-12 cells wide, lobe margins crenulate by protruding cells. Lobule variable in size, well developed lobules inflated with strongly arched keel, 2/5-1/2 x as wide as lobe, making a wide sinus with the arched postical lobe margin, apical tooth short, up to 2 x as long as wide, sometimes lobule reduced to 1-2 rows of cells. Cells without trigones or intermediate thickenings, 16-20 x 16-24  $\mu\text{m}$ , oil bodies 2-8 per cell. Underleaves usually wider than long, 1.5-2 x as wide as the stem, bilobed to 1/2, sinus wide. Dioicous. Perianth compressed, cordate, nearly equally 5-keeled, 0.5-0.7 x 0.3-0.46 mm. **Habitat:** Epiphytic savanna and gallery forest, also in cultivated landscape, 1300-1700 m. **Distribution in Rwanda:** **Central Rwanda:** Huye (Butare). **Akagera:** Lake Ihema, Lake Mpanga region. **Distribution in Africa:** Central African Republic, Congo-Brazzaville, DR Congo, Uganda, Tanzania, Angola, Malawi, Zambia, Zimbabwe, South Africa. Also Socotra, Rodriguez, Seychelles.





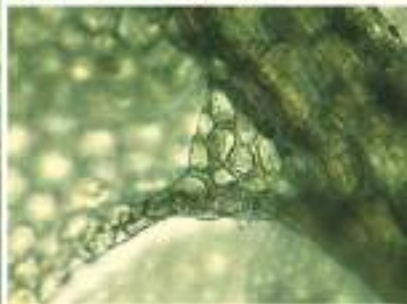
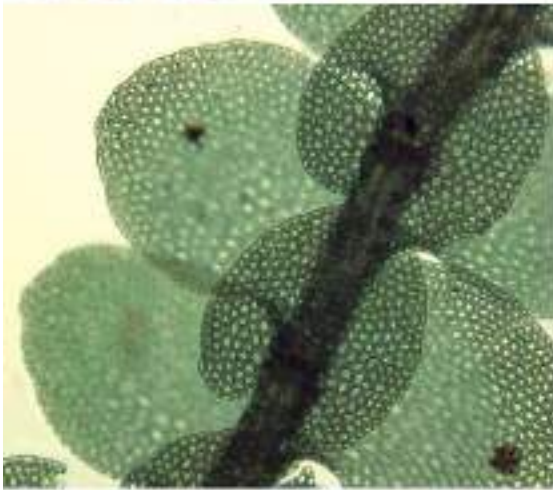
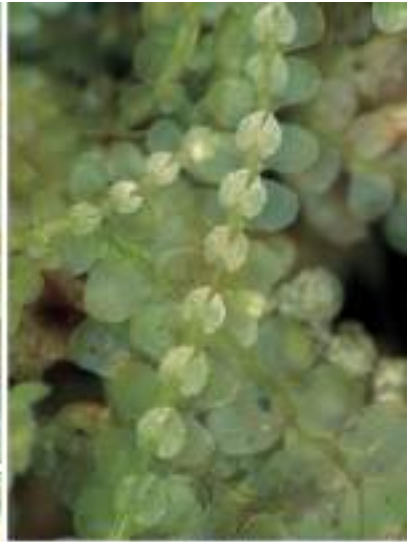
**Figs 258 and 259 (next page).** *Lejeunea tabularis* (Spreng.) Gottsche

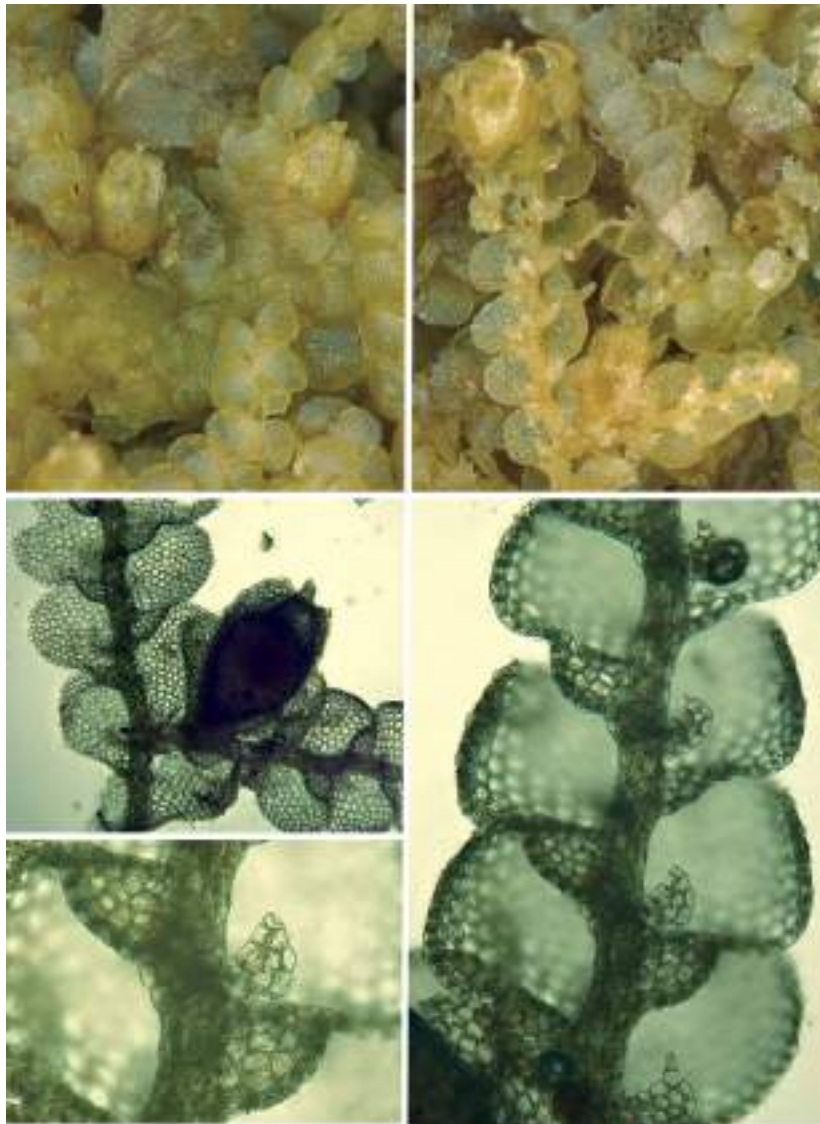
Synonyms: *Lejeunea flava* ssp. *tabularis* (Spreng.) S.W.Arnell; *L. grossecristata* (Steph.)

E.W.Jones. Plants yellowish-green to pale yellow or yellowish-brown. Stem up to 2 cm long. Leaves imbricate, spreading in about 45-55°, lobe concave, 0.45-0.65(-0.75) mm long, overlapping and crossing the stem, apex rounded. Lobule variable in size, usually large, convex, free margin incurved, 1/2 x as wide in the apex as in the base, triangular, with an unicellular tooth at apex, keel slightly arched, in about 45° to the stem.

Underleaves large, cordate to almost circular, 3-4 x as wide as the stem, longer than wide, base deeply cordate, bilobed to 1/2, sinus narrow, obtuse. Cells 16 x 20 µm, walls thin with small intermediate thickenings, trigones small to large. Monoicous. Perianth longly pyriform, 5-plicate, rostrum 40 x 50 µm. **Habitat:** Epiphytic in montane forest up to *Hagenia-Hypericum* forest, 2000-3300 m. **Distribution in Rwanda: Volcano NP:** Karisimbi, in the saddle between Bisoke and Karisimbi, Sabinyo. **Gishwati Forest:** Gikungu. **Lake Kivu:** Tea plantation near Cyongoroka. **Nyungwe NP:** Rwasenkoko, Karamba, Kamiranzovu, Uwinka, Gisakura, Mt. Muzimu. **Central Rwanda:** Lake Bulera

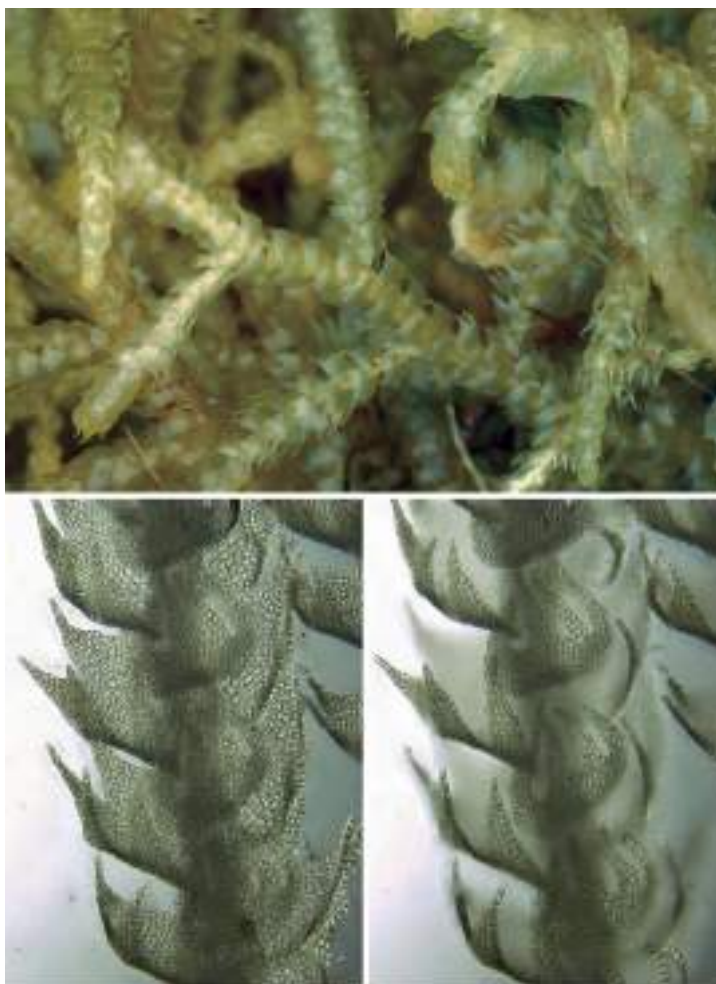
**Distribution in Africa:** Guinea, Ivory Coast, Nigeria, Príncipe, Bioko, Cameroon, Central African Republic, Congo-Brazzaville, DR Congo, Burundi, Uganda, Kenya, Tanzania, Malawi, Mozambique, South Africa. Also Comoros, Madagascar, Mauritius, Réunion.





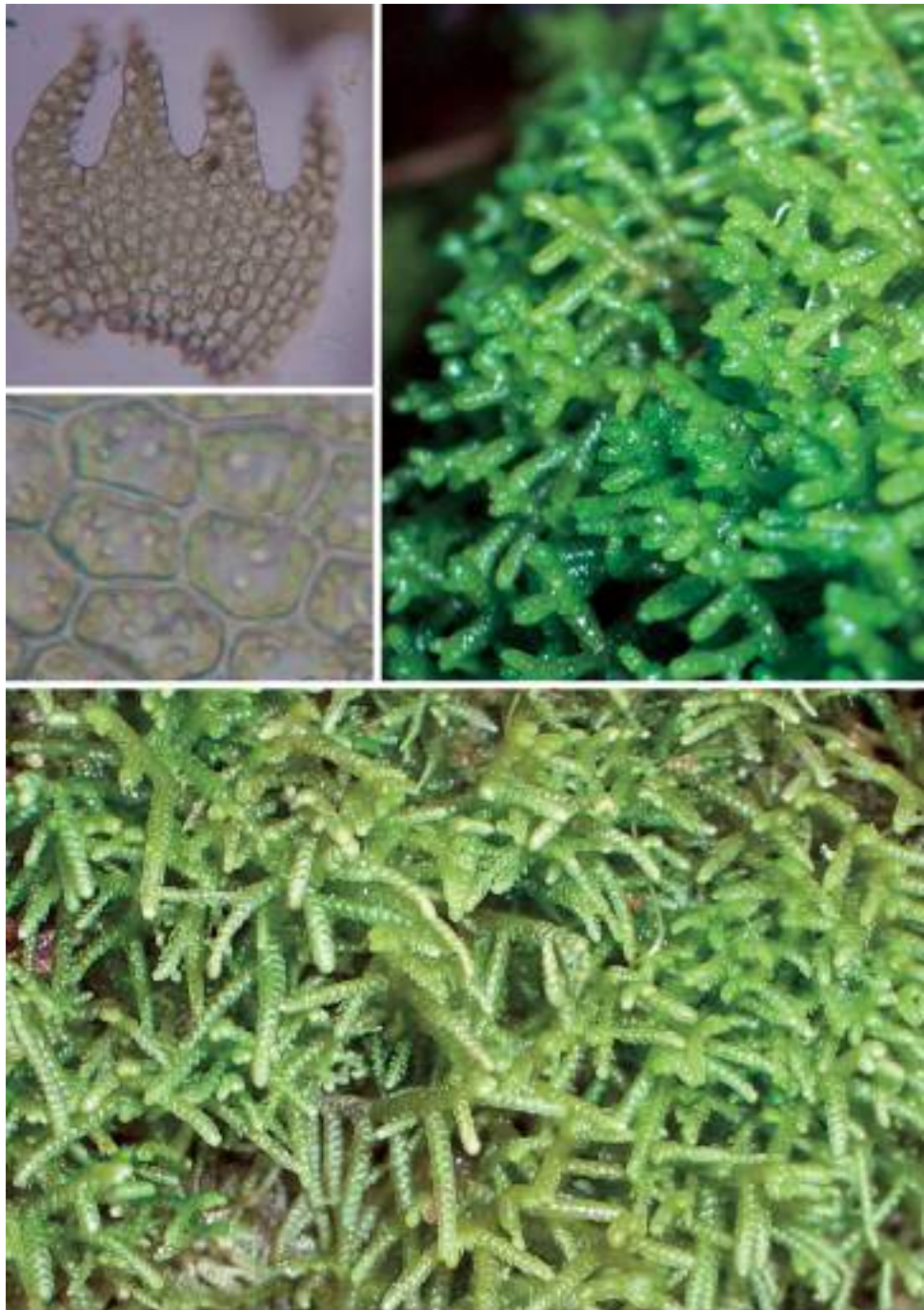
**Fig. 260. *Lejeunea villaumei*** (Steph.) Grolle

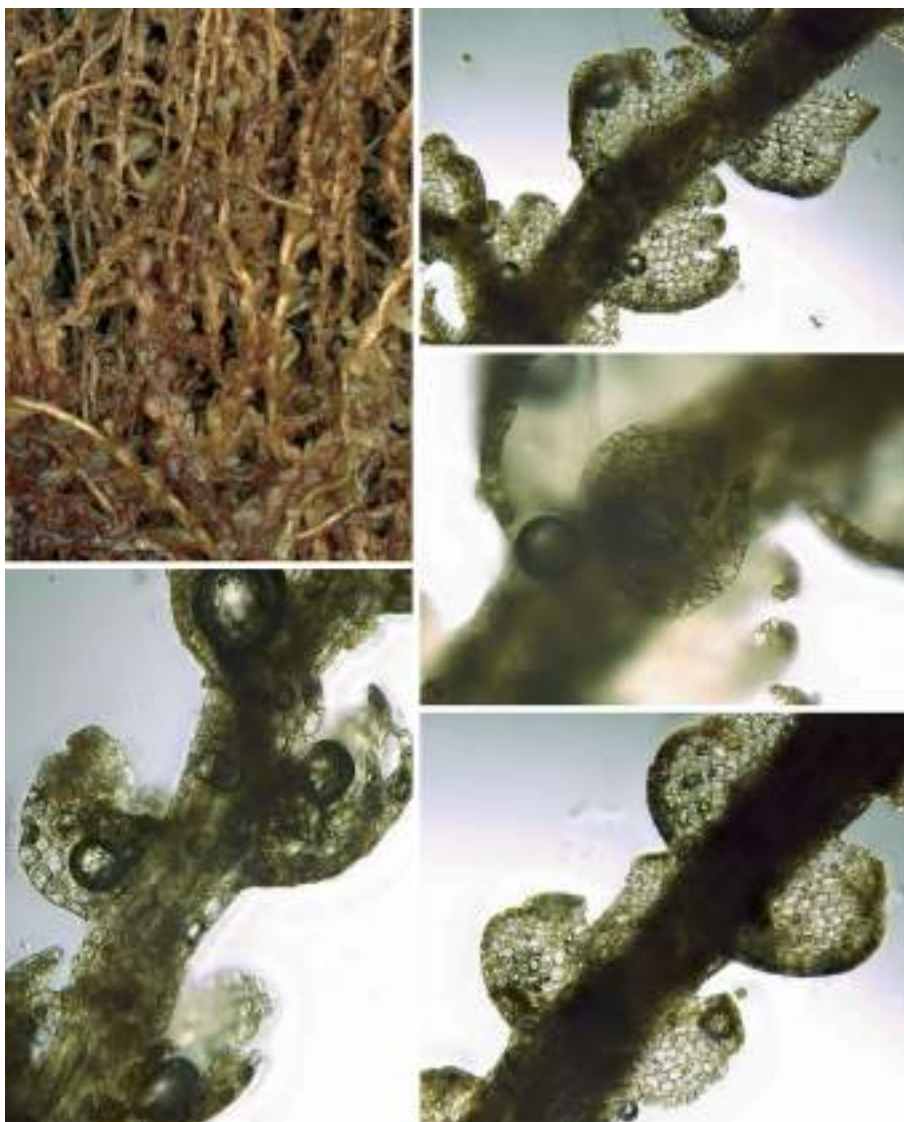
Synonyms: *Ciliolejeunea capensis* S.W.Arnell; *Lejeunea arnelliana* R.M.Schust. Plants yellowish green to dark bluish-green, up to 10 mm long. Leaves imbricate. Lobe 0.29 x 0.25 mm, apex rounded. Lobule 0.1 x 0.08 mm. Cells without distinct trigones, 27 x 24  $\mu$ m. Underleaves small, 0.11-0.13 x 0.15 mm, lobes spreading, sinus 0.05 mm long. Ventral margin of leaf forming deep sinus (-90°) with strongly arched keel. Autoicous. Perianth tuberculate or irregularly dentate, sometimes with 2-3-celled processes, 0.48 x 0.31 mm. **Habitat:** Epiphytic in montane forest, 2000-2100 m. **Distribution in Rwanda:** Nyungwe NP: Gisakura. **Distribution in Africa:** Uganda, Kenya, Tanzania, Malawi, South Africa. Also Madagascar, Réunion, Seychelles.



**Figs 261 and 262 (next page). *Lepidozia cupressina* (Sw.) Lindenb. in Gottsche, Lindenb. & Nees**

Synonym: *Lepidozia truncatella* Nees. Plants forming mats and cushions to large swelling tufts. Shoots to 3-4 cm, procumbent, pinnately or occasionally bipinnately branched, branches sometimes becoming attenuate. Leaves closely imbricate, incubous, overlapping and concealing stem, markedly asymmetrical, very convex, insertion oblique, 0.48-0.84 x 0.5-0.88 mm, (2-)3-4-lobed to 1/4-1/3 of their length, lobes triangular, acute (4-)7-12 cells wide at base, ending in 1-4 uniseriate cells. Underleaves erect, concave, 0.28-0.48 x 0.3-0.56 mm, 4-lobed to 1/3. Dioicous. **Habitat:** Epiphytic in montane forest, 2100-3200 m. **Distribution in Rwanda:** **Volcano NP:** Sabinyo. **Nyungwe NP:** Rwasenkoko, Uwinka, Mt. Bigugu. **Distribution in Africa:** Bioko, DR Congo, Uganda, Kenya, Tanzania, Lesotho, South Africa. Also Europe (Scotland, Ireland, France, Germany, Spain, SW Norway), Atlantic Islands (Azores, Madeira, Canaries), Jamaica, Yunnan. **Note:** *Lepidozia cupressina* ssp. *quinquefida* (Steph.) Pócs differs mainly in the leaves with 4-5 lobes. It is known from Ruwenzori and Kilimanjaro.





**Fig. 263. *Lepidozia pearsonii* Spruce**

Synonym: *Lepidozia hyalina* Steph. Plants pale or yellowish green. Shoots up to 6 cm long, stems procumbent, pinnate, branches usually becoming attenuate. Stem leaves usually distant, spreading to erecto-patent, not overlapping stem, plane to convex, asymmetrical, insertion oblique, 0.32-0.59 x 0.18-0.48 mm, (2-)3-lobed to 1/2-2/3 of their length, lobes narrowly triangular, acute, (2-)4-7 cells wide at base, ending in 1-2 uniseriate cells, branch leaves smaller, distant, mostly 3-lobed. Underleaves slightly concave, 0.2-0.4 x 0.26-0.4 mm. Dioicous. **Habitat:** Epiphytic in Paramo, 3800-4200 m. **Distribution in Rwanda: Volcano NP:** Karisimbi. **Distribution in Africa:** DR Congo, Uganda, Malawi, South Africa. Also Europe (England, SW Norway).





**Figs 264 and 265 (next page).** *Lepidozia reptans* (L.) Dumort.

Plants small, dull dark green. Shoots up to 3 cm long, procumbent, stems pinnately branched, small-leaved flagelliform branches often arising from ventral side of stem. Stem leaves distant to imbricate, not overlapping stem, insertion oblique, 0.24-0.56 x 0.18-0.48 mm, 3-4-lobed to 1/4-1/3 of their length, lobes triangular, acute to obtuse, 4-7 cells wide at base, ending in 1-2 uniseriate cells, branch leaves smaller, imbricate, mostly 3-lobed. Underleaves somewhat concave, 0.2-0.4 x 0.26-0.4 mm. Autoicous. Perianths narrowly ellipsoid or fusiform, plicate above, mouth small, denticulate. **Habitat:** Epiphytic in montane forest, 2800 m. **Distribution in Rwanda:** Nyungwe NP: Mt. Bigugu. **Distribution in Africa:** DR Congo (Mt. Kahuzi). Widespread in the Northern Hemisphere (Europe, Asia - China and Taiwan, N America).





**Figs 266 and 267 (next page). *Lepidozia stuhlmannii* Steph.**

Synonyms: *Lepidozia stuhlmannii* var. *abyssinica* (S.W.Arnell) Pócs; *L. abyssinica* S.W.Arnell; *L. lacerata* Steph. Plants forming loose mats. Shoots regularly pinnate or weakly bipinnate, usually 1-2 cm long, lateral branches distant, attenuate or flagelliform. Leaves approximate, 0.3-0.4 mm long, mostly 3-4-lobed, the lobes less than 0.5 of the leaf length, narrowly triangular, decurved or inflexed so that the whole leaf is convex, lobes 4-5 cells wide at base, with 1-2 uniseriate cells at apex, dorsal lobe often wider (7 cells), ventral lobe often narrower (3 cells). Underleaves usually narrower or only slightly wider than stem, 3-4-lobed. Autoicous. **Habitat:** Epiphytic in montane forest up to *Hagenia-Hypericum* forest and *Erica* forest, 2000-3300 m. **Distribution in Rwanda:** **Volcano NP:** Karisimbi, in the saddle between Bisoke and Karisimbi, Bisoke, Sabinyo. **Nyungwe NP:** Rwasenkoko, Gisakura, Rwasenkoko, Kamiranzovu. **Distribution in Africa:** Bioko, Cameroon, DR Congo, Ethiopia, Uganda, Kenya, Tanzania, Malawi, South Africa.

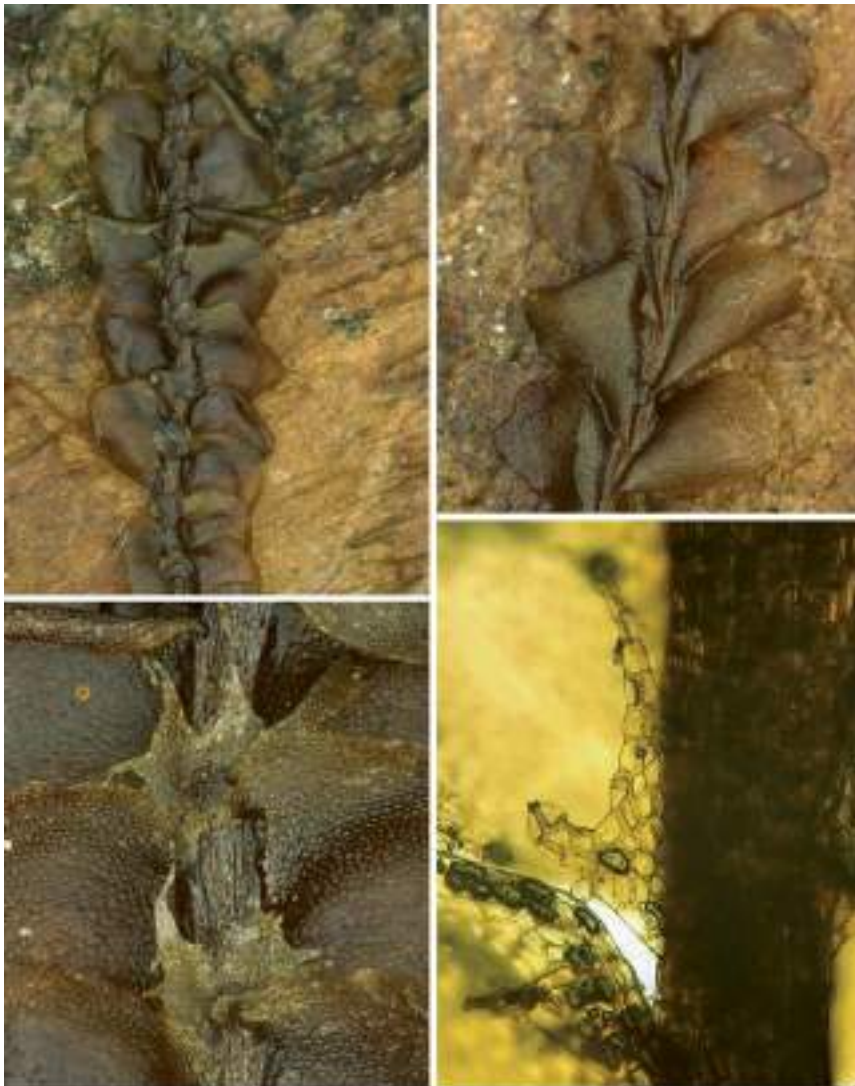




**Figs 268 and 269 (next page). *Lepidozia succida* Mitt.**

Synonym: *Sprucella succida* (Mitt.) Steph. Plants deep green, often forming cushions, stems pinnate or bipinnate. Main stems 2-3 cm long, sometimes stoloniform, branches regularly spaced, complanate or ascending and secund. Stem leaves 3-lobed to 0.25 of their length, distant to approximate, 0.5-0.6 mm long, not much longer than wide, branch leaves 2-lobed to 0.25 of their length, oblong, much longer than stem leaves, 0.5-1 mm long, 1.5-2 x as long as wide, approximate, nearly longitudinally inserted, dorsal margin forming an angle of 45°-80° with the stem. Underleaves mostly 4-lobed, lobed to 0.5 of their length. Dioicous. **Habitat:** Forest floor in dense montane forest, 1800-2000 m. **Distribution in Rwanda: Nyungwe NP:** Gisakura. **Distribution in Africa:** Guinea, Sierra Leone, Ivory Coast, Ghana, Nigeria, São Tomé, Bioko, Cameroon, Gabon, Rio Muni, Central African Republic, Congo-Brazzaville, DR Congo, Uganda, Angola. Also Madagascar.





**Fig. 270. *Leptoscyphus expansus* (Lehm.) Grolle**

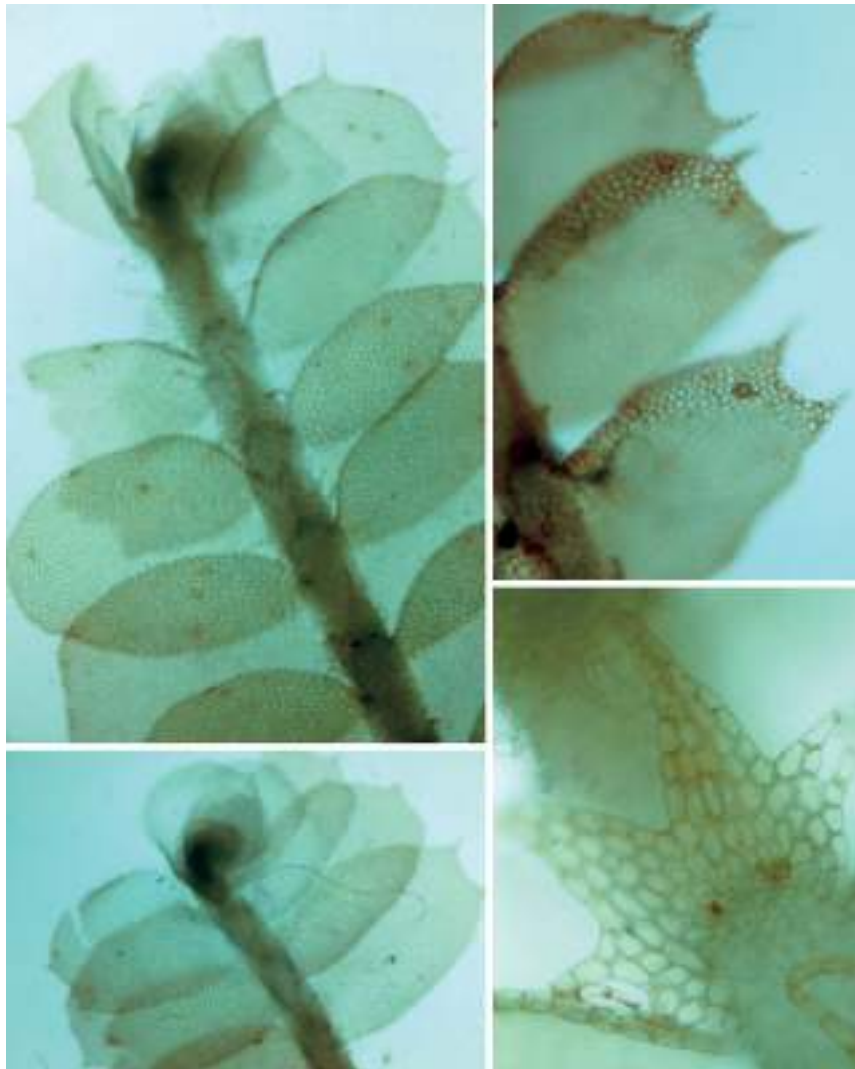
Plants greenish to brownish, shoots 50 mm long and up to 4 mm wide. Leaves opposite to alternate, patent, convex, rounded or oblong, 1.3-1.8 mm long, ventral margin arched, dorsal margin less arched, shortly decurrent, margin entire. Underleaves free from the leaves or narrowly connate on one or both sides, deeply 2-lobed, the lobes longly acuminate, sinus V-shaped, with 2-4(-rarely 6) teeth or spines on each side. Cells hexagonal, 35-40  $\mu\text{m}$  wide, walls thin, oil bodies 2-3 per cell. Dioicous. Perianths 3 x 2 mm, inflated at base, mouth bilaterally compressed, truncate. **Habitat:** Forest floor in dense montane forest, 2000 m. **Distribution in Rwanda: Gishwati Forest:** Gikungu. **Distribution in Africa:** DR Congo, Kenya, Malawi, Zimbabwe, Lesotho, South Africa. Also Madagascar.



**Figs 271 and 272 (next page).** *Leptoscyphus hedbergii* (S.W.Arnell) R.M.Schust. Plants greenish to brownish, shoots 50 mm long and up to 4 mm wide. Leaves opposite to alternate, patent, convex, rounded or oblong, 1.3-1.8 mm long, ventral margin arched, dorsal margin less arched, shortly decurrent, margin entire. Underleaves free from the leaves or narrowly connate on one or both sides, deeply 2-lobed, the lobes longly acuminate, sinus V-shaped, with 6-8 spines on each side. Cells hexagonal, (25-)35-40(-50)  $\mu\text{m}$  wide, walls thin, oil bodies 2-3 per cell. Dioicous. Perianths 3 x 2 mm, inflated at base, mouth bilaterally compressed, truncate. **Habitat:** *Hagenia-Hypericum* forest, ericaceous belt and *Dendrosenecio*-Paramo, 2700-3400 m. **Distribution in Rwanda:** **Volcano NP:** Sabinyo, Karisimbi, Bisoke. **Distribution in Africa:** DR Congo (Mt. Kahuzi, Ruwenzori), Uganda (Ruwenzori and Virunga Volcanoes), Kenya (Mt. Kenya), Tanzania (Kilimanjaro).

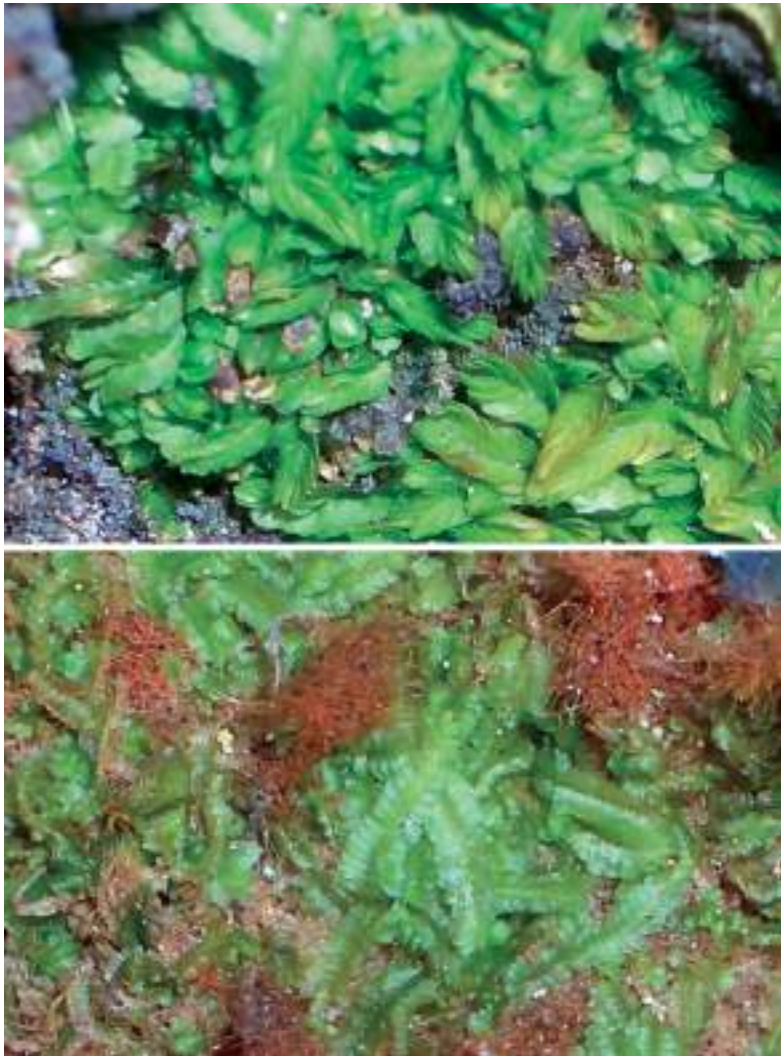






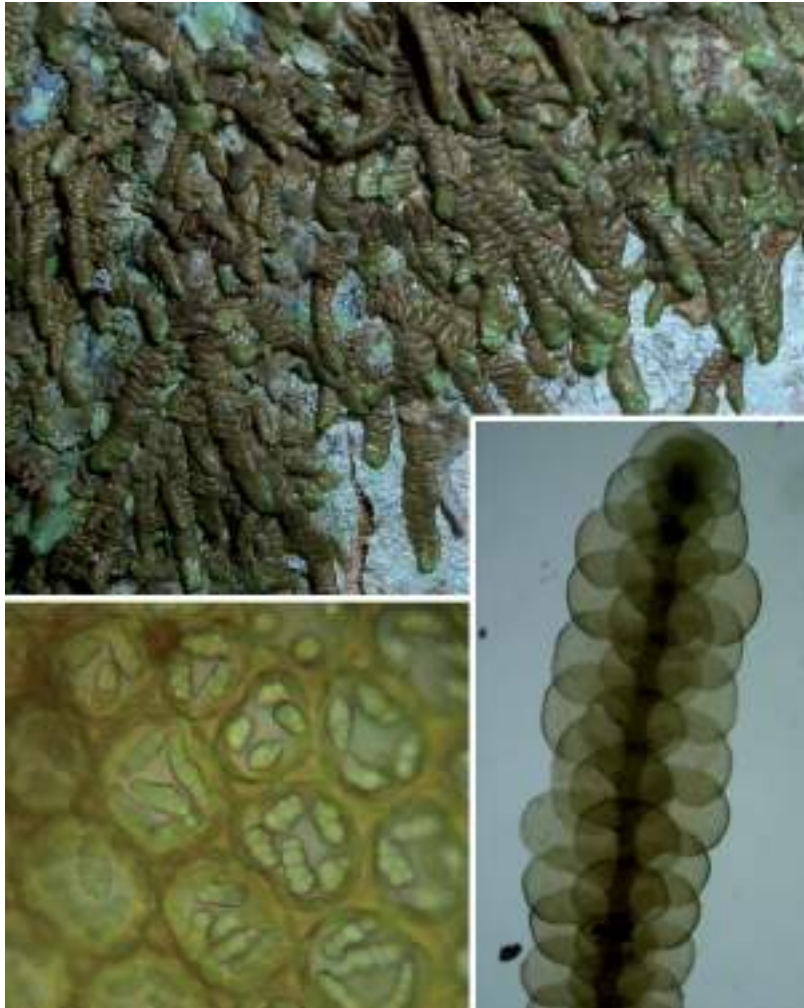
**Figs 273 and 274 (next page).** *Leptoscyphus infuscatus* (Mitt.) E.W.Jones  
 Plants brownish, shoots 2.5-3.5 mm wide. Leaves opposite to alternate, patent, convex, rounded or oblong, 1.3-1.8 mm long, ventral margin arched, dorsal margin less arched, shortly decurrent, apex with 1-3(-4) distant spiniform teeth, each tooth of 2-6 elongate cells. Underleaves free from the leaves or narrowly connate on one or both sides, deeply 2-lobed, the lobes longly acuminate, sinus V-shaped, with 1-4(-6) spinose teeth, short cilia or laciniae on each side. Cells hexagonal, 30-45  $\mu$ m wide, walls thin, oil bodies 2-3 per cell. Dioicous. Perianths 3 x 1.5-2 mm, strongly inflated at base, mouth bilaterally compressed, truncate, shortly lacinate. **Habitat:** Epiphytic, on litter or on ground, 2500-3200 m. **Distribution in Rwanda:** Volcano NP: Bisoke. **Nyungwe NP:** Rwasenkoko, Mt. Bigugu. **Distribution in Africa:** Bioko, Cameroon, DR Congo, Ethiopia, Uganda, Tanzania, Malawi, Zimbabwe. Also Madagascar, Réunion.





**Figs 275 and 276 (next page). *Lethocolea congesta*** (Lehm.) S.W.Arnell  
 Plants green, sometimes with purple margins. Stems 5-10 mm long, basally with leafless stolons. Leaves lingulate-ellipsoid, larger towards apex of the shoot, alternate, hardly decurrent on dorsal face. Underleaves only present in top below female organs, entire to slightly dentate. Marginal cells in a distinct row, 16-22 x 30-40  $\mu$ m, cells in the centre rounded. Paroicous. **Habitat:** On soil with poor vegetation cover, in swamps, on rocks, cliffs or roadcuts, from montane forest to *Hagenia-Hypericum* forest and *Dendrosenecio-Lobelia stuhlmannii* paramo, 2000-3700 m. **Distribution in Rwanda: Volcano NP:** Karisimbi, in the saddle between Bisoke and Karisimbi, Karisimbi, on the E-slopes along trail to summit. **Nyungwe NP:** Rwasekoko, Karamba, along abandoned road to Burundi. **Distribution in Africa:** DR Congo, Uganda, Kenya, Tanzania, Lesotho, South Africa. Also Comoros, Réunion.



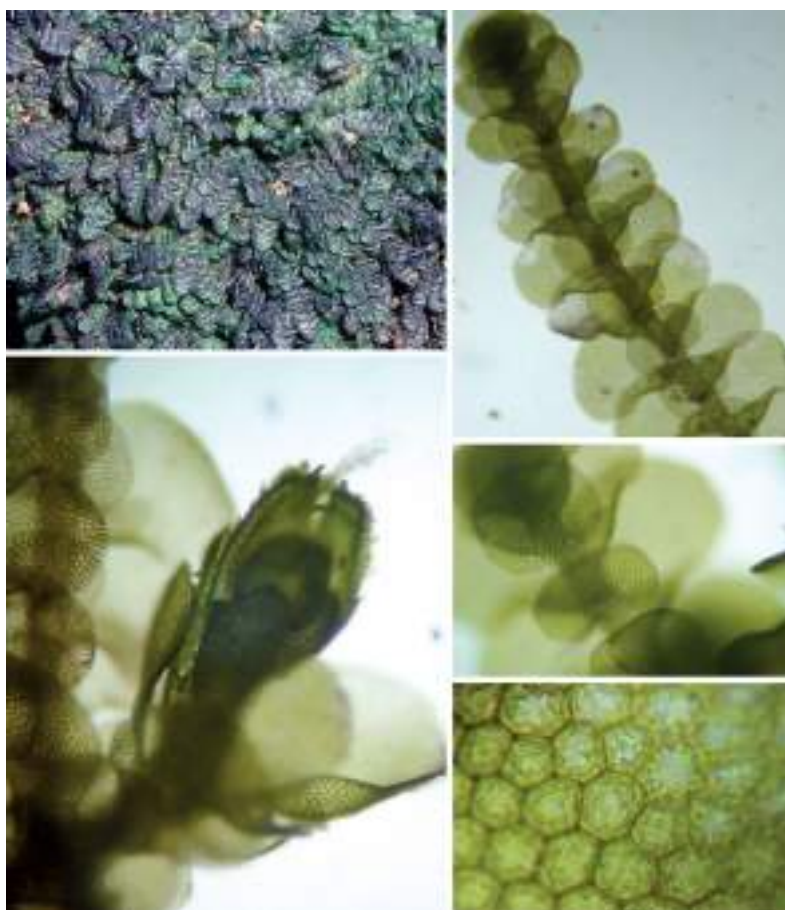


**Fig. 277. *Lopholejeunea eulopha* (Tayl.) Schiffn.**

Plants dark brown-olive to nearly black, shoots 2-3(-5) cm long and 1.4-2(-2.8) mm wide.

Leaves imbricate. Lobe concave at ventral face, obovate-elliptic, rounded and often involute at apex, dorsal base truncate to rounded, (0.6-)0.7-0.9(-1.2) x (0.7-)1-1.3(-1.6) mm, lobule with arched keel forming an obtuse angle with the ventral margin of lobe, 0.15-0.27 x 0.2-0.375 mm, lobule sometimes reduced. Underleaves imbricate to contiguous, large, 5-8 x as wide as the stem, reniform, wider than high, (0.4-)0.5-0.8 x 0.9-1.2(-1.4) mm. Cells hexagonal, wall with non-nodulose trigones and nodulose-elongated intermediate thickenings, (22-)25-30(-35) x (28-)30-36(-45)  $\mu$ m. Monoicous. Perianth covered by female bracteoles or weakly exserted, obovate, rounded or subcordate at apex, 2 lateral and 2 ventral keels present, winged and with laciniae, 1.1-1.6 x 0.8-1 mm.

**Habitat:** Epiphytic or epiphyllous in montane forest, 2000 m. **Distribution in Rwanda:** Nyungwe NP: Karamba, Kamiranzovu. **Distribution in Africa:** Tanzania. Also Comoros, Madagascar, Mauritius, Réunion, Seychelles.



**Fig. 278. *Lopholejeunea nigricans*** (Lindenb.) Schiffn.

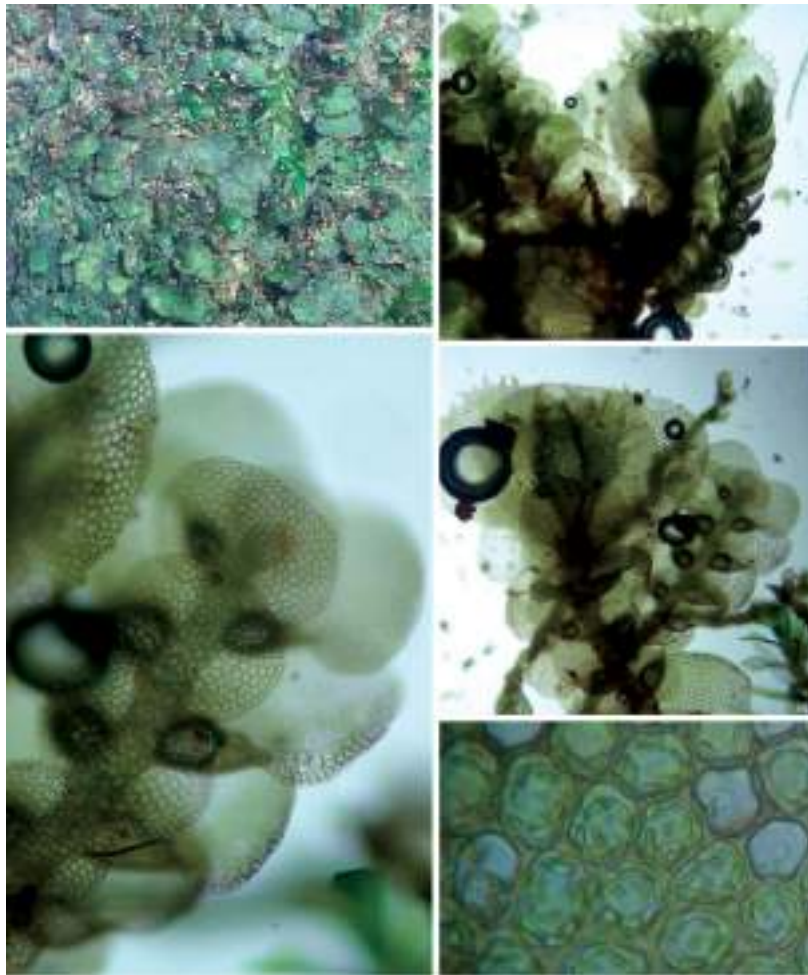
Synonym: *Lopholejeunea abortiva* (Mitt.) Steph. var. *fragilis* (Steph.) Vanden Berghen.

Plants brown to dark brown-green, shoots 1-3 cm long and 0.9-1.4(-1.6) mm wide.

Leaves contiguous or imbricate. Lobe elliptic, subsymmetrical, entire, rounded, obtuse or apiculate at apex, plane or weakly concave, 0.4-0.6(-0.75) x 0.5-0.8(-1) mm, lobule well developed, large, 1/4-1/2 as long as the lobe, proximal part inflated, keel very convex forming an obtuse angle with the margin of the lobe, 0.13-0.15(-0.22) x 0.18-0.25(-0.38) mm, sometimes reduced.

Underleaves distant to imbricate, (2-)3-4 x as wide as the stem, reniform to suborbicular, entire, 0.27-0.4(-0.6) x 0.3-0.6(-0.75) mm. Cells with small trigones and nodulose-elongated intermediate thickenings, 18-26(-30) x 20-30(-40)  $\mu$ m.

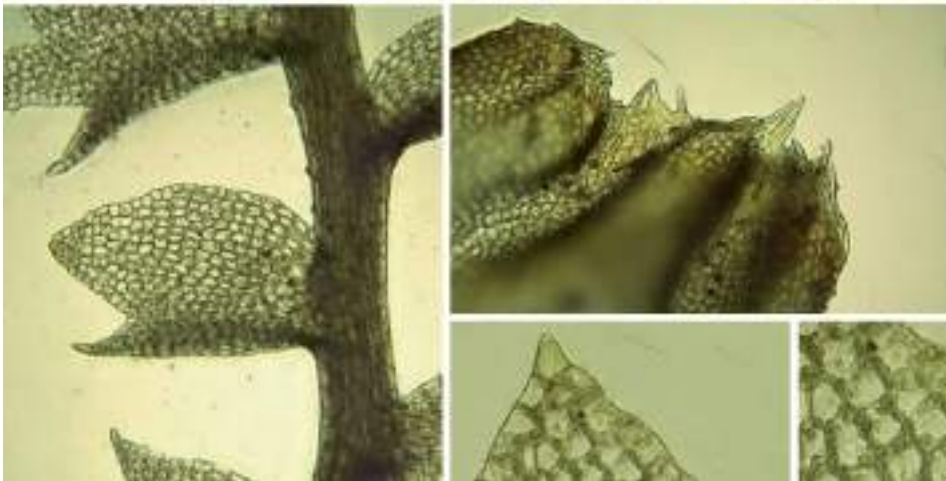
Perianth shortly to longly exserted, compressed, obovate to obcordate, rounded, retuse or emarginate at apex, with 2 lateral and 2 ventral keels. **Habitat:** Epiphytic or epiphyllous in montane forest, 2000 m. **Distribution in Rwanda: Nyungwe NP:** Karamba. **Distribution in Africa:** Guinea, Sierra Leone, Ivory Coast, Ghana, Togo, Nigeria, Bioko, Cameroon, Rio Muni, Gabon, Central African Republic, Congo-Brazzaville, DR Congo, Burundi, Ethiopia, Tanzania, Malawi, Zambia, Zimbabwe, Mozambique, South Africa. Also Madagascar, Mauritius, Réunion, Rodriguez, Seychelles.



**Fig. 279. *Lopholejeunea subfusca* (Nees) Schiffn.**

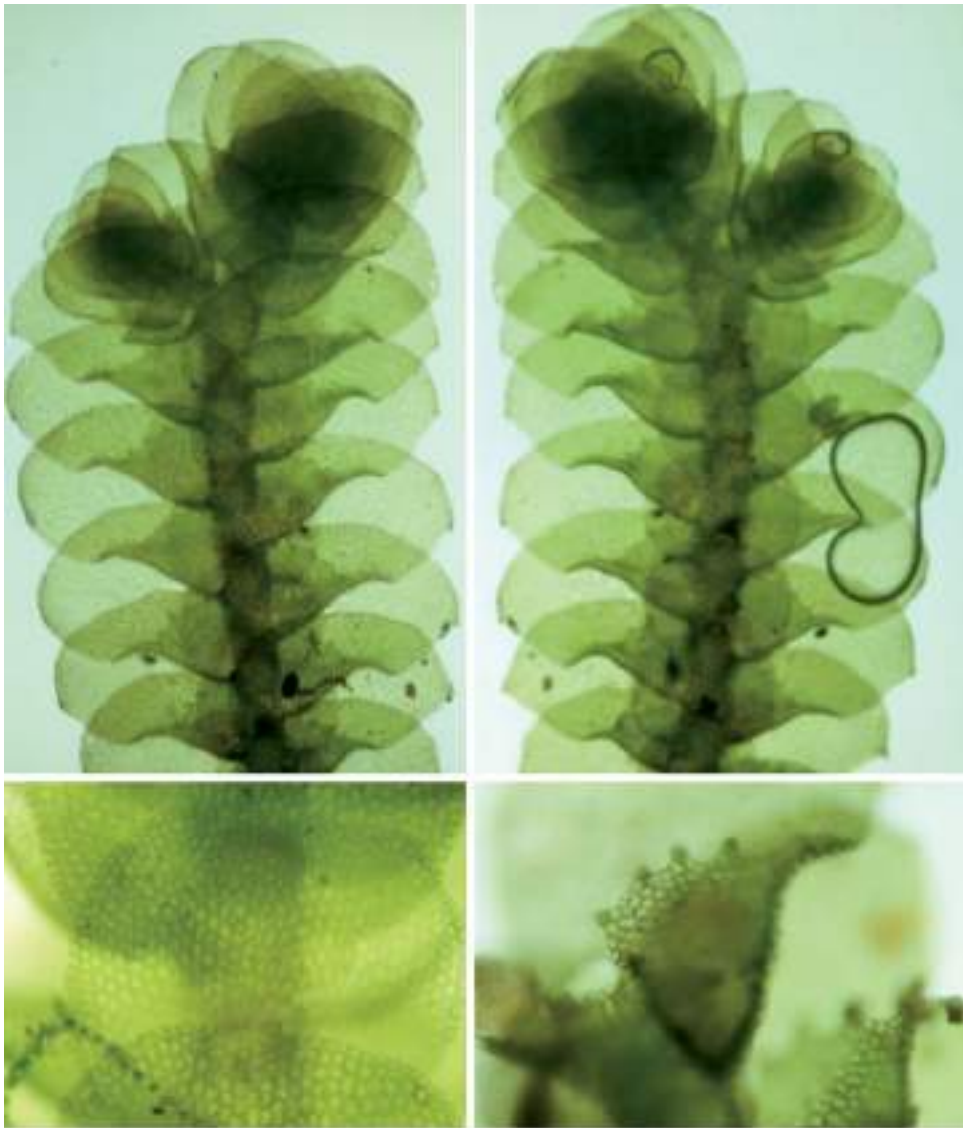
Plants dark brown, shoots 1-3 cm long and (0.8-)1-1.3(-1.75) mm wide, sometimes microphyllous shoots present. Leaves weakly imbricate. Lobe subelliptic, falcate, subsymmetrical, rounded at apex, plane, 0.4-0.6(-0.75) x 0.5-0.8(-1) mm, lobule well developed, ovate, proximal part inflated, 0.15-0.2 x 0.2-0.26 mm. Underleaves distant to imbricate, 3-5 x as wide as the stem, reniform to elliptic, entire, 0.3-0.5 x (0.28-)0.45-0.6(-0.7) mm. Cells with small trigones and nodulose-elongated intermediate thickenings, 20-23 x (20-)23-27(-30)  $\mu\text{m}$ . Monoicous. Perianth often nearly entirely covered by female bracteoles, sometimes exerted to 1/5 of its length, compressed, obovate to obcordate, rounded to subtruncate at apex, with 2 lateral and 2 ventral keels bearing irregularly triangular laciniae. **Habitat:** Epiphytic or epiphyllous in montane forest, 2000 m. **Distribution in Rwanda:** Nyungwe NP: Kamiranzovu. **Distribution in Africa:** Guinea, Sierra Leone, Ivory Coast, Ghana, Togo, Nigeria, Annobon, Bioko, Cameroon, Rio Muni, Gabon, Central African Republic, DR Congo, Kenya, Tanzania, Angola, South Africa. Also Comoros, Madagascar, Mauritius, Réunion, Seychelles



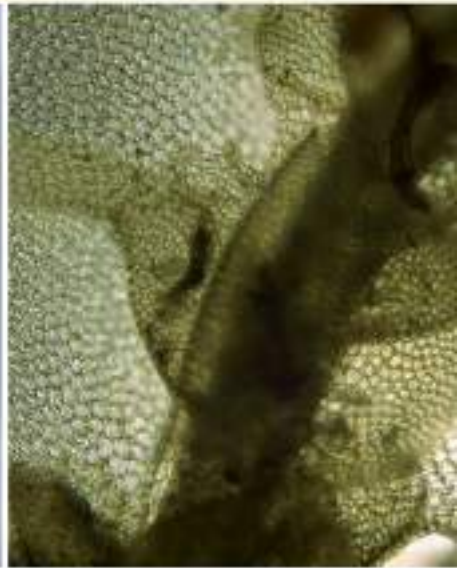


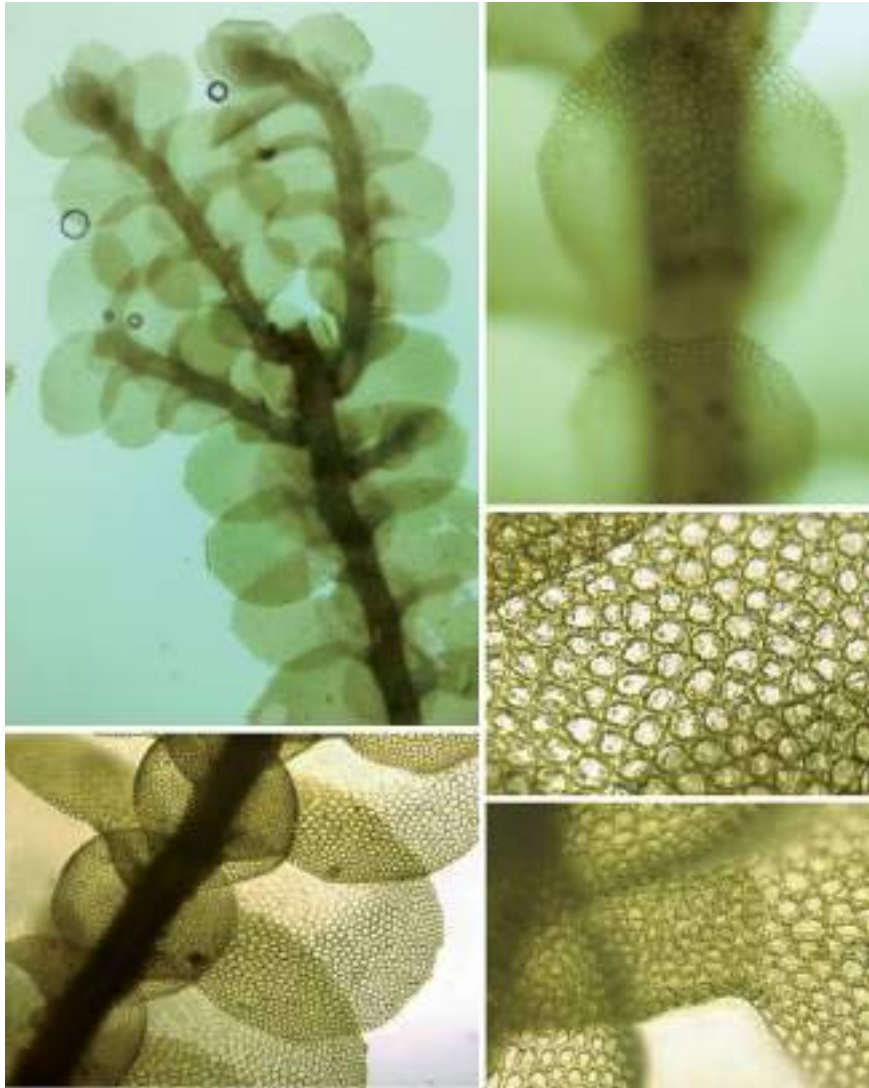
**Fig. 280. *Lophozia jamesonii*** (Mont.) R.M.Schust.

Synonyms: *Andrewsianthus jamesonii* (Mont.) Váňa; *A. kilimanjaricus* (S.W.Arnell) Grolle & Váňa. Plants pale green to brownish, stems 0.4-1.5 cm long, prostrate to ascending. Leaves distant to imbricate, erect-spreading, oblong, subequally 2-lobed, rarely 3-lobed. Underleaves subulate to reduced to 1-2 cells or absent. Cells thin-walled, with trigones, 25-30 x 30-45  $\mu$ m. **Habitat:** Epiphyte on ericaceous shrubs, 3100-3400 m. **Distribution in Rwanda: Volcano NP:** Sabinyo. **Distribution in Africa:** DR Congo, Uganda, Kenya, Tanzania.



**Figs 281 and 282 (next page).** *Marchesinia deslooveri* Vanden Berghen  
 Plants large, epiphytic, deep green to brown. Stems up to 3-4 cm long. Leaves alternate, imbricate, wide-spreading. Lobes concave, elliptic, 1.2-1.6 mm long, apex acuminate, margin entire. Lobules 0.4-0.52 x 0.58-0.6 mm, usually flat, apical tooth with 1-3 cells, free margin usually plane, with 2-4 small teeth. Cells with trigones 26-31 x 30-35  $\mu\text{m}$ . Underleaves 3-5 times as large as stem, 0.9-1.3 x 0.98-1.5  $\mu\text{m}$ . Monoicous. Perianths obcordate, truncate, flat and compressed, plane on both surfaces or with obscure keel on ventral surface, margins entire, 2-2.2 x 3.4-3.6 mm. **Habitat:** Epiphytic in montane bamboo forest, 2350 m. **Distribution in Rwanda:** Nyungwe NP: Rugera. **Distribution in Africa:** Tanzania.





**Fig. 283. *Marchesinia excavata* (Mitt.) Schiffn.**

Plants large, epiphytic, deep green to brown. Stems up to 4.5 cm long. Leaves alternate, imbricate, wide-spreading. Lobes concave, elliptic, 0.8-0.9 x 0.45-0.6 mm, apex rounded but usually with a sharp apiculus and also with few minute teeth. Lobules 0.4-0.52 x 0.58-0.6 mm, usually flat, with only 1 apical tooth consisting of 1-2 cells. Cells with trigones 20-25 x 20-30  $\mu$ m. Underleaves 3-5 x as large as stem, 0.9-1.3 x 0.9-1.2  $\mu$ m. Dioicous. Perianths obcordate, truncate, flat and compressed, keeled laterally but not winged, 1.6 x 0.9 mm. **Habitat:** Epiphytic in montane forest, 2000-2200 m. **Distribution in Rwanda: Nyungwe NP:** Gisakura. **Distribution in Africa:** Guinea, Sierra Leone, Ghana, Togo, Nigeria, Annobón, São Tomé, Bioko, Cameroon, Gabon, Rio Muni, DR Congo, Uganda, Kenya, Tanzania, Malawi, Zambia. Also Socotra, Madagascar.



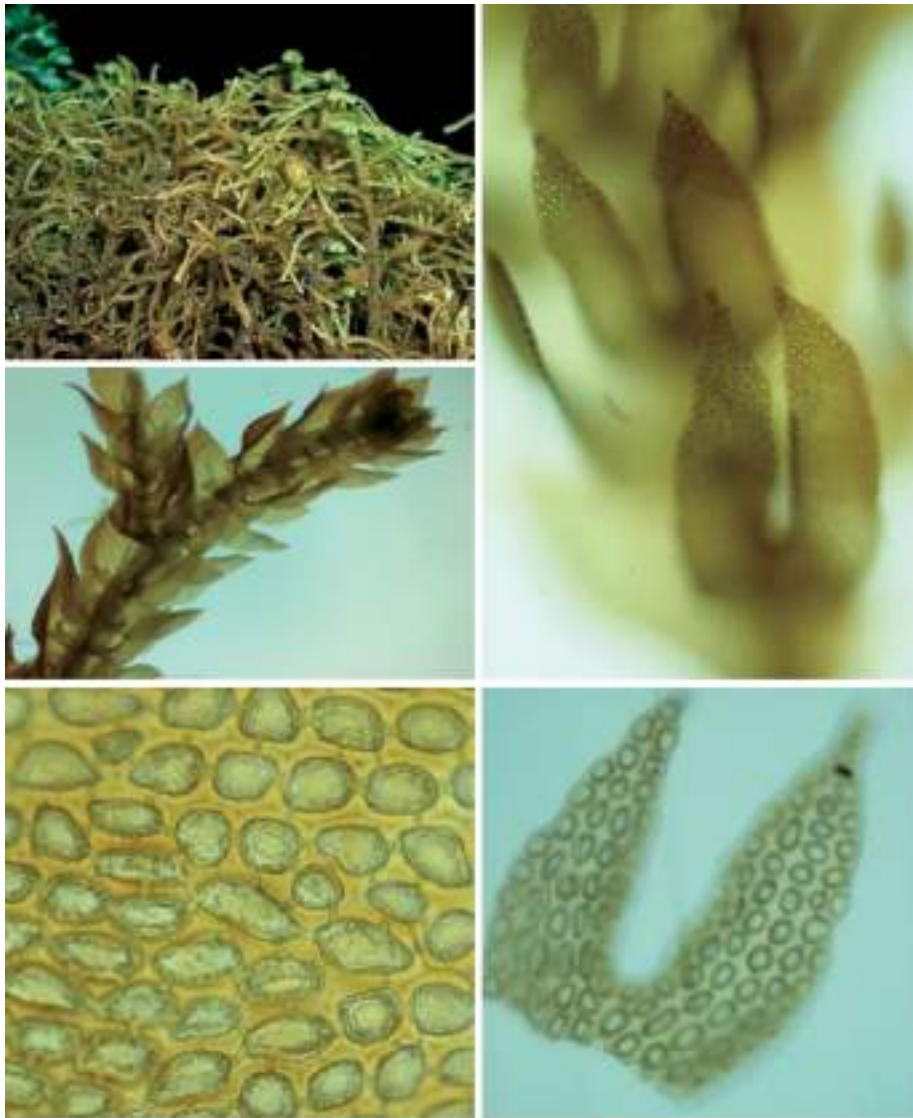
**Fig. 284.** *Marsupella emarginata* (Ehrh.) Dumort.

Plants green to reddish-brown or brownish, in dense patches, shoots (10-)20-50 mm high and 1.6-2.4 mm wide, erect, simple or with few branches. Leaves contiguous to imbricate, round ate, bilobed to 0.2-0.3 of their length, lobes obtusely pointed to subacute. Cells with thin walls and large trigones, 17-30  $\mu\text{m}$  in diameter. Dioicous. Perianth short, tubular, irregularly lobed, nearly ridge within bracts. **Habitat:** On rocks in *Dendrosenecio* paramo and in *Alchemilla* mats interrupted by boulders, 4200-4400 m. **Distribution in Rwanda:** **Volcano NP:** Karisimbi, on the E slope in the alpine belt. **Distribution in Africa:** DR Congo, Uganda, Tanzania. Also in the Northern Hemisphere and in high mountains of Central and South America and South East Asia.

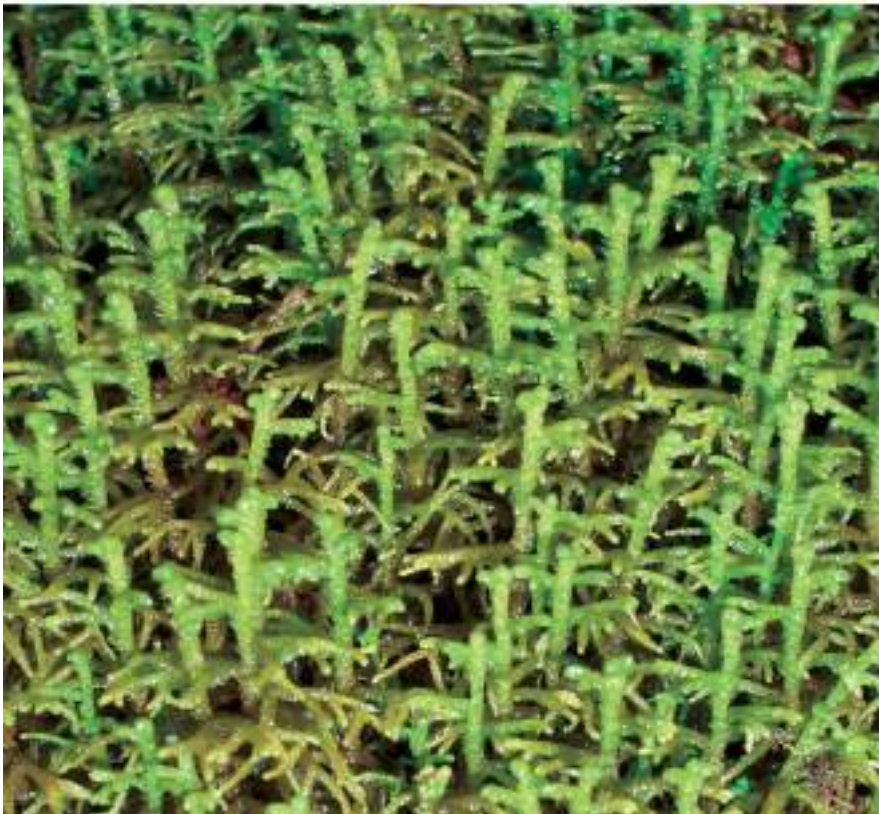


**Fig. 285. *Marsupella subintegra*** S.W.Arnell

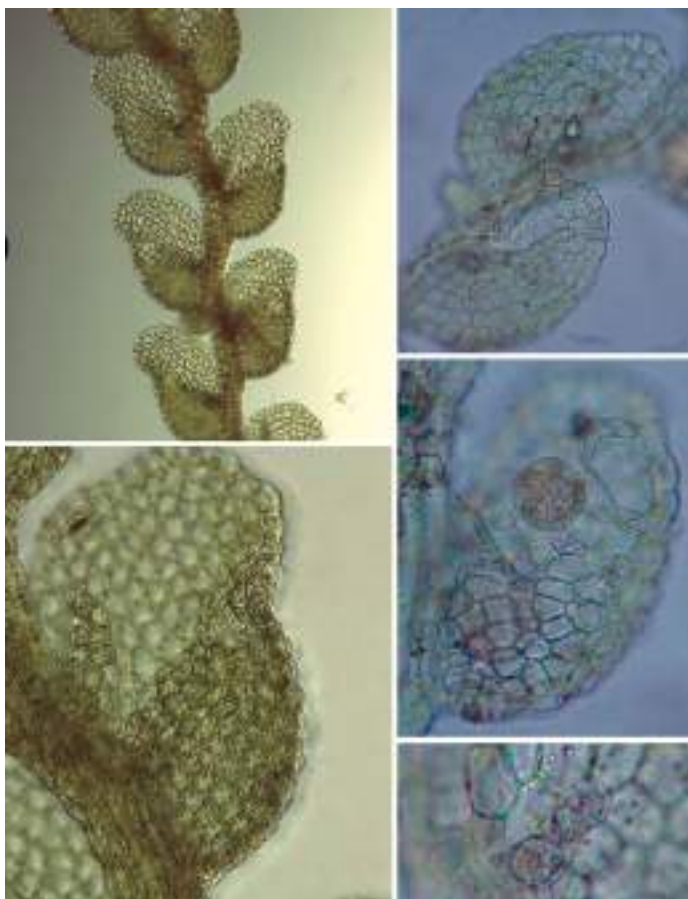
Plants reddish-brown or brownish, in dense patches, shoots 10-15 mm high and 1.2-2 mm wide, erect, simple or with few branches. Leaves contiguous to imbricate, roundate, bilobed to 0.2-0.3 of their length, lobes obtusely pointed to subacute. Cells with thin walls and large trigones, 17-30  $\mu$ m in diameter. Dioicous. Perianth absent. **Habitat:** On rocks in *Dendrosenecio* paramo, 3700-4500 m. **Distribution in Rwanda:** Volcano NP: Karisimbi. **Distribution in Africa:** Uganda, Malawi. Also Réunion, Nepal, Borneo, Sumatra, Papua New Guinea.



**Figs 286 and 287 (next page). *Mastigophora dicladus*** (Brid. ex Web.) Nees  
 Plants reddish to yellowish-brown. Stems procumbent to ascending or erect, up to 10  
 cm long, 1-2-pinnate, mature branches with attenuate apices with small leaves. Leaves,  
 2-3-lobed, 0.5-1.1 mm long, divided for 0.8-0.9 of their length, dorsal lobes large, ventral  
 lobes much smaller, with triangular laciniae at both lobes. Cells with large trigones, walls  
 pigmented, 20-25 x 25-35  $\mu\text{m}$ . Underleaves 2-lobed, similar to lateral leaves. **Habitat:**  
 Epiphytic in montane forest, 2000-2200 m. **Distribution in Rwanda: Nyungwe NP:**  
 Rugege, Gisakura, Karamba, Kamiranzovu. **Distribution in Africa:** Annobón, São  
 Tomé, Bioko, Cameroon, Gabon, Rio Muni, Ethiopia, Uganda, Tanzania. Also Ascension,  
 Comoros, Madagascar, Mauritius, Réunion, Seychelles.







**Figs 288 and 289 (next page). *Microlejeunea africana* Steph.**

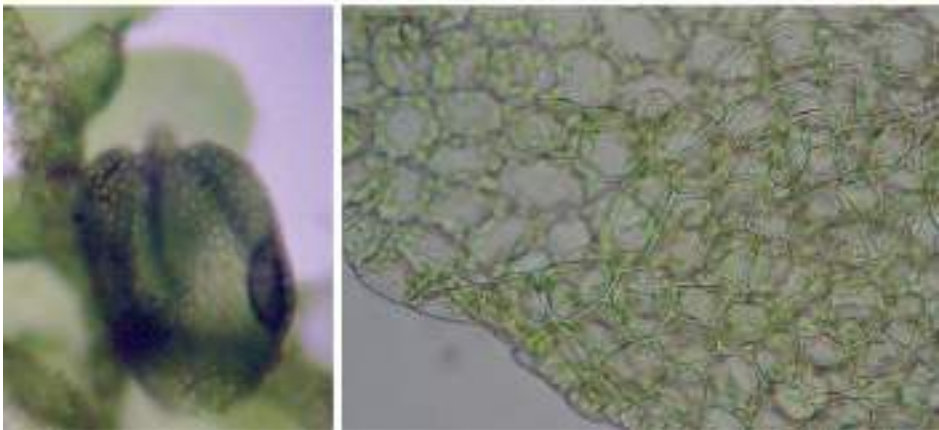
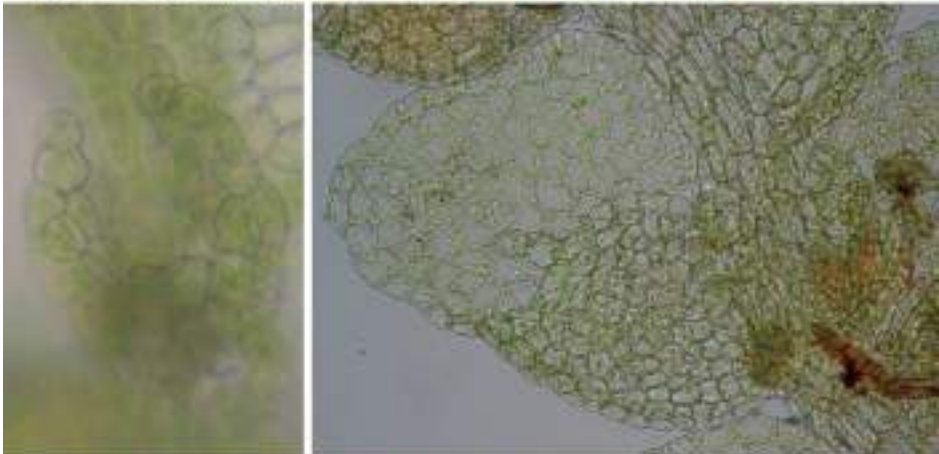
Synonyms: *Lejeunea ulicina* ssp. *africana* (Steph.) Vanden Berghen; *L. ulicina* ssp. *ocellifera* (S.W.Arnell) R.M.Schust. Plants very small, 2-5 mm long and 0.1-0.2 mm wide, epiphytic or epiphyllous, pale green to pure-green. Leaves dimorphous, distant to contiguous, 0.15-0.22 mm long, in sterile shoots the portion of the lobe extending forward from the lobule about equal to the lobule, with ventral margin almost in line with keel. Lobes suberect, apex rounded, margins entire, ocelli 1-3. Lobules inflated, elongate ovate, apical tooth curved, spiniform. Cells thin-walled, 15-18 x 18-20  $\mu$ m. Underleaves bifid to 1/3-2/5 of their length, longer than wide, 1.5 x stem width. Dioicous. Perianths inflated-pyriform, with 5 slightly crenulate keels. **Habitat:** Epiphytic or epiphyllous in montane forest up to *Dendrosenecio-Lobelia stuhlmannii* paramo, 2000-3600 m. **Distribution in Rwanda: Volcano NP:** Karisimbi, on the E-slopes along trail to summit. **Gishwati Forest:** Gikungu. **Nyungwe NP:** Rwasekoko, Karamba, Kamiranzovu, Gisakura, Uwinka, Mt. Bigugu. **Distribution in Africa:** Guinea, Guinea-Bissau, Sierra Leone, Ghana, Benin, Togo, Nigeria, Príncipe, Annobón, São Tomé, Bioko, Cameroon, Central African Republic, Congo-Brazzaville, DR Congo, Burundi, Ethiopia, Uganda, Kenya, Tanzania, Malawi, Zimbabwe, Mozambique, Lesotho, South Africa. Also Socotra, Comoros, Madagascar, Mauritius, Réunion, Rodriguez, Seychelles.

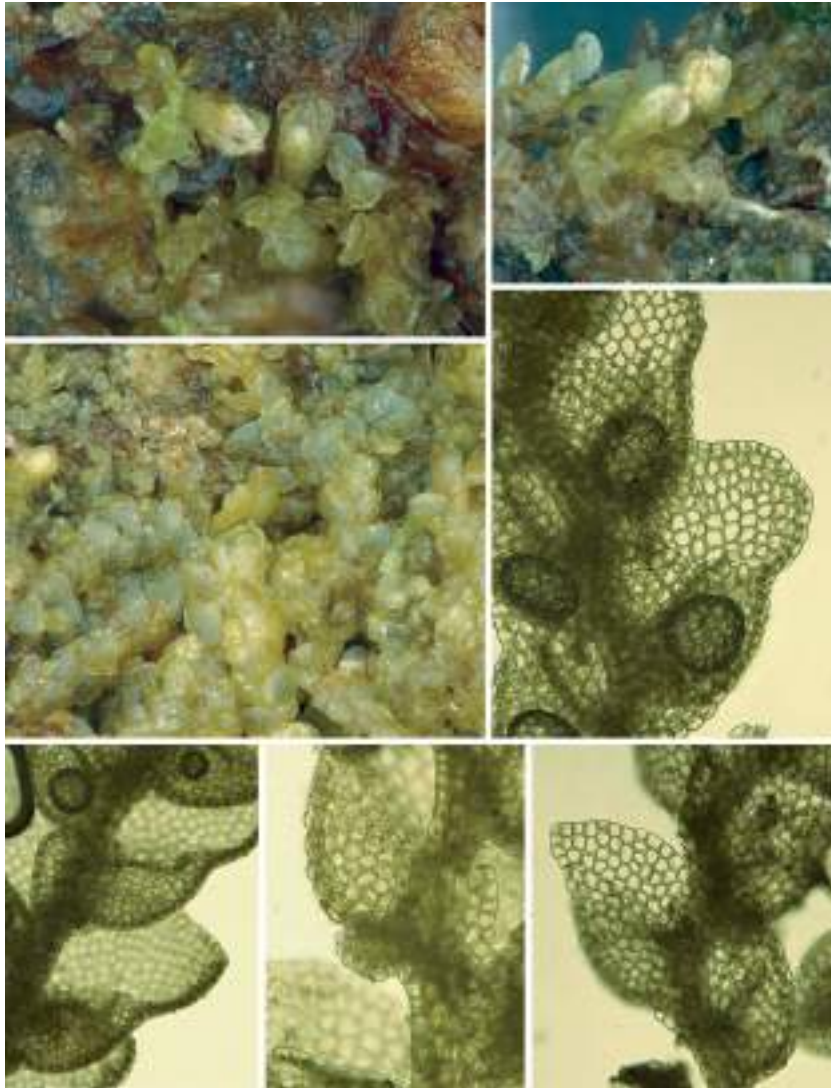




**Figs 290 and 291 (next page). *Microlejeunea kamerunensis* Steph.**

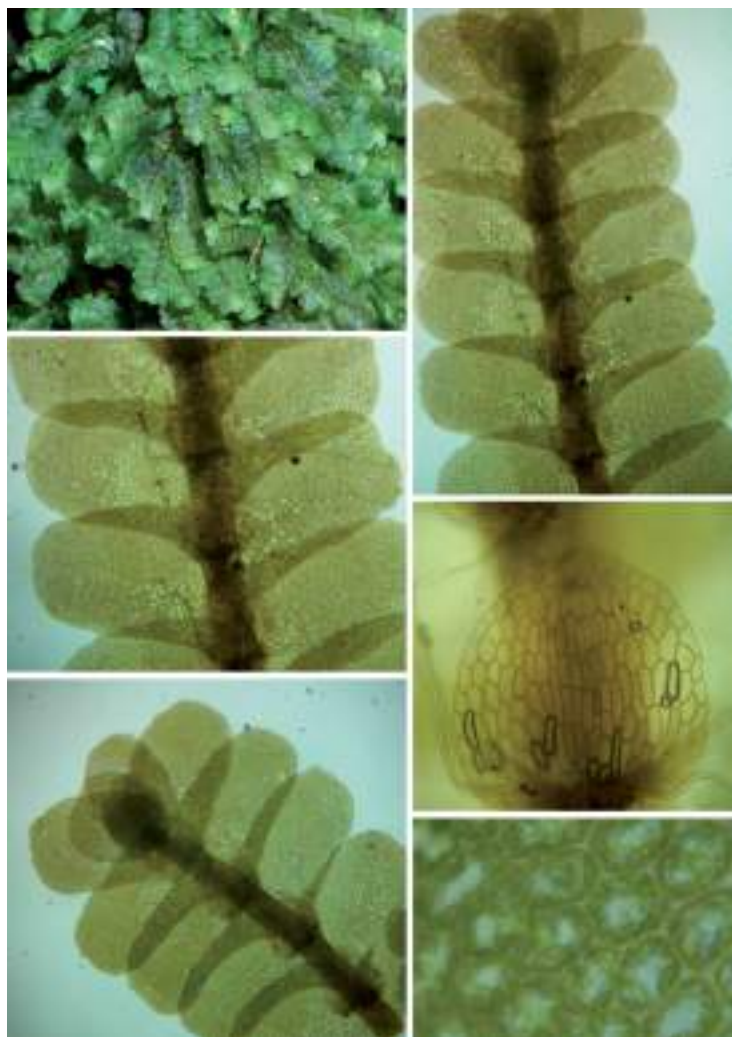
Synonym: *Lejeunea kamerunensis* (Steph.) Vanden Berghen. Plants very small, 2-5 mm long and 0.35-0.6 mm wide, epiphytic or epiphyllous, pale green to pure-green. Leaves dimorphous, distant to contiguous, 0.15-0.2 x 0.2-0.4 mm. Lobes ovate, asymmetric, spreading at right angle to the stem, leaves of sterile shoots with ventral margin arched, forming a distinct sinus with keel apex rounded, margins entire or crenulated, ocelli (1-)2-6(-8), in an irregular group. Lobules c. 1/2 of the length of the lobe, apical tooth falcate, acute, 40-50  $\mu$ m long. Cells thin-walled, 15 x 17  $\mu$ m. Underleaves bifid to 1/2 of their length, longer than wide, 1.5-2 x stem width, 0.06-0.1 x 0.09-0.13 mm. Dioicous. Perianths inflated-pyriform, 0.27-0.3 x 0.5-0.6 mm, conically obovate or narrow pyriform, with 5 slightly crenulate keels. **Habitat:** Epiphytic or epiphyllous in montane forest up to *Hagenia-Hypericum* forest and *Dendrosenecio-Lobelia stuhlmannii* paramo, 1950-3600 m. **Distribution in Rwanda: Volcano NP:** Karisimbi, in the saddle between Bisoke and Karisimbi, Karisimbi, on E-slopes along trail to summit. **Nyungwe NP:** Rwasenkoko, Gisakura, Karamba, Kamiranzovu, Rwankuba, Uwinka. **Distribution in Africa:** Sierra Leone, Ivory Coast, Nigeria, Príncipe, São Tomé, Bioko, Cameroon, DR Congo, Burundi, Uganda, Kenya, Tanzania, Zimbabwe, Mozambique. Also Mauritius, Réunion.





**Fig. 292. *Microlejeunea nyandaruensis* Pócs**

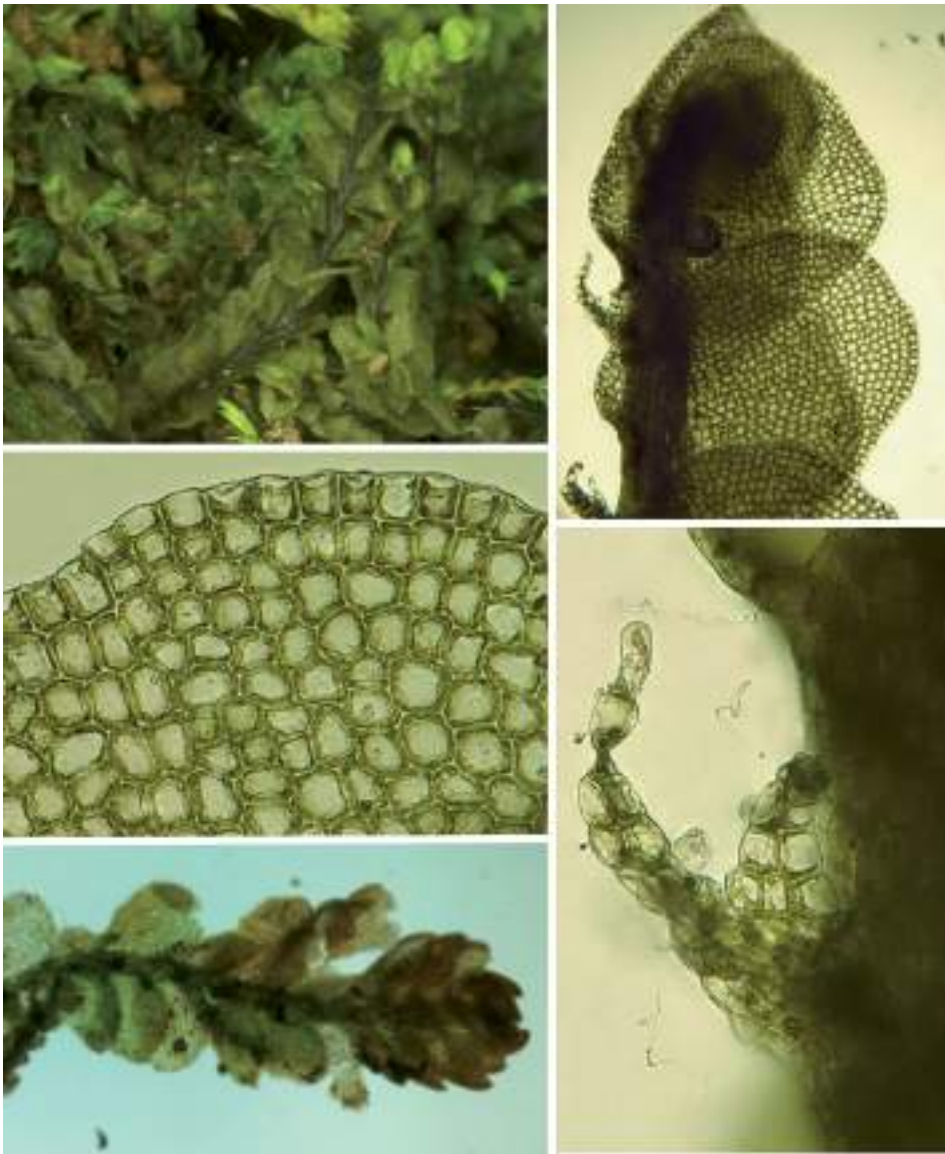
Plants very small, 2-5 mm long and 0.2-0.3 mm wide, epiphytic or epiphyllous, pale green to pure-green. Leaves dimorphous, distant to contiguous, 300-400 x 250-300  $\mu$ m. Lobes suberect, apex rounded, margins entire or crenulated, ocelli (1)2-6(-8), in an irregular group. Lobules inflated, elongate ovate, apical tooth falcate, often hidden by the enrolled free margin, hyaline papilla distal. Cells thin-walled, 20 x 20-35  $\mu$ m. Underleaves bifid to 1/3-2/5 of their length, longer than wide, 1.2-2.0 x stem width, 200 x 150  $\mu$ m. Autoicous. Perianths inflated-pyriform, 350-700  $\mu$ m long, conically obovate or narrow pyriform, with 5 slightly crenulate keels. **Habitat:** Epiphytic in *Dendrosenecio-Lobelia stuhlmannii* paramo, 3600 m. **Distribution in Rwanda: Volcano NP:** Karisimbi, on E-slopes along trail to summit. **Distribution in Africa:** Kenya.



**Figs 293 and 294 (next page). *Mnioloma fusca* (Lehm.) R.M.Schust.**

Synonym: *Calypogeia fusca* (Lehm.) Steph. Plants usually terrestrial, small to medium-sized, pale-brown to dark-brown, 1-2 mm wide. Stems prostrate to ascending, 0.1-0.2 mm wide. Leaves imbricate, alternate, oblong-ovate to broadly ovate, 0.5-1.0 x 0.4-0.8 mm, apex rounded or slightly emarginate, ventral base decurrent. Cells thin-walled, with small nodulose trigones, subapical cells 20-30 x 30-40  $\mu$ m, mid-leaf cells 25-30 x 34-50  $\mu$ m, cuticle verrucose, oil bodies compound, finely granular (*Jungermannia*-type), colourless, 2-6 per cell. Underleaves 1.5-2 x as wide as the stem, rounded, apex minutely emarginate to rounded, base not decurrent, margin dentate or entire. **Habitat:** On soil, rotten wood and on roadcuts 1950-2100 m. **Distribution in Rwanda:** Nyungwe NP: Gisakura, Uwinka. **Distribution in Africa:** Bioko, Cameroon, DR Congo, Ethiopia, Uganda, Tanzania, Lesotho, Swaziland, South Africa. Also Azores, St. Helena, Mauritius, Réunion, Seychelles.





**Fig. 295. *Notoscyphus lutescens*** (Lehm. & Lindenb.) Mitt.

Synonym: *Notoscyphus belangerianus* (Lehm. & Lindenb.) Mitt. Plants terrestrial, green to red, shoots 1-2 mm wide. Leaves alternate to subopposite, ovate-oblong, 0.4-1 x 0.3-0.6 mm, apex rounded or truncate. Cells usually with large trigones, rectangular, 20-35 x 25-45  $\mu$ m. Underleaves small, narrower than stem, divided into 2 subulate lobes. Dioicous.

**Habitat:** Quartzitic rocks in montane forest, 2000 m. **Distribution in Rwanda:** Nyungwe NP: Karamba. **Distribution in Africa:** Cameroon, DR Congo, Burundi, Malawi, South Africa. Also Comoros, Madagascar, Mauritius, Réunion.





**Figs 296 and 297 (next page).** *Odontolejeunea lunulata* (Web.) Schiffn.

Plants large, forming dense mats of several cm<sup>2</sup>, shoots (1.8-)2.5-3.2 mm wide. Lobe ovate, rounded and sometimes dentate at apex, 0.18-0.3 x (0.27-)0.3-0.45 mm.

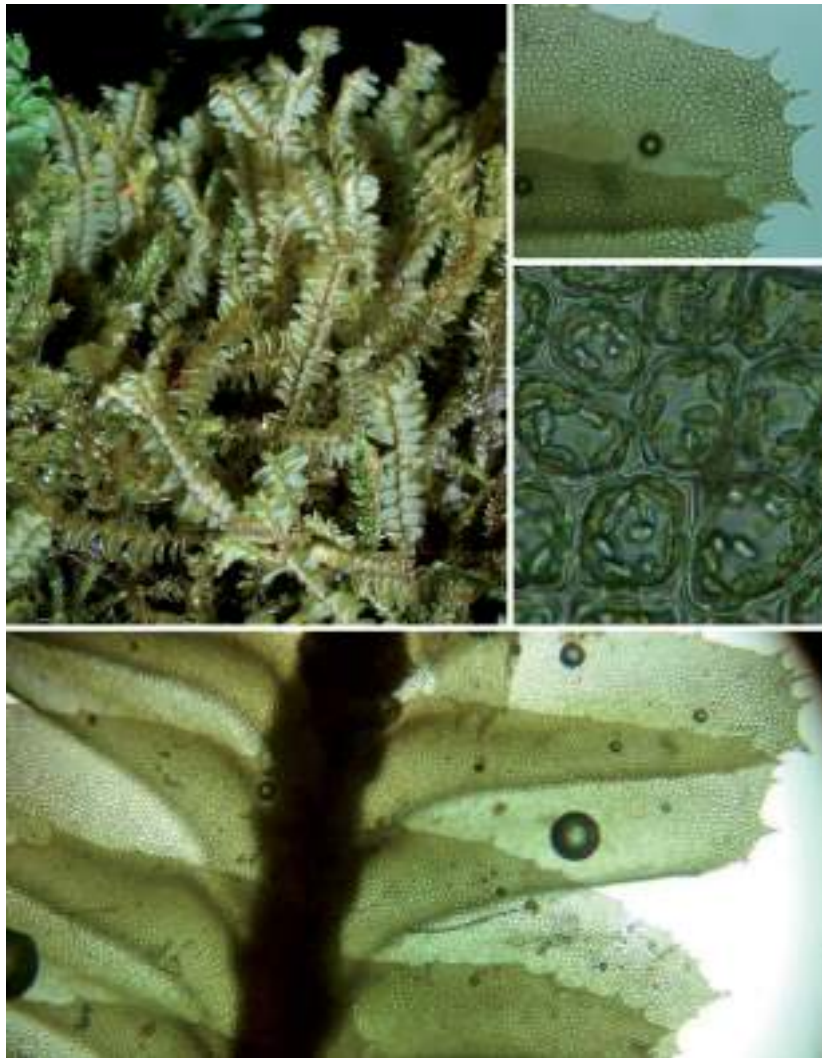
Lobule inflated, ovate, c. 0.22 x 0.32 mm, keel convex. Underleaves with disc-like paraphigastria for adhesion on leaf surfaces. Monoicous. Perianth compressed, obovate to oblong, dorsal face smooth, ventral face with obtuse keel, lateral keels dentate, 0.7-1 x 1-1.4 mm. **Habitat:** Epiphyllous in montane forest, 1970-2000 m. **Distribution in Rwanda:** Nyungwe NP: Gisakura, Karamba, Kamiranzovu. **Distribution in Africa:** Guinea, Sierra Leone, Ivory Coast, Nigeria, Bioko, São Tomé, Cameroon, Rio Muni, Congo-Brazzaville, DR Congo, Ethiopia, Uganda, Kenya, Tanzania, Mozambique. Also Comoros, Madagascar, Mauritius, Réunion.





**Figs 298 and 299 (next page). *Omphalanthus roccatii* (Gola) R.M.Schust.**  
 Synonyms: *Evansiolejeunea roccatii* (Gola) Vanden Berghen; *Acrolejeunea convexa* Steph.; *Omphalanthus renistipulus* Steph. Plants robust, epiphytic, yellowish-green to brownish, shoots up to 3 cm long. Lobe ovate, rounded and obtuse at apex, decurved, 0.8 x 1 mm. Lobules subquadrangular, their free margins not incurved, apical tooth 1-celled. Cells thick-walled, trigones prominent and bulging, 18 x 27  $\mu$ m. Underleaves entire, rounded, inserted on four or more rows of stem cells, insertion arched. Dioicous. Androecia not observed. Gynoecia without innovations beneath, immersed in the cucullate bracts. Perianths emerging from surrounding bracts, pyriform-cylindrical, inflated, with 5-6 acute keels (2 ventral keels, 2 lateral keels, 1-2 dorsal keels). **Habitat:** Epiphytic in ericaceous forest, 2900-3100 m. **Distribution in Rwanda:** **Volcano NP:** Sabinyo. **Nyungwe NP:** Mt. Bigugu. **Distribution in Africa:** DR Congo (Uvira, Kahuzi, Biéga, Ruwenzori), Uganda (Ruwenzori).





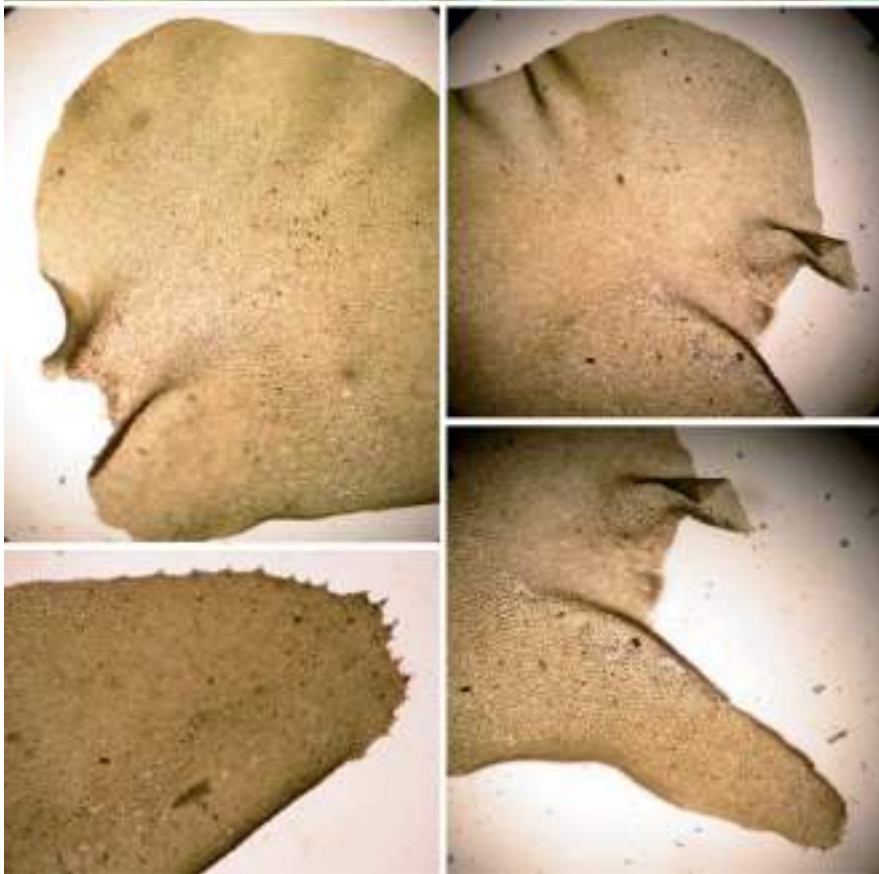
**Fig. 300. *Plagiochila barteri* Mitt.**

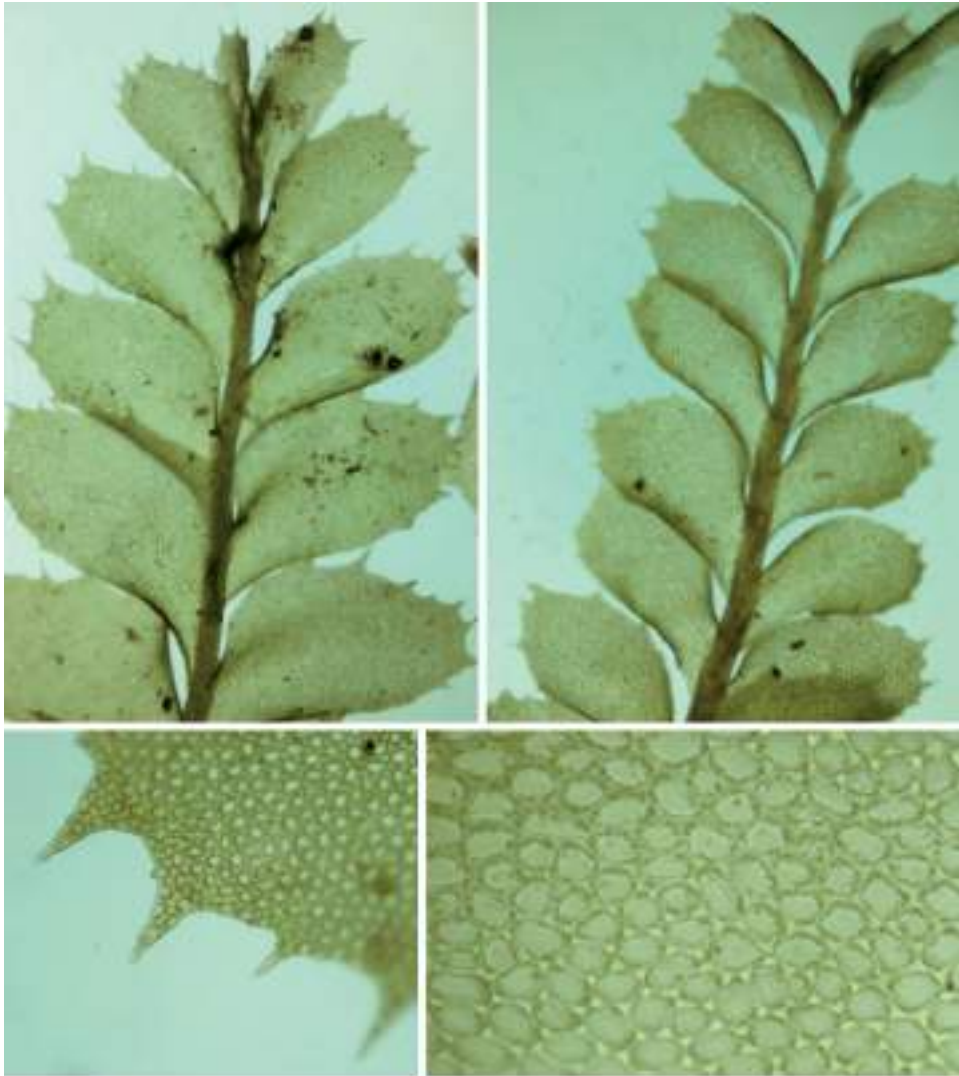
Plants up to 2-6(-10) cm long, shoots up to (2.4-)3-5(-7) mm wide, with intercalary ramifications. Leaves contiguous to imbricate, subtriangular-ovate, (0.8-)1.6-2.4 x 2-3.2 mm, ventral appendix well developed, convex, 0.8-1.2 mm high, dentate or entire-serrate at margin, ventral margin slightly convex, with 10-20 long involute, and acute teeth, dorsal margin involute, entire or dentate, prolonged by a wing. Cells with large trigones, 25-30 x 30-35  $\mu$ m. Dioicous. Perianth ovate-oblong, 2.6-3 x 4.4-5 mm, dorsal keel not winged, apex dentate at mouth. **Habitat:** Epiphyte in montane forest, 2000-2500 m. **Distribution in Rwanda: Nyungwe NP:** Rwasenkoko, Karamba, Kamiranzovu, Uwinka, W edge of forest near Gisakura. **Distribution in Africa:** Sierra Leone, Togo, São Tomé, Príncipe, Bioko, Cameroon, Gabon, DR Congo, Ethiopia, Kenya, Tanzania, Malawi, Zimbabwe. Also Comoros, Madagascar, Mauritius, Réunion.



**Figs 301 and 302 (next page). *Plagiochila colorans* Steph.**

Synonym: *Plagiochila barteri* ssp. *colorans* (Steph.) Pócs. Plants up 15-30 cm long, shoots up to 7-9 mm wide, with few or without ramifications. Leaves broadly triangular, 4.4 x 3 mm, postical base widely ampliate, shortly decurrent in a broad erose wing, antical base longly decurrent, auriculate at base, the insertions meeting at mid-line, stem completely concealed from above and below, leaf narrowed to the rounded apex, with small spiniform teeth. Cells with large trigones, 15-22 x 20-30  $\mu$ m. Dioicous. Perianth ovate-oblong, 2.6-3 x 4-5 mm, dorsal keel not winged, apex dentate at mouth. **Habitat:** Epiphyte in *Hagenia-Hypericum* forest, *Erica* forest, *Dendrosenecio-Lobelia stuhlmannii* paramo 2900-3900 m. **Distribution in Rwanda: Volcano NP:** Karisimbi, SW of Susa River, in the saddle between Mt. Bisoke and Mt. Karisimbi, on the E-slopes along trail to summit. **Nyungwe NP:** Mt. Bigugu. **Distribution in Africa:** DR Congo (Kahuzi-Biéga, Ruwenzori), Ethiopia (Bale), Uganda (Virunga Volcanoes, Ruwenzori), Kenya (Mt. Kenya), Tanzania (Mt. Meru, Kilimanjaro).





**Figs 303 and 304 (next page). *Plagiochila ericicola* Steph.**

Synonym: *Plagiochila hedbergii* S.W.Arnell. Plants up to 30 cm long, green, shoots up to 5 mm wide, with regularly pinnate to bipinnate branching. Leaves distant, ovate except for the longly decurrent tapering antical base, antical margin not strongly inrolled, nearly straight at about 50° to the stem, postical base narrow, longly decurrent, postical half of leaf strongly deflexed to lie at right angles to the stem, apex, postical margin and distal part of postical base regularly ciliate-dentate, teeth straight, of 1-3 cells. Cells with large nodular trigones, 21-27 x 25-30 μm. **Habitat:** Epiphyte in *Hagenia-Hypericum* forest, *Erica* forest, *Dendrosenecio-Lobelia stuhlmannii* paramo, 3000-3900 m. **Distribution in Rwanda: Volcano NP:** Karisimbi, Bisoke, Sabinyo, Muhabura. **Distribution in Africa:** DR Congo, Uganda, Kenya, Tanzania.

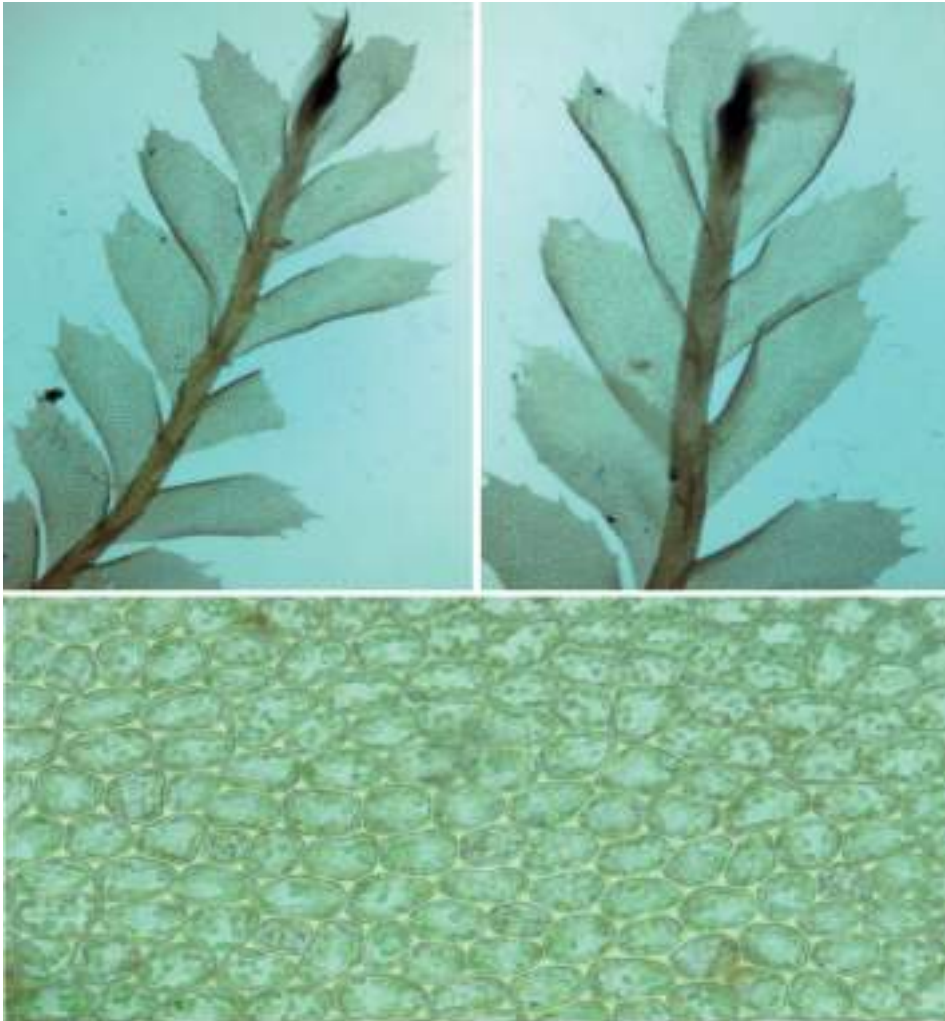






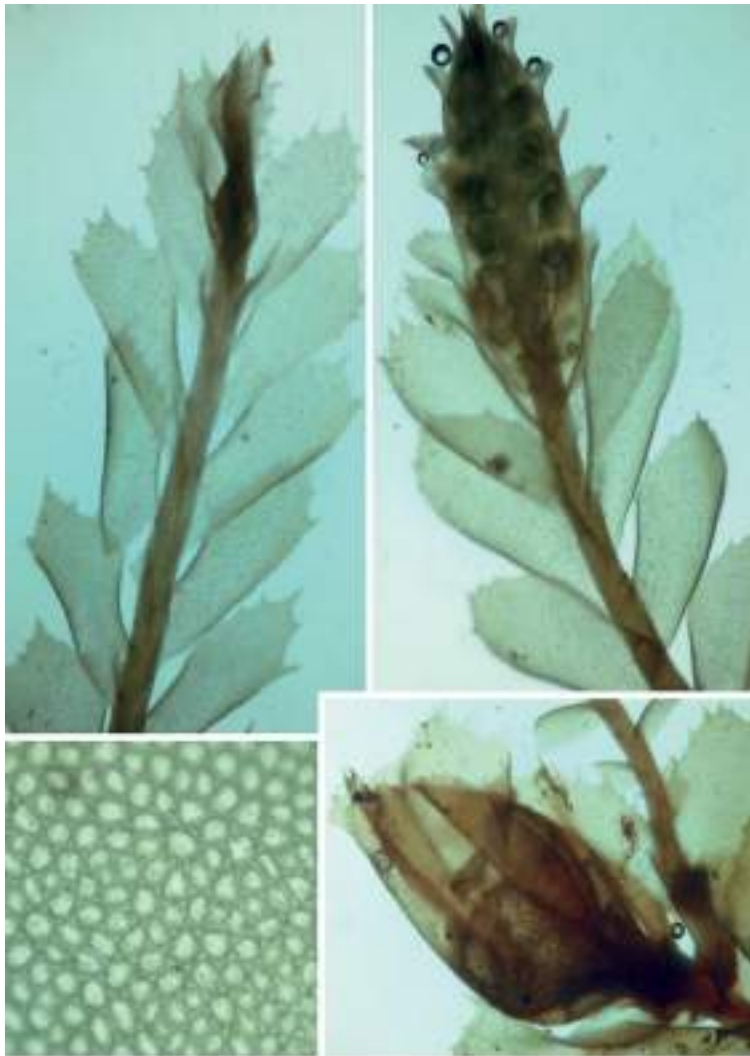
**Figs 305 and 306 (next page). *Plagiochila exigua*** (Taylor) Taylor  
 Plants up to 1-2 cm long, shoots up to 0.8-1.8 mm wide, with intercalary ramifications, microphyllous flagellae abundant. Leaves distant to contiguous, caducous, convex, distinctly narrowed at insertion, 0.5-1.2 x 0.3-6 mm, margin not or only slightly decurrent, bilobed to c. 1/3, lobes acuminate, spreading and thus V-shaped, dorsal margin entire or rarely with 1 tooth, ventral margin with 0-1(-2) teeth with 2-3 cells in a row. Cells with small trigones, 20-25 x 20-28  $\mu$ m. Vegetative reproduction with caducous leaves. **Habitat:** Epiphyte in *Erica* forest, 3300-3500 m. **Distribution in Rwanda: Volcano NP:** Gahinga, Muhabura. **Distribution in Africa:** DR Congo, Ethiopia, Uganda, Kenya, Tanzania, Malawi, Lesotho, South Africa. Also atlantic Europe (Scotland, England, Ireland, SW Norway, NW France, N Spain, Switzerland, Italy), Azores, Madeira, Canaries, Réunion, North America, Caribbean, South America, Asia (Bhutan, Japan).





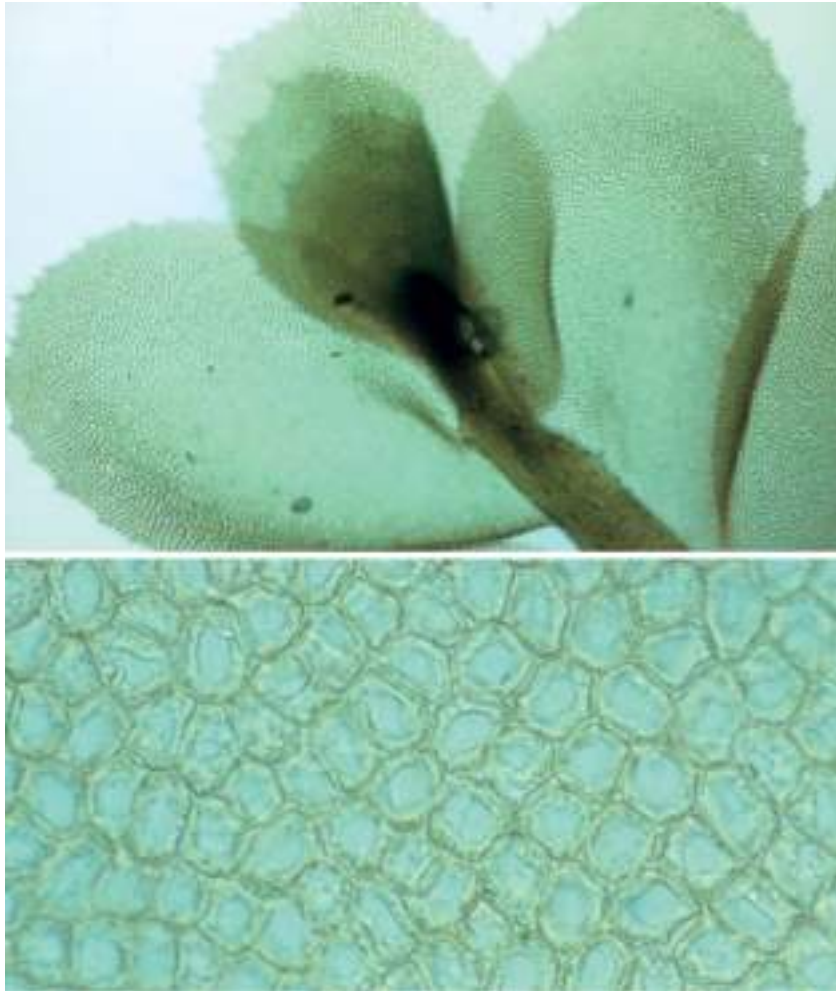
**Fig. 307. *Plagiochila fusifera* Tayl.**

Plants forming lax tufts, fronds 1-3 cm tall, arising from basal stolons, shoots 3-4.5 mm wide, dichotomously branched distally. Leaves approximate to somewhat imbricate, 1.4-1.7 mm long, ovate to oblong-triangular, dorsal margin nearly straight or weakly concave, shortly decurrent, insertion shorter than width of leaf, ventral base shortly and narrowly decurrent, leaf apex variable, rounded or truncate, leaf margin dentate around the whole of apex and ventral margin with  $\pm$  triangular teeth, often with some teeth on ventral base. Cells isodiametric, 20-25 x 20-30  $\mu$ m, trigones distinct, small or medium-sized. **Habitat:** Epiphyte in montane rainforest, 2500 m. **Distribution in Rwanda: Gishwati Forest:** N end of Gishwati, W of Gakarara. **Nyungwe NP:** Uwinka. **Distribution in Africa:** Senegal, Guinea, Sierra Leone, Ivory Coast, Togo, Ghana, Nigeria, São Tomé, Príncipe, Bioko, Cameroon, Gabon, Central African Republic, DR Congo, Ethiopia, Somalia, Uganda, Kenya, Tanzania, Malawi, Zambia.



**Fig. 308. *Plagiochila heterostipa* Steph.**

Plants with fronds up to 5 cm long, distantly pinnate to bipinnate, 3-4.5 mm wide. Leaves (1.2-) 1.5-2(-2.5) mm long, contiguous or distant, ovate to oblong, dorsal base moderately to longly decurrent in a narrow wing, obliquely inserted, leaving the dorsal side of the stem well exposed, dorsal margin arching outwards at an angle of 45°-70°(-80°), ventral base shortly decurrent, leaf apex truncate, leaf margin coarsely and irregularly dentate with 3-4(-5) teeth at apex, and 2-4 teeth on ventral margin, dentition generally coarser and shorter than in *P. terebrans* (see below). Cells 17-20 x 20-23 µm, trigones medium-sized, sharply defined. Dioicous. Perianth widely triangular, slightly longer than wide. **Habitat:** Epiphyte in submontane to montane rainforest, 2000-2500 m. **Distribution in Rwanda:** Nyungwe NP: Uwinka. **Distribution in Africa:** Ivory Coast, Gabon, DR Congo, Burundi, Uganda, Kenya, Tanzania, Angola, Malawi, Zimbabwe, Swaziland, South Africa.



**Figs 309 and 310 (next page). *Plagiochila integerrima* Steph.**

Synonym: *Plagiochila blanda* Steph. Plants forming dense mats up to 1-3 cm tall, shoots 0.5-2 cm long and 3-4.8(-6) mm wide with exclusively intercalary ramifications. Leaves distant to contiguous or slightly imbricate, obovate-oblong, cuneate at base, (1-)1.2-2 x 1.8-3.4 mm, ventral margin shortly decurrent on stem, sinuate, with 1-6 small teeth in distal part towards apex, apex rounded or truncate, subentire or irregularly dentate, with 3-8 acute teeth. Cells without trigones or with small nodulose trigones, 24-30 x 30-40  $\mu$ m. **Habitat:** Lithophytic or terrestrial, occasionally epiphytic in montane rainforest, often near streams or rivers, 1900-2400 m. **Distribution in Rwanda: Nyungwe NP:** Nyungwe, c. 7 km E of Pindura, Kamiranzovu, Uwinka. **Distribution in Africa:** Guinea, Sierra Leone, Ivory Coast, Togo, Ghana, Nigeria, São Tomé, Bioko, Cameroon, Gabon, Rio Muni, Central African Republic, Congo-Brazzaville, DR Congo, Burundi, Ethiopia, Somalia, Uganda, Kenya, Tanzania, Malawi, Zimbabwe. Also Madagascar, Mauritius, Réunion, Seychelles.

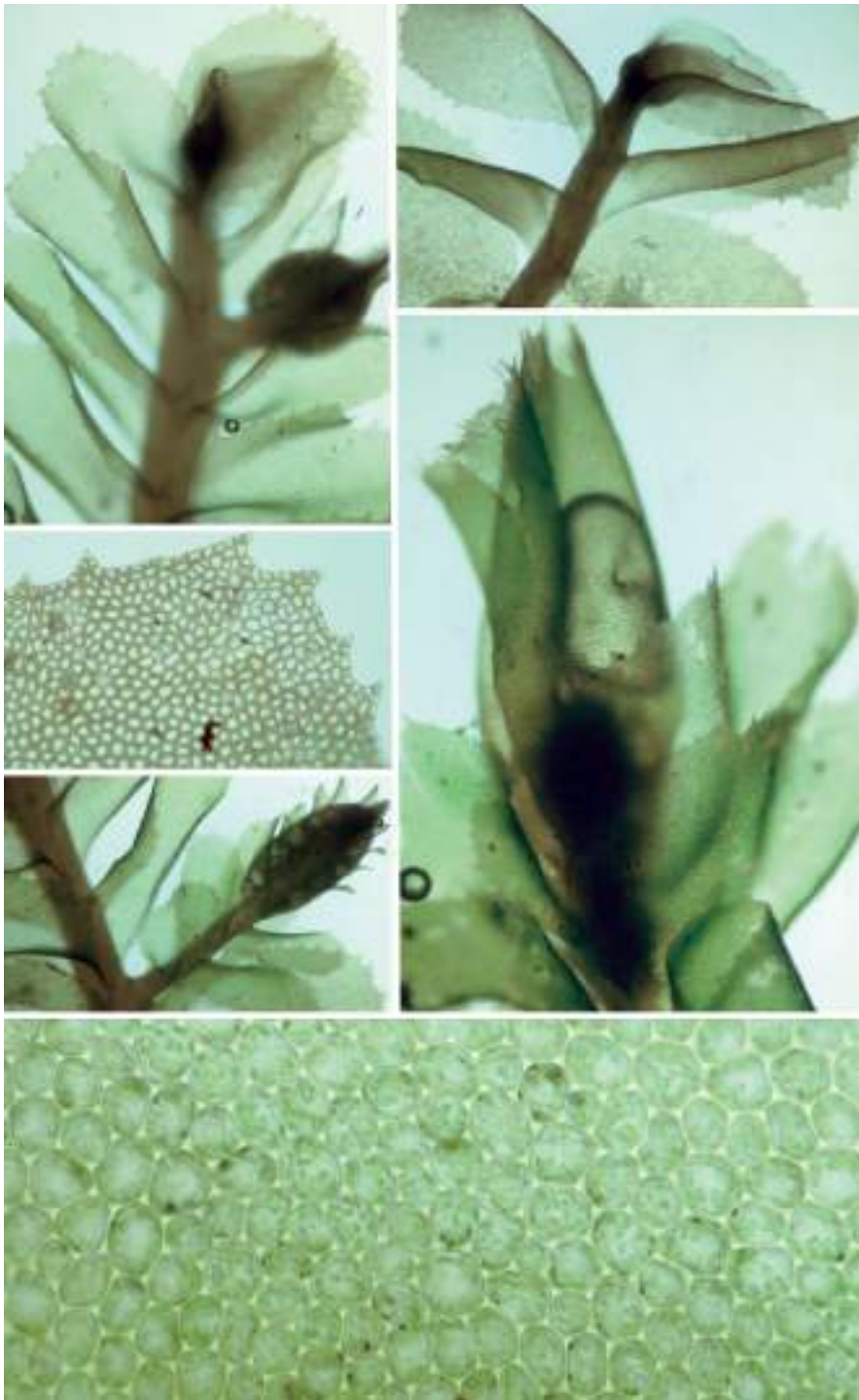


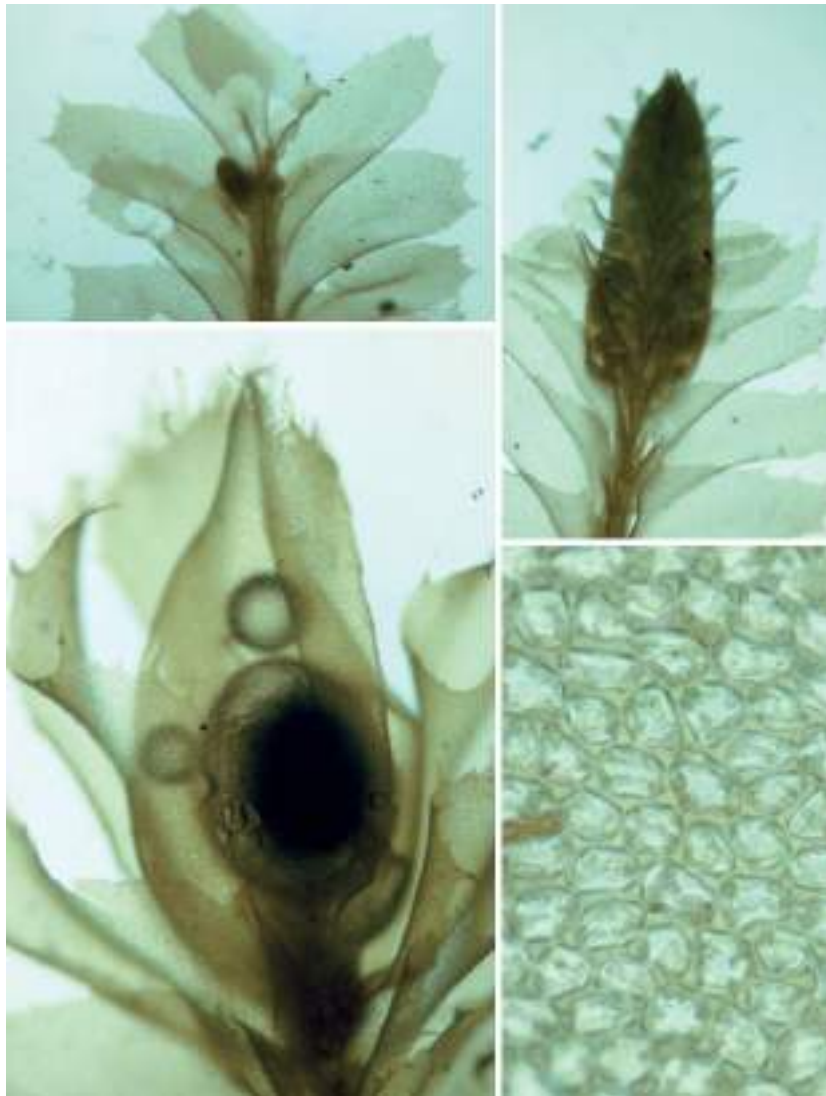


**Figs 311 and 312 (next page). *Plagiochila kiaerii* Gottsche**

Synonym: *Plagiochila divergens* Steph. Plants similar to *Plagiochila fusifera*, differing mainly in being much larger and more richly branched, fronds pinnately or bipinnately branched, 4-8 cm tall, shoots 4-6 mm wide. Leaves 2-3.5 mm long, dentition variable, usually dentate near apex and in the distal part of the ventral margin, entire proximally, involute leaf margin prolonged by an obliquely inserted wing on stem. Cells with large nodulose trigones, 18-22 x 20-26  $\mu\text{m}$ . Dioicous. Perianth subtriangular, 1.4-1.6 x 1.5-2 mm, mouth ciliate. **Habitat:** Epiphyte in montane rainforest, 2000 m. **Distribution in Rwanda: Nyungwe NP:** Rugege. **Distribution in Africa:** DR Congo, Burundi, Uganda, Kenya, Tanzania, Angola, Malawi, South Africa. Also Madagascar, Seychelles.

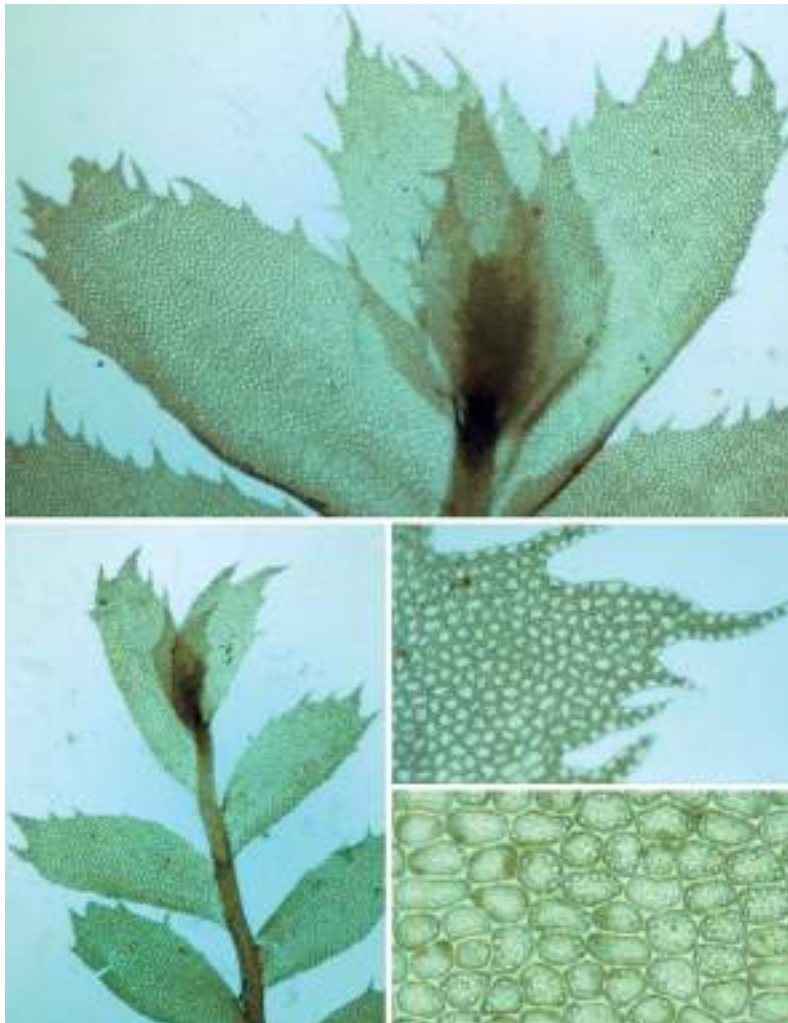






**Fig. 313. *Plagiochila lastii* Mitt.**

Plants up to 6-8 cm long, shoots up to 3-5 mm wide, often pendulous, laxly pinnate or bipinnate. Leaves distant to contiguous, triangular, postical margin on main axis at 90°, postical bases forming a low but well-marked crest, longly decurrent in a narrow and undulate wing, postical margin at apex coarsely and irregularly dentate or biserrate with 2-4 principal teeth. Cells with distinct trigones and intermediate thickenings, 15-24 x 20-40 µm. Underleaves often conspicuous, bifid, deeply lacinate. Dioicous. Perianth ovate or elliptic, 2 x as long as wide, apex closely and shortly lacinate. **Habitat:** Montane rainforest, 2450 m. **Distribution in Rwanda:** Nyungwe NP: Uwinka. **Distribution in Africa:** DR Congo, Ethiopia, Uganda, Kenya, Tanzania, Malawi, Zimbabwe, South Africa.



**Figs 314 and 315 (next page). *Plagiochila pectinata* (Willd. ex Web.) Lindenb.**  
 Plants up to 2-6 cm long, shoots up to (2.8-)4-6(-7) mm wide, with intercalary ramifications  
 Leaves distant to contiguous, slightly imbricate, slightly falcate, cuneate at base and  
 convex dorsally, usually 2 x long as wide, (0.8-)1-2 x (1.8-)2.3-3.8 mm, ventral margin  
 convex, slightly decurrent at stem, forming an angle of 45° with the stem, in distal part  
 2-4(-7) triangular teeth, apex acute, rarely truncate, in proximal part (1-)2-6(-8) triangular  
 teeth. Cells with distinct trigones, 23-30 x 32-45 µm. Dioicous. Androecium 2.4-4.5  
 mm long, bracts imbricate. Perianth ovate or elliptic, 1.1-1.7 x 1.7-3.4 mm, not winged,  
 apex with 10-16 cilia on each side of mouth. **Habitat:** Epiphyte in montane rainforest  
 and ericaceous forest, 2450-3000 m. **Distribution in Rwanda:** Nyungwe NP: Uwinka.  
**Volcano NP:** Muhabura. **Distribution in Africa:** Sierra Leone, Ghana, São Tomé, Bioko,  
 Cameroon, Gabon, Rio Muni, DR Congo, Uganda, Kenya, Malawi. Also Madagascar,  
 Mauritius, Seychelles.



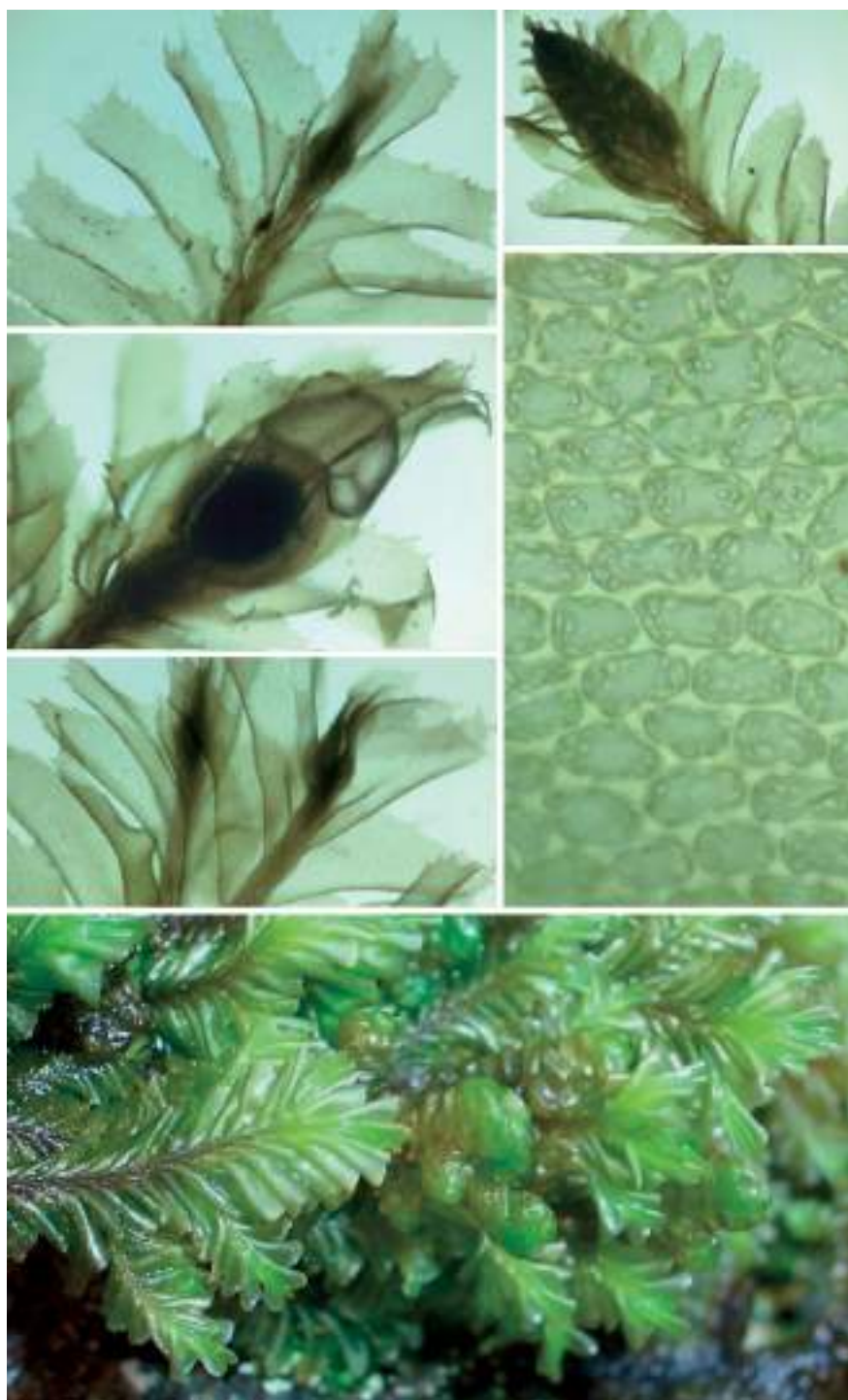


**Figs 316 and 317 (next page).** *Plagiochila squamulosa* var. *sinuosa* (Mitt.) Vanden Berghen

Synonym: *Plagiochila sinuosa* Mitt. Close to *P. squamulosa* var. *squamulosa* but differing in shorter teeth that are triangular rather than spiniform, plants usually more closely and regularly pinnate or bipinnate. **Habitat:** Epiphyte in *Lobelia mildbraedii*-*Cyperus denudatus* bog, ericaceous heath with *Andropogon shirensis* and montane forest, 2400-2500 m.

**Distribution in Rwanda:** **Gishwati Forest:** W of Gakarara. **Nyungwe NP:** Rwasenkoko.

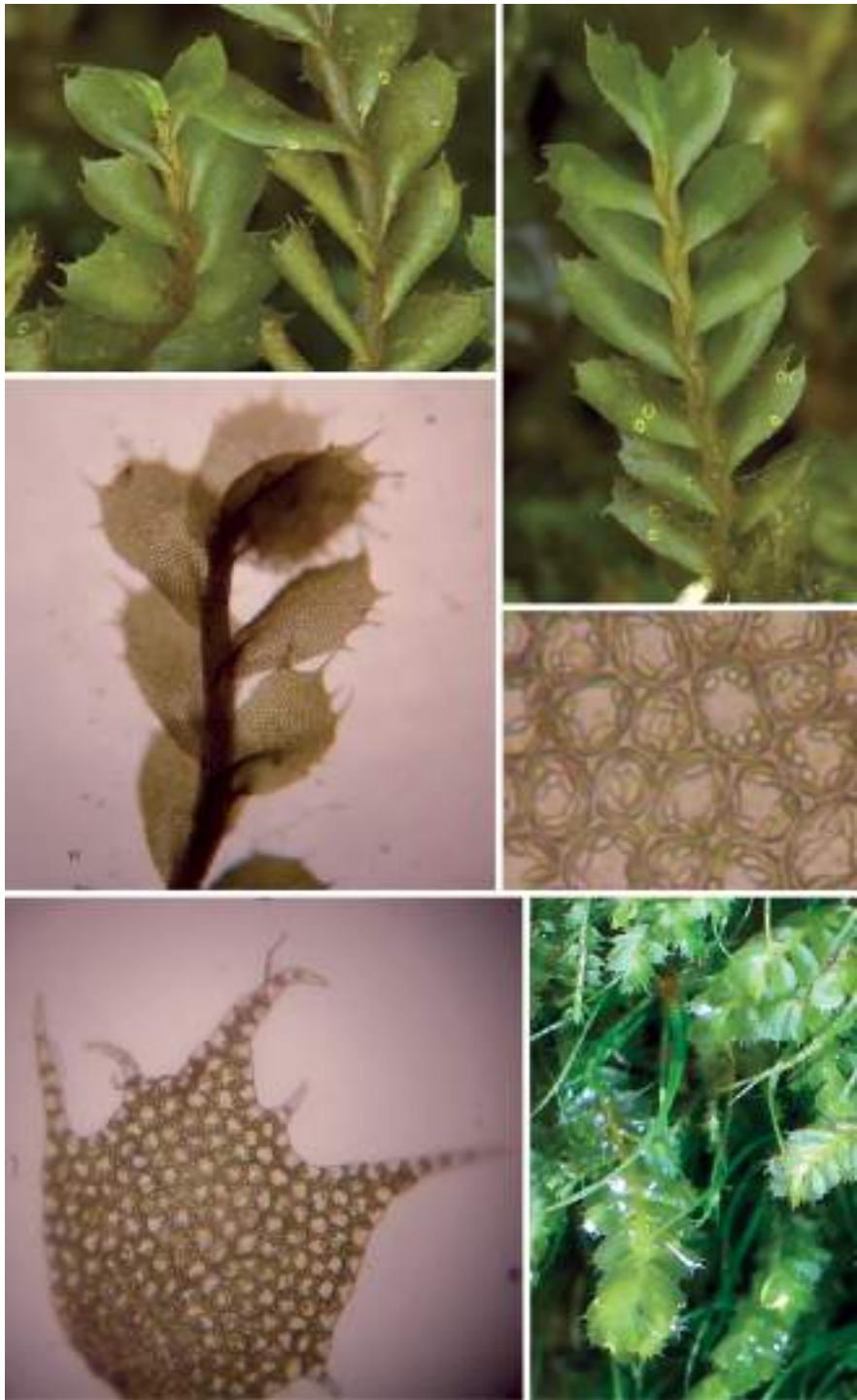
**Distribution in Africa:** Cameroon, DR Congo, Burundi, Ethiopia, Uganda, Kenya, Tanzania, Angola, Malawi, Zambia, Zimbabwe. Also Madagascar, Mauritius.



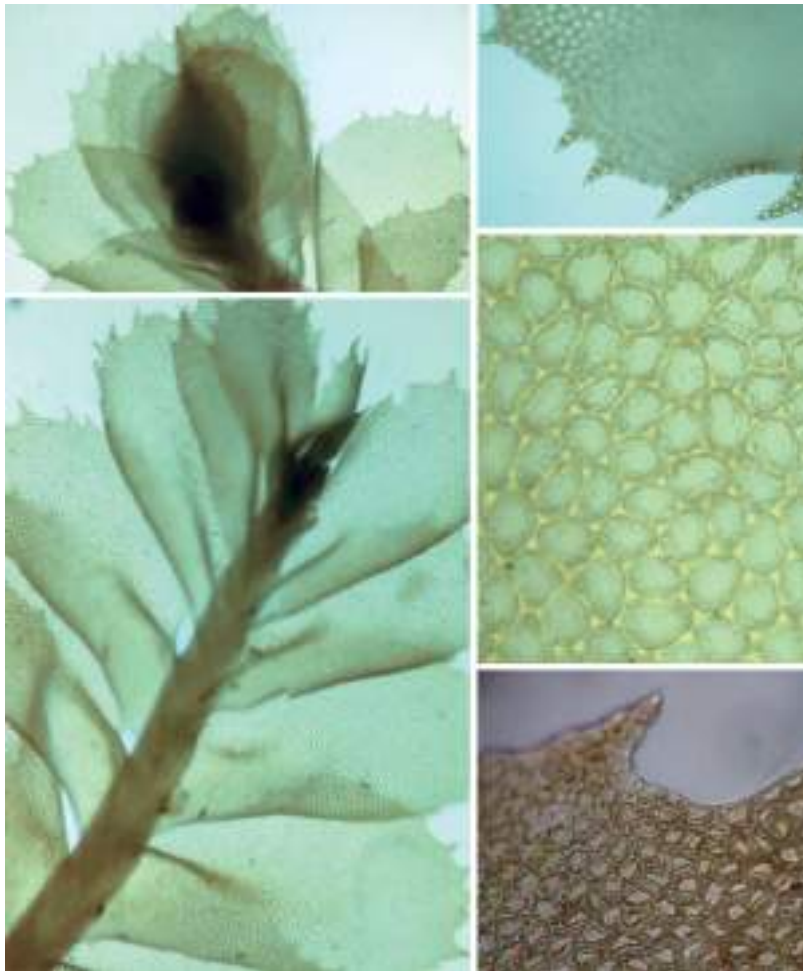


**Figs 318 and 319 (next page). *Plagiochila subalpina* Steph.**

Synonym: *Plagiochila pseudoattenuata* S.W.Arnell. Plants up to 1-2 cm tall, shoots up to 1.5-2 mm wide, with intercalary ramifications, microphyllous flagellae abundant. Leaves distant to contiguous, obovate or suborbicular, 0.58-0.82 x 0.72-1 mm, ventral margin convex, nearly hemicircular, apex rounded, ventral margin and apex with (4-)6-9(-10) teeth with 2-3 cells in a row. Cells with large trigones, 19-25 x 23-26  $\mu$ m. Vegetative reproduction with caducous leaves. **Habitat:** Epiphyte in *Dendrosenecio-Lobelia stuhlmannii* paramo, 3600-3900 m. **Distribution in Rwanda: Volcano NP:** Karisimbi, on the E-slopes along trail to summit. **Distribution in Africa:** DR Congo, Uganda, Kenya, Tanzania, Malawi, Lesotho. Also Madagascar.







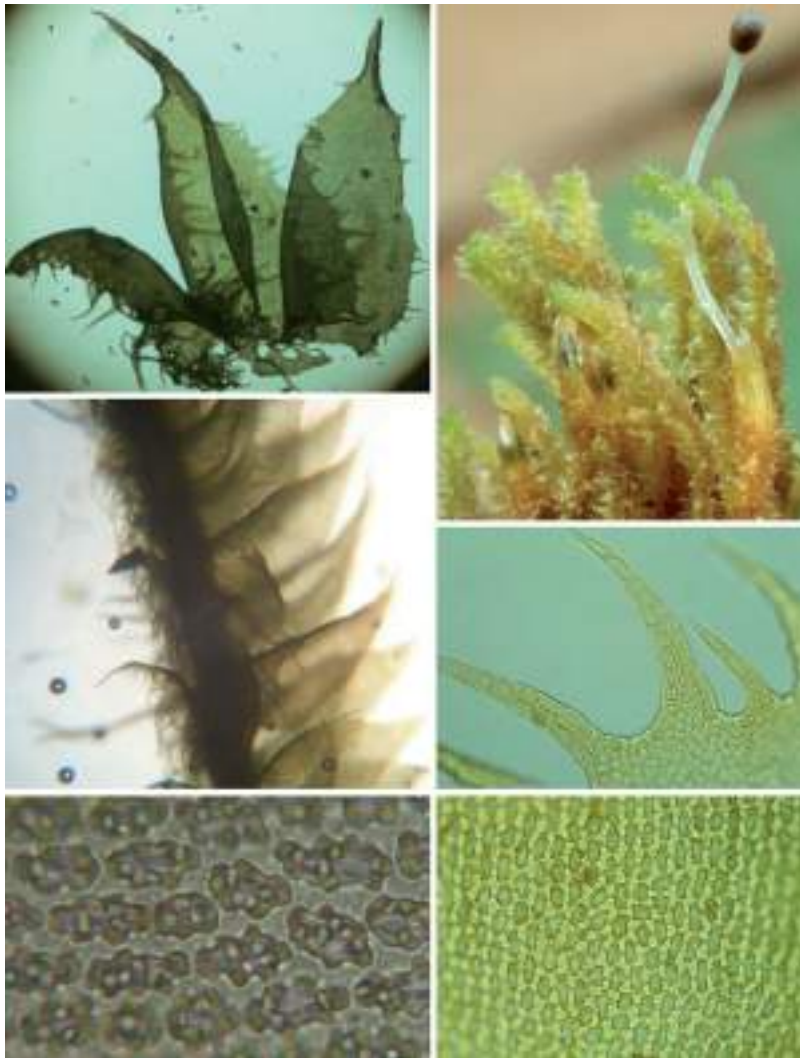
**Figs 320 and 321 (next page). *Plagiochila terebrans* Lindenb. ex Nees & Mont.** Plants in dark green tufts, shoots up to 3-5(-10) cm long and 2-5(-7) mm wide, irregularly pinnate-bipinnate. Leaves distant to contiguous, sometimes slightly imbricate, 0.7-1.5 x 1.5-3.2 mm, slightly falcate, ventral appendix lacking, ventral margin convex, slightly decurrent at stem, in distal part with 4-10 unequal and broadly triangular teeth, dorsal margin concave, with 0-3 small teeth. Cells with distinct non-nodulose trigones, 15-20 x 22-35  $\mu$ m. Dioicous. Perianth ovate or oblong, 1.2-1.8(-2.4) x 1.6 x 2.4 mm, dorsal keel with wing, apex with long and fimbriate cilia on each side of mouth. **Habitat:** Epiphyte in montane rainforest, *Hagenia-Hypericum* forest, ericaceous shrub and *Dendrosenecio-Lobelia stuhlmannii* paramo, 2000-3900 m. **Distribution in Rwanda:** **Volcano NP:** Karisimbi, in the saddle between Mt. Bisoke and Mt. Karisimbi, on the E-slopes along trail to summit, *Erica* forest SW of Susa river. **Nyungwe NP:** Rwasekoko, Karamba, Kamiranzovu, Uwinka, Gisakura. **Distribution in Africa:** Ivory Coast, Annobón, São Tomé, Bioko, Cameroon, Rio Muni, DR Congo, Burundi, Ethiopia, Uganda, Kenya, Tanzania, Angola, Malawi. Also Comoros, Madagascar, Mauritius, Réunion.





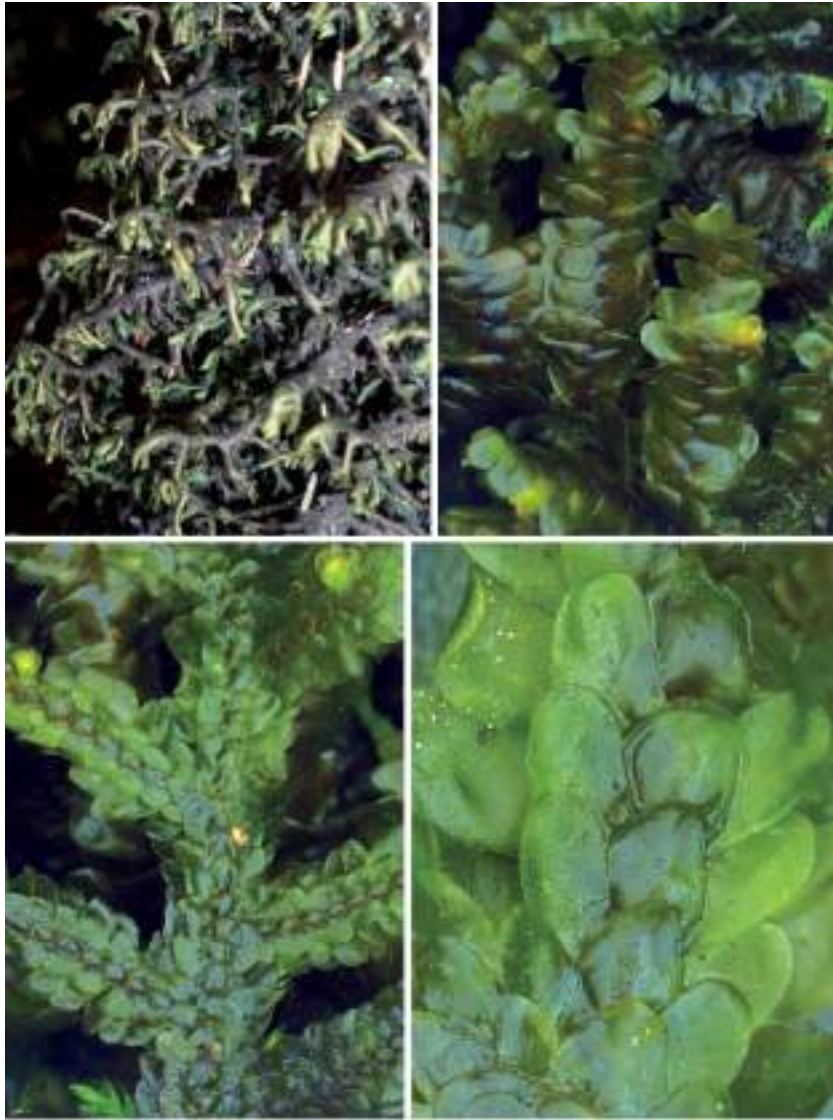
**Fig. 322. *Plicanthus giganteus*** (Steph.) R.M.Schust.

Synonyms: *Chandonanthus hirtellus* ssp. *giganteus* (Steph.) Vanden Berghen; *C. giganteus* Steph. Plants epiphytic or rupicolous, large, robust, yellowish-green to brown. Stems suberect to erect, up to 10-12 cm long, with paraphyllia. Leaves imbricate, transversely inserted, asymmetrically 3-lobed, to 3 mm long, margins long-ciliate near base, with 15-20 cilia on each margin, cilia about 180  $\mu$ m long. Cells with large, bulging trigones, 15-25  $\mu$ m in diameter towards apex, basal leaf cells elongate, 30-40 x 15-20  $\mu$ m. Underleaves as large as leaves, deeply 2-lobed, margin long-ciliate. **Habitat:** *Hagenia-Hypericum* forest (with mossballs on branches) and *Erica* forest, 3000 - 3500 m. **Distribution in Rwanda:** **Volcano NP:** Sabinyo, Karisimbi, in the saddle between Mt. Bisoke and Mt. Karisimbi, Karisimbi, SW of Susa river. **Distribution in Africa:** DR Congo, Ethiopia, Uganda, Kenya, Tanzania.



**Figs 323 and 324 (next page). *Plicanthus hirtellus* (F.Weber) R.M.Schust.**  
 Synonym: *Chandonanthus hirtellus* (F.Weber) Mitt. Plants epiphytic or rupicolous, small, brownish. Stems suberect to erect, about 2-4 cm long, paraphyllia absent. Leaves laxly imbricate, transversely inserted, asymmetrically 3-lobed almost to base, to 3 mm long, margins long-ciliate, up to 5-7 ciliae on each margin, cilia about 150  $\mu$ m long. Cells with large, bulging trigones, 18  $\mu$ m in diameter towards apex, mid leaf cells 15-20 x 10-15  $\mu$ m. Underleaves smaller than leaves, deeply 2-lobed, margin long-ciliate. **Habitat:** montane forest, rocky slopes in heath forest, 2000-2500 m, *Carapa grandiflora*-*Syzygium* swamp forest. **Distribution in Rwanda:** Nyungwe NP: Rwasenkoko, Karamba, along abandoned road to Burundi, Kamiranzovu, Gisakura. **Distribution in Africa:** Sierra Leone, São Tomé, Cameroon, DR Congo, Ethiopia, Uganda, Kenya, Tanzania, Zimbabwe, Malawi, South Africa. Also Comoros, Madagascar, Mauritius, Réunion, Seychelles.



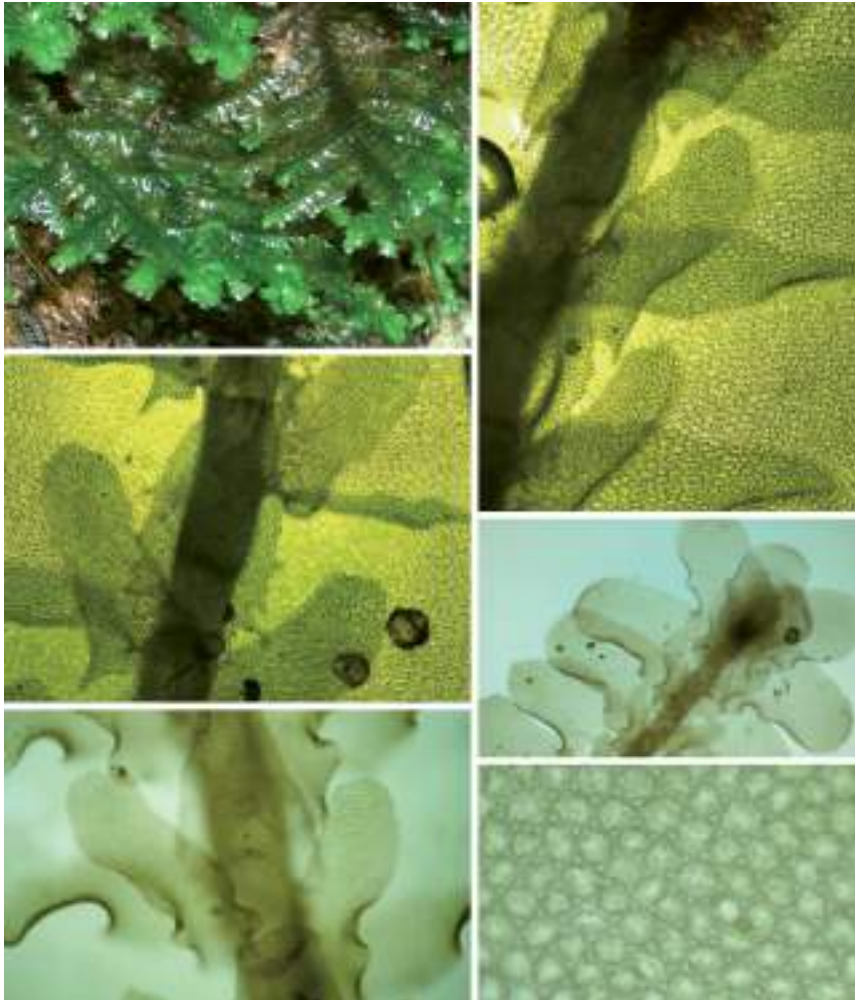


**Fig. 325. *Porella abyssinica* (Nees) Trev.**

Plants robust, olive-green to brown, prostrate or pendent, 3.6-4 mm wide. Stems pinnate to bipinnate, 5-6 cm long. Lobes convex, ovate to oblong, dorsally decurrent on stem, 1-1.4 x 1.8-2.5 mm, entire, rounded or truncate at apex, margins entire. Lobules oblong, wider than stem, 0.6-0.75 x 0.7-1.2 mm, auriculate and crispate to lacinate at base, apex entire. Cells with trigones, 20-25(-28) x 24-30(-35)  $\mu$ m. Underleaves 2-2.5 x the width of the stem large, longer than wide, undivided, 0.8-1.2 x 1-1.4 mm. Dioicous.

Perianths bluntly 3-keeled, mouth with large unequal teeth, 1.8-2 x 2.8-3 mm. **Habitat:** Epiphyte in montane forest, 2300 m. **Distribution in Rwanda: Gishwati Forest:** Gikungu.

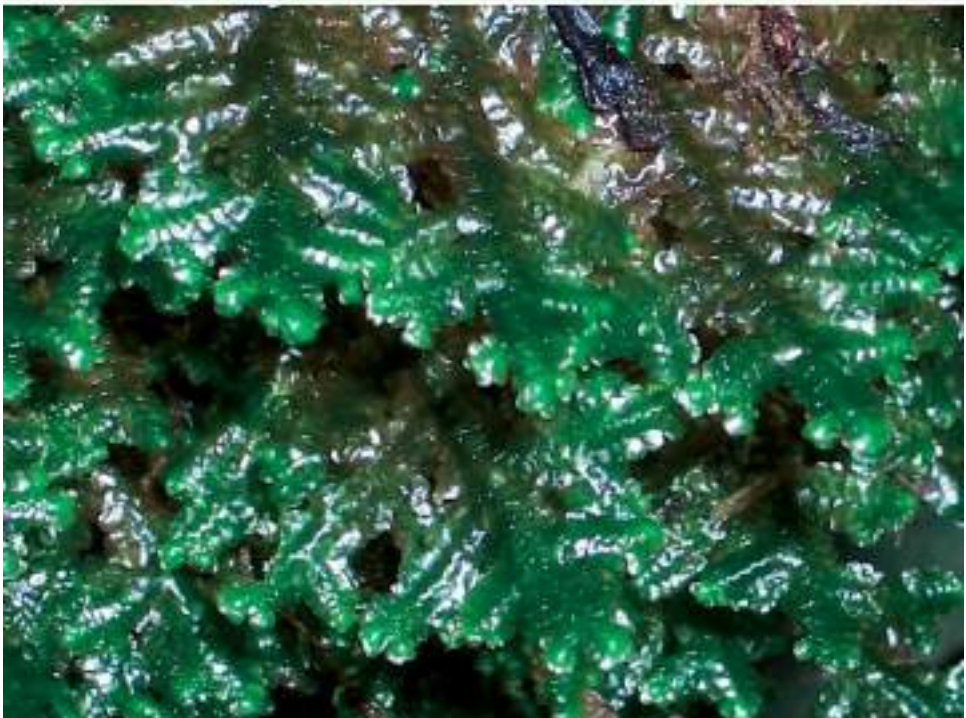
**Distribution in Africa:** DR Congo, Ethiopia, Kenya, Tanzania.



**Figs 326 and 327 (next page).** *Porella subdentata* (Mitt.) Steph.

Plants robust, olive-green to brown, prostrate or pendent, 3-3.6 mm wide. Stems bipinnate, 3-8 cm long. Lobes convex, subtriangular to oblong, dorsally and ventrally decurrent on stem, 1-1.6 x 2-2.6 mm, entire, rounded or truncate at apex, margins entire.

Lobules oblong, wider than stem, 0.6-0.75 x 0.7-1.2 mm, auriculate and crispate to lacinate at base, apex irregularly dentate. Cells with trigones, 20-25(-28) x 24-30(-35)  $\mu$ m. Underleaves 1-1.6 x the width of the stem, large, longer than wide, undivided, 0.8-1.2 x 1-1.4 mm, margin irregularly dentate. Dioicous. Perianths bluntly 3-keeled, mouth with large unequal teeth, 1.8-2 x 2.8-3 mm. **Habitat:** A variable species growing in rain forests or gallery forests preferably as epiphyte or on rocks, 1400–1700 m. **Distribution in Rwanda:** Volcano NP: Iuhanga. **Akagera:** Akagera near Kagitumba. **Distribution in Africa:** Guinea, Ivory Coast, Ghana, Togo, Nigeria, Príncipe, São Tomé, Cameroon, Gabon, Central African Republic, Ethiopia, Uganda, Kenya, Tanzania, Angola, Malawi, Zimbabwe.







**Figs 328 and 329 (next page). *Prionolejeunea grata* (Gottsche) Schiffn.**

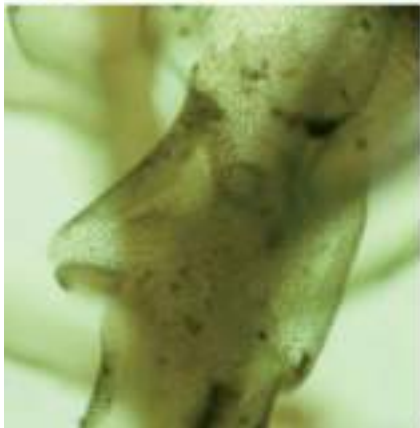
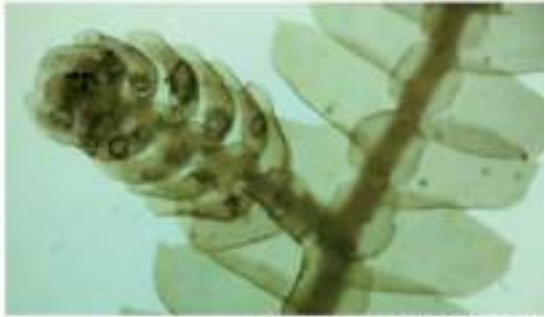
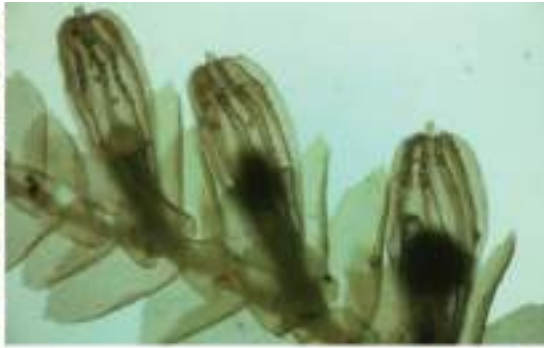
Synonym: *Prionolejeunea serrula* (Mitt.) Steph. Plants epiphytic to epiphyllous, pale-green to yellowish-green, 0.6-0.8 mm wide. Leaves alternate, 0.3-0.35 x 0.22-0.27 mm, dorsal base straight proximally, then arched across the stem, apex acute to acuminate, margins crenulate-denticulate with conically projecting cells, thickened by a papilla at apex. Lobules about 1/3 of lobe length, ovate-inflated, with a 1-celled tooth, hyaline papilla proximal, keel strongly arched. Cells with trigones and intermediate thickenings, 14-22 x 17-26  $\mu$ m. Underleaves small, 1.5-2 x stem width, deeply bifid with a broad sinus. Autoicous. Perianths flattened-pyriform, somewhat inflated ventrally, with 2 broad lateral keels, usually expanded above into short auricles, 0.6-0.8 x 0.4-0.5 mm. **Habitat:** Epiphytic or epiphyllous in montane forest, 1900-2000 m. **Distribution in Rwanda:** **Nyungwe NP:** Kamiranzovu, Gisakura. **Distribution in Africa:** Ivory Coast, Ghana, Nigeria, Annobon, Príncipe, São Tomé, Cameroon, Gabon, Rio Muni, DR Congo, tTanzania, Malawi, Zimbabwe. Also Comoros, Madagascar, Mauritius, Seychelles.

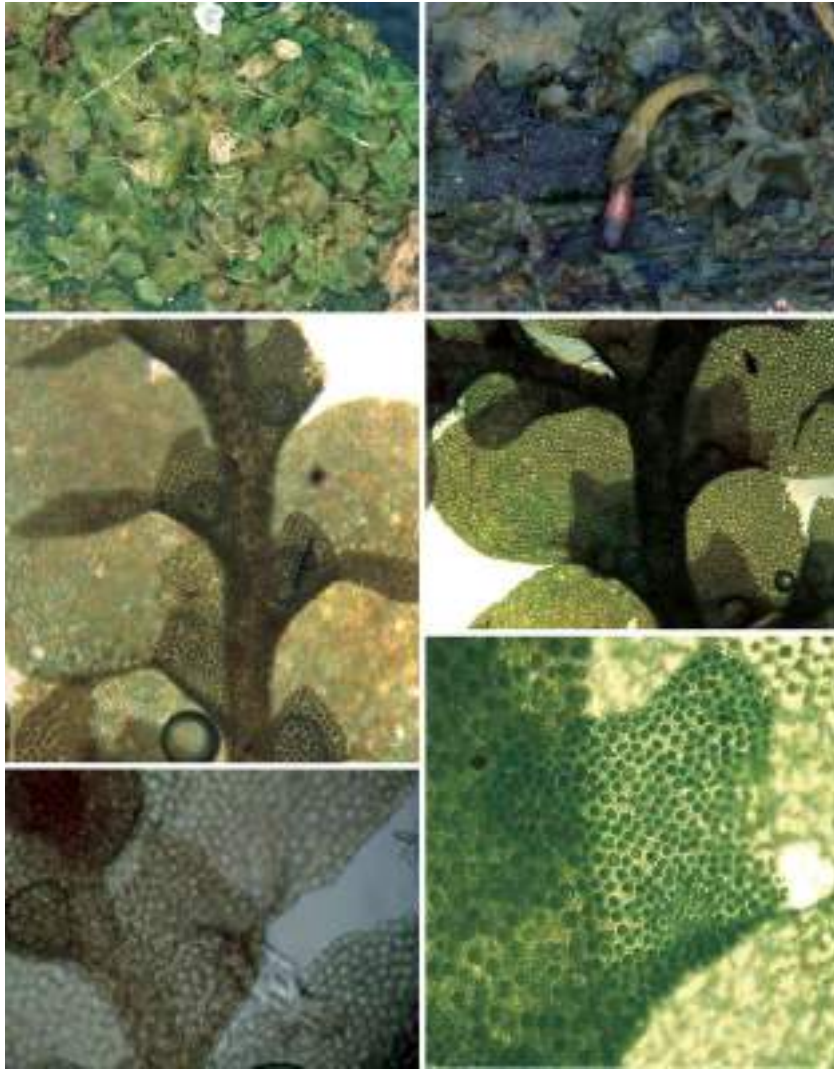




**Figs 330 and 331 (next page). *Ptychanthus africanus* Steph.**

Synonym: *Ptychanthus striatus* auct. non (Lehm. & Lindenb.) Nees. Plants dull green to brownish-green, robust, usually pendent or spreading-erect and resembling *Porella* or *Plagiochila*. Stems regularly pinnate or bipinnate, up to 18 cm long. Leaves alternate. Lobes usually coarsely dentate, acuminate, 1.7 x 1 mm. Lobules inflated, very small, only with one apical tooth. Cells with thickened walls, 20-24 x 25-30  $\mu$ m. Underleaves coarsely dentate, sometimes emarginate at apex, 2-4 x as wide as the stem. Autoicous. Perianths claviform-cylindric, inflated, striate with about 10 longitudinal keels, 1.2-1.7 x 0.6-0.8 mm. **Habitat:** Epiphytic or epiphyllous in montane forest, 1900-2100 m. **Distribution in Rwanda: Gishwati Forest:** Gishwati. **Nyungwe NP:** Cyamudongo Forest, Gisakura. **Distribution in Africa:** Guinea, Sierra Leone, Bioko, Cameroon, DR Congo, Burundi, Ethiopia, Uganda, Kenya, Tanzania, Malawi, Zambia, Zimbabwe, Mozambique, South Africa. Also Madagascar.





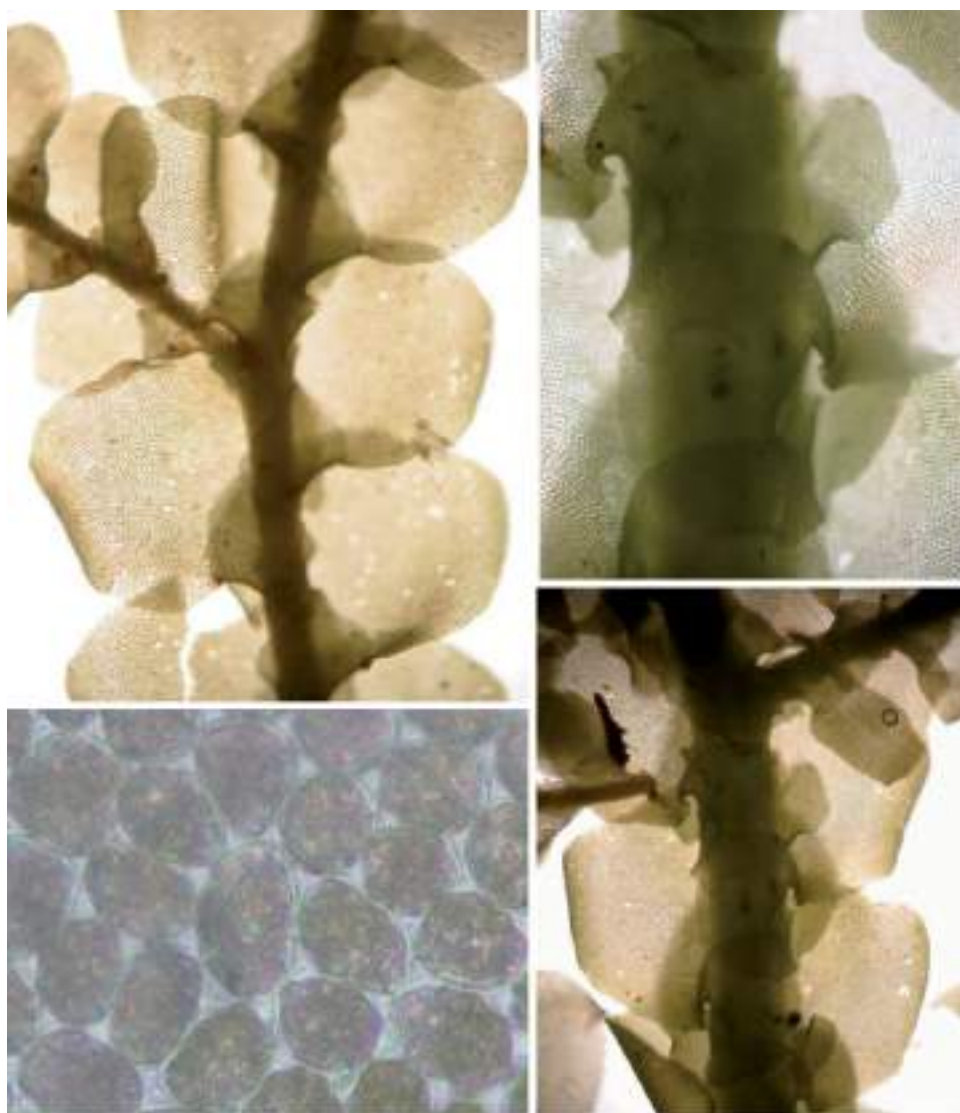
**Fig 332. *Radula ankefinensis* Gottsche ex Steph.**

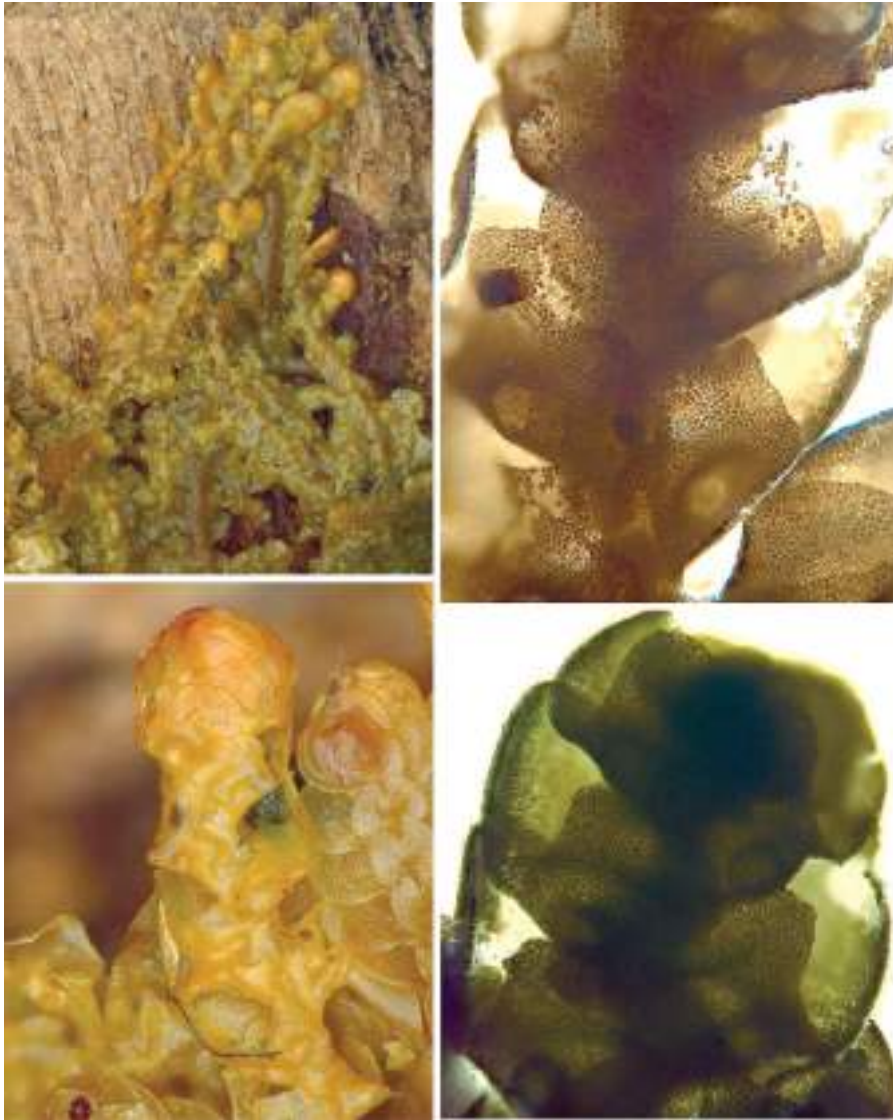
Synonym: *Radula holstiana* Steph. Plants small, light green, usually not more than 2 cm long, regularly pinnate, robust shoots 1.5-2.5 mm wide. Leaves approximate or slightly imbricate, ovate, base rounded and extending towards other side of stem but not crossing it, 0.9-1.2 x 0.6-0.9 mm, often caducous. Lobules small, occupying 0.35-0.45 the width of the shoot, keel nearly straight, usually slightly concave, forming an angle of 45-80° with the stem, slightly wider than long, apex rectangular or extended slightly into a blunt beak. Cells with thin walls and usually with minute trigones. Monoicous. Perianth narrowly conical, 0.7-0.8 x 2-3 mm, compressed in upper third. **Habitat:** Montane forest, 2000-2500 m. **Distribution in Rwanda: Nyungwe NP:** Rwasenkoko, Karamba. **Distribution in Africa:** Bioko, Cameroon, Burundi, Ethiopia, Uganda, Kenya, Tanzania, Malawi, Swaziland, South Africa. Also Madagascar, Mauritius, Réunion.



**Figs 333 and 334 (next page).** *Radula boryana* (Web.) Nees ex Mont.

Plants dark olive-green or brown, with glossy dark brown stems, up to 10 cm long, bipinnate, shoots 2.5-3 mm wide. Leaves approximate or distant, base of the lobe usually crossing the stem. Lobule relatively small, the base occupying 1/5 to 1/3 the width of the shoot, in robust forms extending across the stem into a large volute auricle, keel very short, straight or concave, forming an angle of 60-90° with the stem. Cells with nodular trigones. Dioicous. Perianth second, broadly oblong-conical, compressed, up to 2.5-2.8 mm long. **Habitat:** Montane *Carapa grandiflora*-*Syzygium* swamp forest, 2000 m. **Distribution in Rwanda:** Nyungwe NP: Karamba, Kamiranzovu, Gisakura. **Distribution in Africa:** Ghana, Togo, Annobón, São Tomé, Príncipe, Bioko, Cameroon, Rio Muni, DR Congo, Uganda, Kenya, Tanzania, Malawi, Zimbabwe, South Africa. Also Comoros, Madagascar, Mauritius, Réunion.

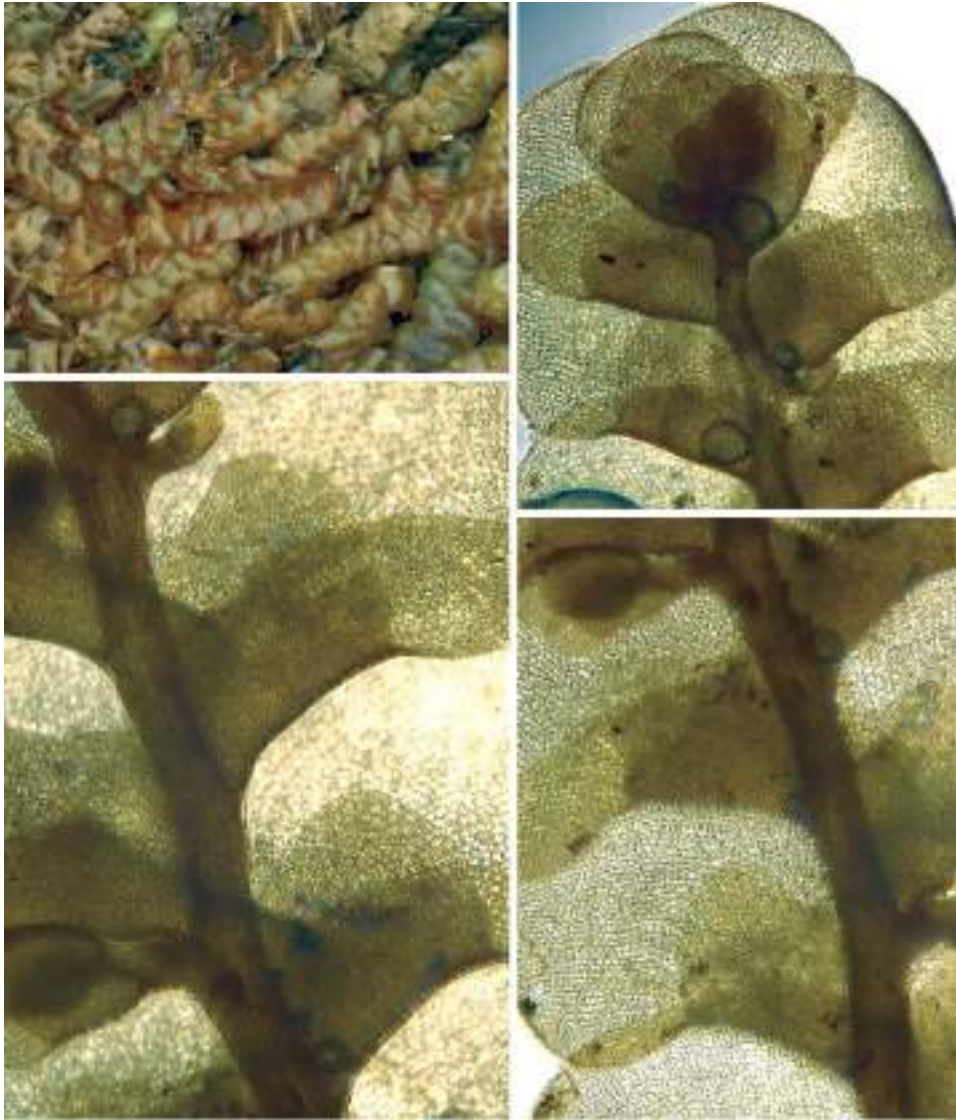




**Fig. 335. *Radula comorensis* Steph.**

Plants light green, sparsely branched, shoots 1.5-1.8 mm wide. Leaves ovate, distant approximate or moderately imbricate, not or only slightly crossing the stem, 0.9 x 0.64 mm, keel concave or straight, forming an angle of 45-60°. Lobule rather small, the base occupying 1/3 to 2/5 of the width of the shoot, slightly ampliate but rarely reaching the other side of the stem, apex rectangular to acute. Cells without trigones or minute trigones present. Dioicous. Perianth narrowly conical, up to 2.5-3 mm long. **Habitat:** Montane rainforest, 2300 m. **Distribution in Rwanda:** Nyungwe NP: Uwinka. **Distribution in Africa:** DR Congo, Socotra, Uganda, Malawi, Lesotho. Also Comoros, Madagascar, Mauritius, Réunion.

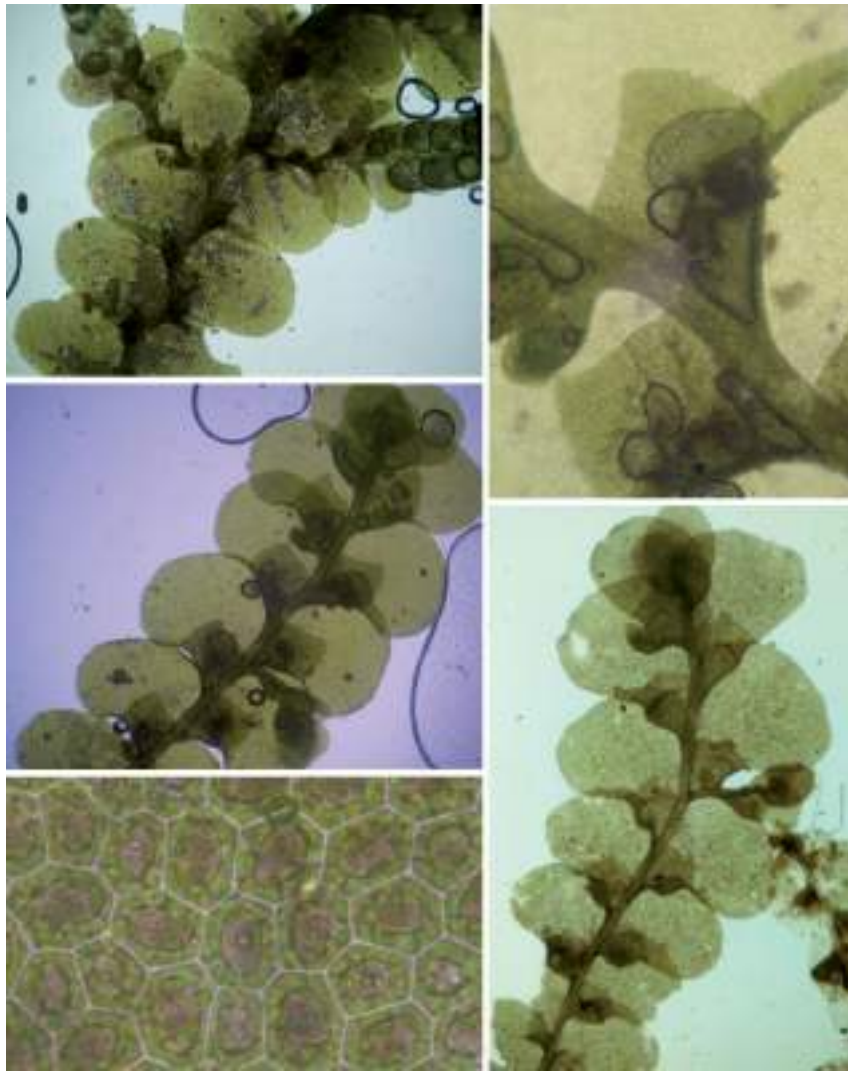




**Fig. 336. *Radula evelynae* Yamada**

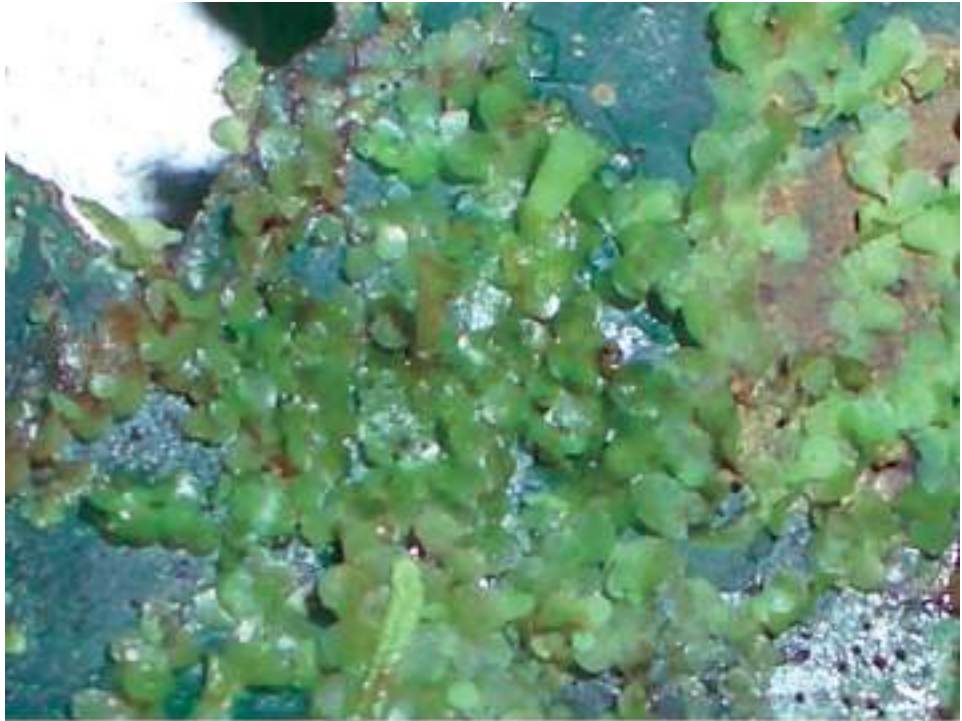
Plants brownish-green, irregularly pinnately branched, shoots 1.5-2 mm wide. Leaves complanate, approximate or moderately imbricate, 0.86-1.15 x 0.64-0.8 mm. Lobule a little longer than wide, with a long insertion, the base occupying 1/3 of the width, not or only slightly ampliate and not or only slightly crossing the midline of stem, keel nearly straight, forming an angle of 40-60°. Cells without trigones or minute trigones present. Dioicous.

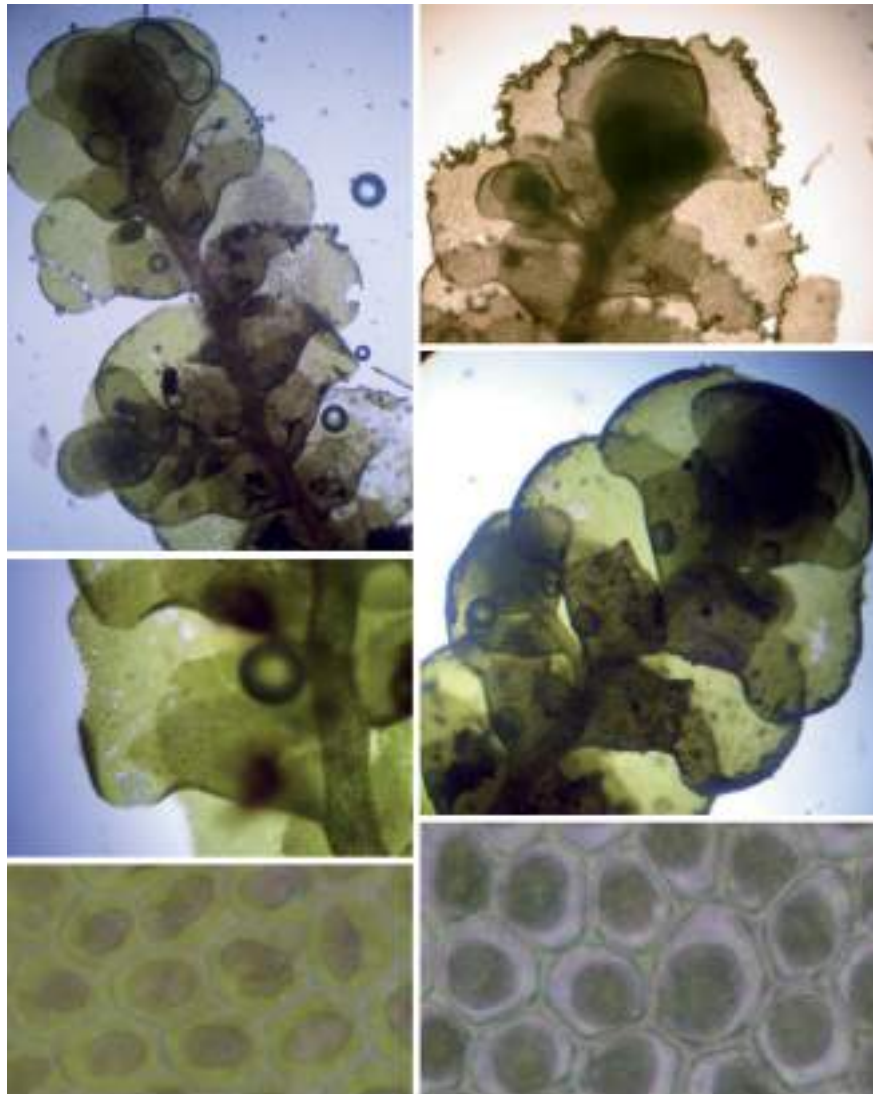
Perianth compressed, up to 3 mm long. **Habitat:** Epiphyte in montane rainforest, 2400 m. **Distribution in Rwanda:** Nyungwe NP: Uwinka. **Distribution in Africa:** DR Congo, Kenya, Tanzania. Also Réunion.



**Figs 337 and 338 (next page).** *Radula flaccida* Lindenb. & Gottsche

Plants green, regularly pinnate or bipinnate, closely appressed to the substrate, shoots 1.5-1.9 mm wide. Leaves flat, approximate or moderately imbricate, bearing reniform stipitate gemmae on the antical margin, the base crossing the stem. Lobule occupying 1/3 the width of the shoot, apex prolonged into a blunt liguliform beak, directed forwards parallel to the stem, keel nearly straight or concave, decurrent, forming an angle of 40-45° with the stem and a wide sinus with the lobe. Cells without trigones. Dioicous. Perianth erect, narrowly conical, up to 2.8 mm long. **Habitat:** Follicolous in montane forest, 2000-2500 m. **Distribution in Rwanda:** Nyungwe NP: Rwasenkoko, Karamba, Kamiranzovu, Uwinka. **Distribution in Africa:** Guinea, Sierra Leone, Ivory Coast, Ghana, Nigeria, São Tomé, Príncipe, Bioko, Cameroon, Rio Muni, DR Congo, Uganda, Kenya, Tanzania, Angola. Also Comoros.

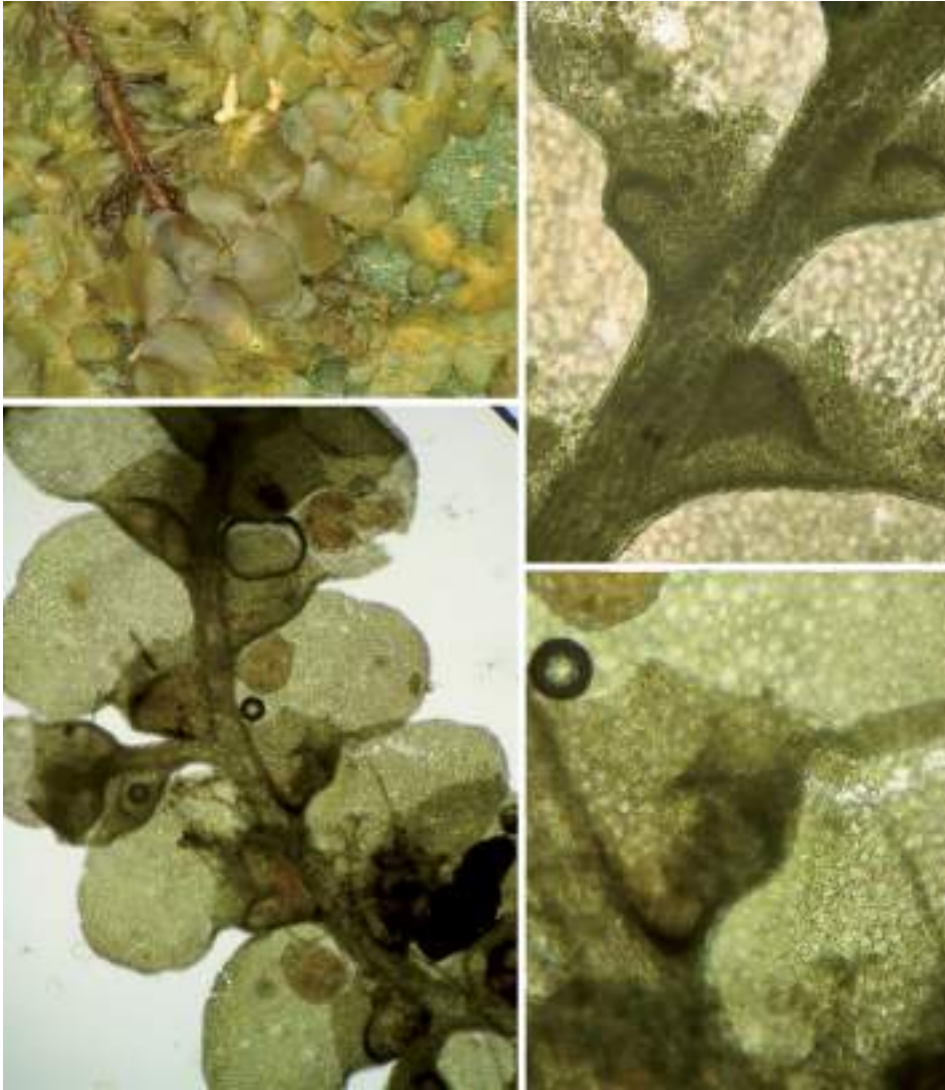




**Figs 339 and 340 (next page). *Radula quadrata* Gottsche**

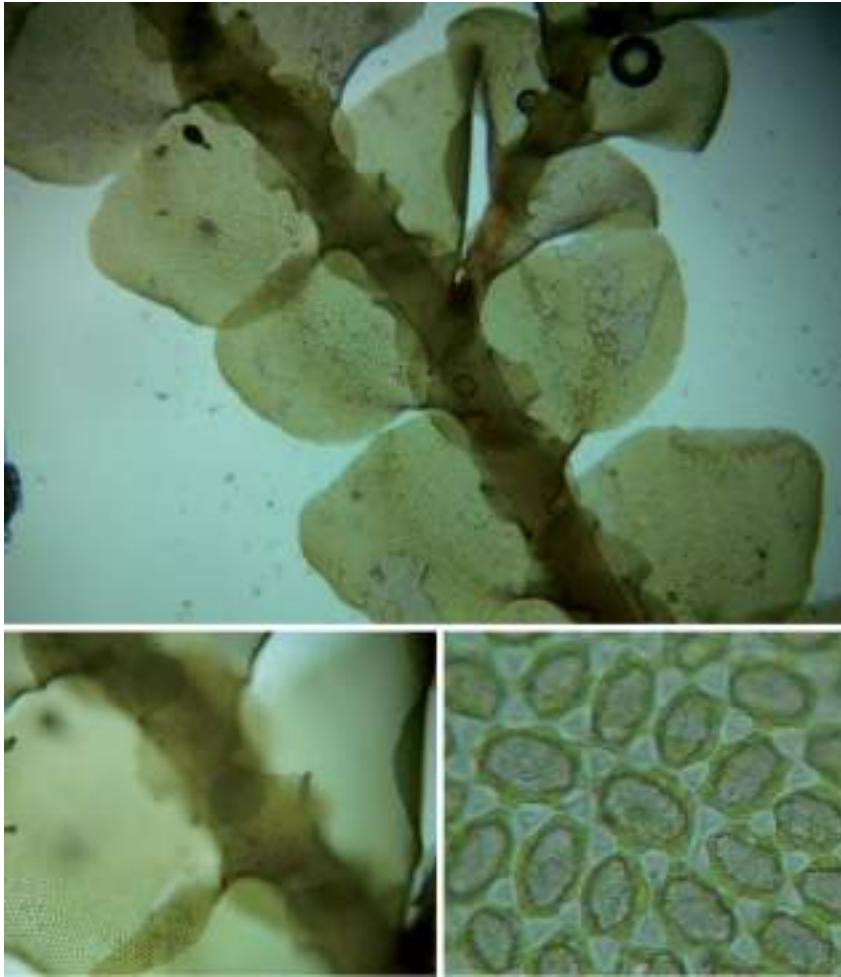
Synonym: *Radula recurvifolia* Steph. Plants green, irregularly pinnately branched, shoots 1.8-2.5 mm wide. Leaves convex, imbricate, 1-1.5 x 0.68-1.2 mm, always with gemmae on margin. Lobule a little longer than wide, with a long insertion, the base occupying more than 1/2 of the width of the shoot, the keel usually nearly straight, making an angle of 50-80° with the stem, the base extending far across the stem but not auriculate. Cells with small trigones, 18-20 µm in diameter. Dioicous. Perianth compressed, 1-2.7 x 1.5-3.5 mm, the mouth truncate. **Habitat:** Epiphyte in ericaceous heath with *Andropogon shirensis*, 2500 m. **Distribution in Rwanda: Nyungwe NP:** Rwasenkoko. **Distribution in Africa:** Bioko, Cameroon, DR Congo, Socotra, Eritrea, Ethiopia, Uganda, Kenya, Tanzania, Malawi, South Africa. Also Comoros, Madagascar, Mauritius, South America.



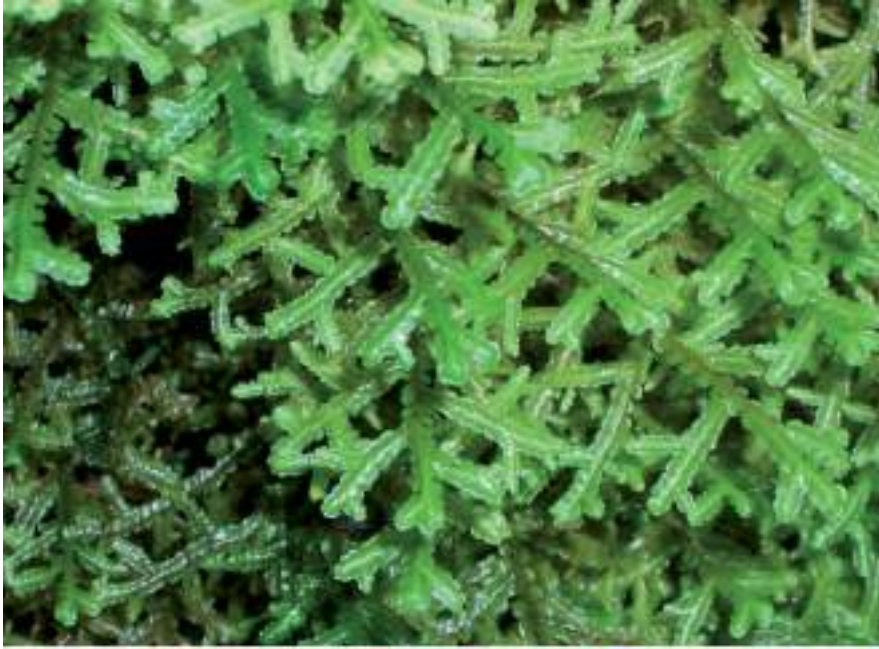


**Fig. 341. *Radula stenocalyx* Mont.**

Plants green, pinnately branched, shoots 1-1.8 mm wide. Leaves ovate, approximate, 1-1.5 x 0.68 -0.8 mm, bearing discoid gemmae. Lobule a little longer than wide, with a long insertion, the keel extending rather less than 1/2 the distance from insertion to leaf apex, very strongly convex, making an angle of 90° with the postical margin of the lobe, the base narrow. Cells without or with minute trigones, 15-25 µm in diameter. Dioicous. Perianth compressed, 0.5 x 2.5 mm, the mouth compressed, slightly and irregularly lobed. **Habitat:** Epiphyllous in montane forest, 1950-1970 m. **Distribution in Rwanda:** Nyungwe NP: Gisakura. **Distribution in Africa:** Guinea, Sierra Leone, Ghana, São Tomé, Bioko, Cameroon, Rio Muni, Gabon, DR Congo, Burundi, Uganda, Kenya, Tanzania, Malawi, South Africa. Also Comoros, Madagascar, Mauritius, Réunion, Seychelles.



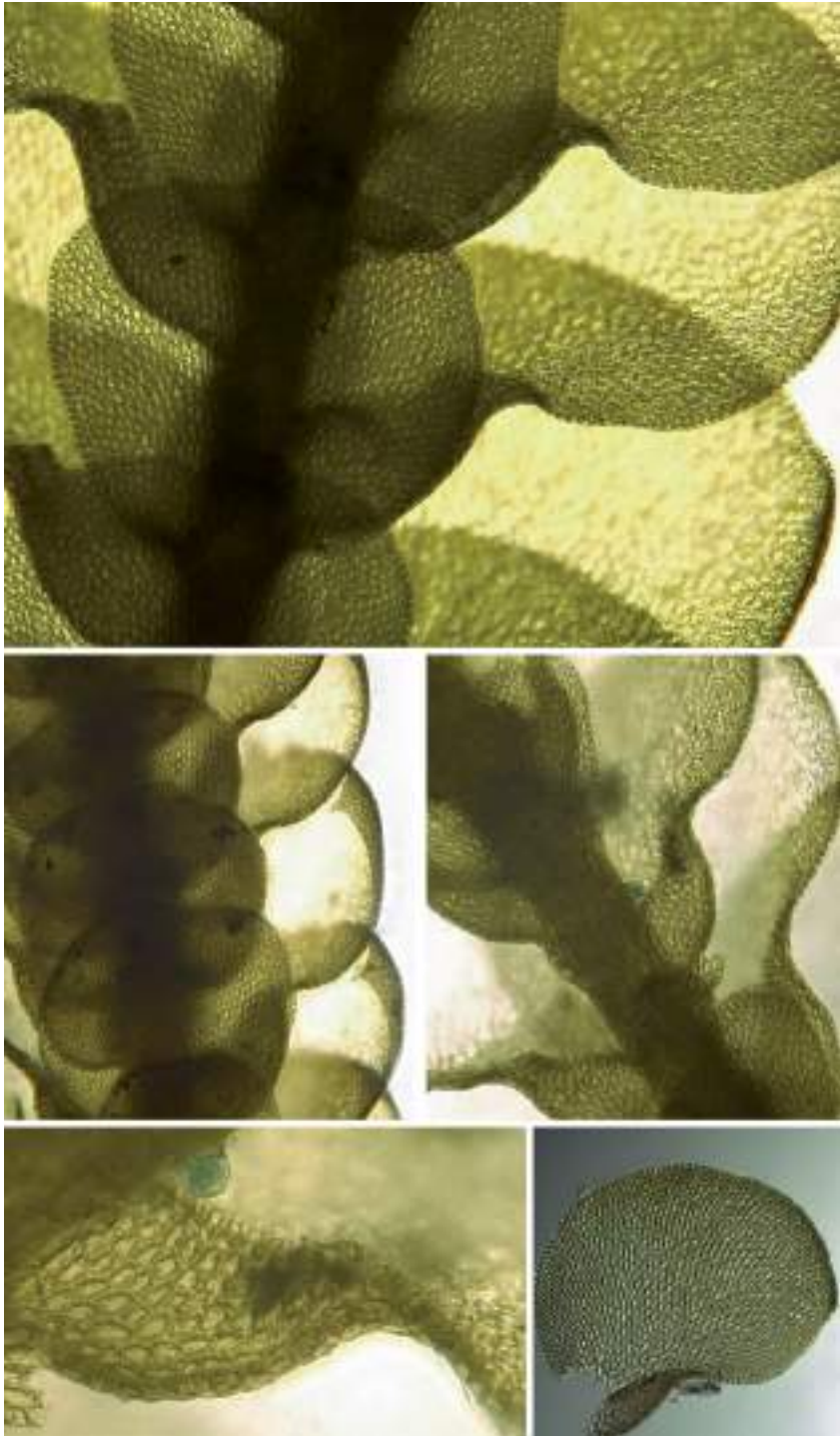
**Figs 342 and 343 (next page). *Radula voluta*** Tayl. ex Gottsche, Lindenb. & Nees  
 Synonyms: *Radula stipatiflora* Steph.; *R. allamanoi* Gola. Plants pale yellow brown or green, pinnately branched, up to 4-10 cm long. Leaves flat or slightly convex, sometimes caducuous, approximate or imbricate, 1-4.5 x 1.1-3.6 mm, the base crossing the stem, sometimes auriculate. Lobule a little wider than long, with a long insertion, the base occupying rather more than 1/2 of the width of a strong shoot, convex, strongly ampliate, apex rectangular, often exceeding the stem, keel nearly straight or slightly concave, forming an angle of 40-60°. Cells with thin trigones. Dioicous. Perianth conical or with oblong apex, up to 2.5-6 mm long. **Habitat:** Montane forest, *Hagenia-Hypericum* forest and *Dendrosenecio-Lobelia stuhlmannii* paramo, 2000 - 3900 m. **Distribution in Rwanda:** **Volcano NP:** Karisimbi, in the saddle between Mt. Bisoke and Mt. Karisimbi, Karisimbi, on E-slopes along trail to summit, Bisoke, crater crest, Sabinyo, Muhavura. **Gishwati Forest:** Gikungu, vallée de Sebeya. **Nyungwe NP:** Rwasekoko, Mt. Muzimu. **Distribution in Africa:** Bioko, DR Congo, Socotra, Ethiopia, Uganda, Kenya, Tanzania, Malawi, South Africa. Also Madagascar, Mauritius, Réunion.





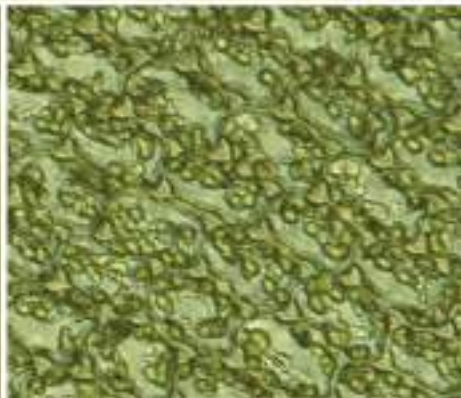
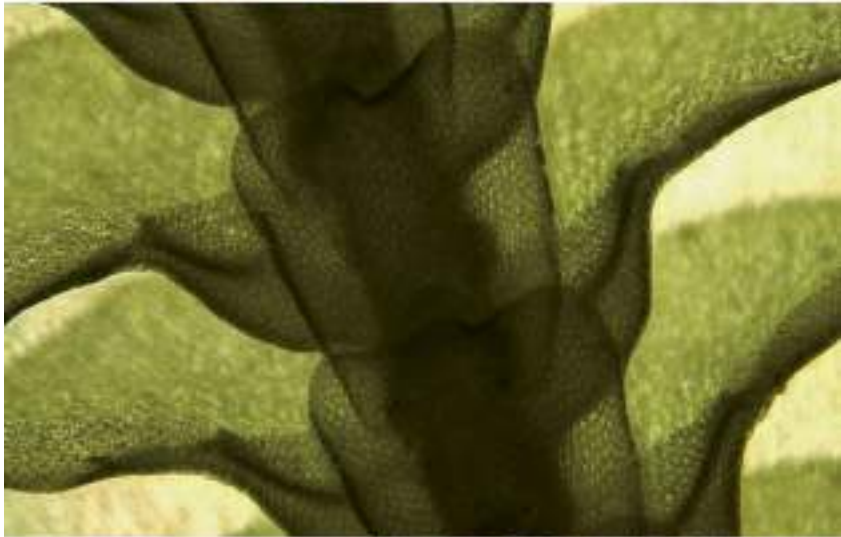


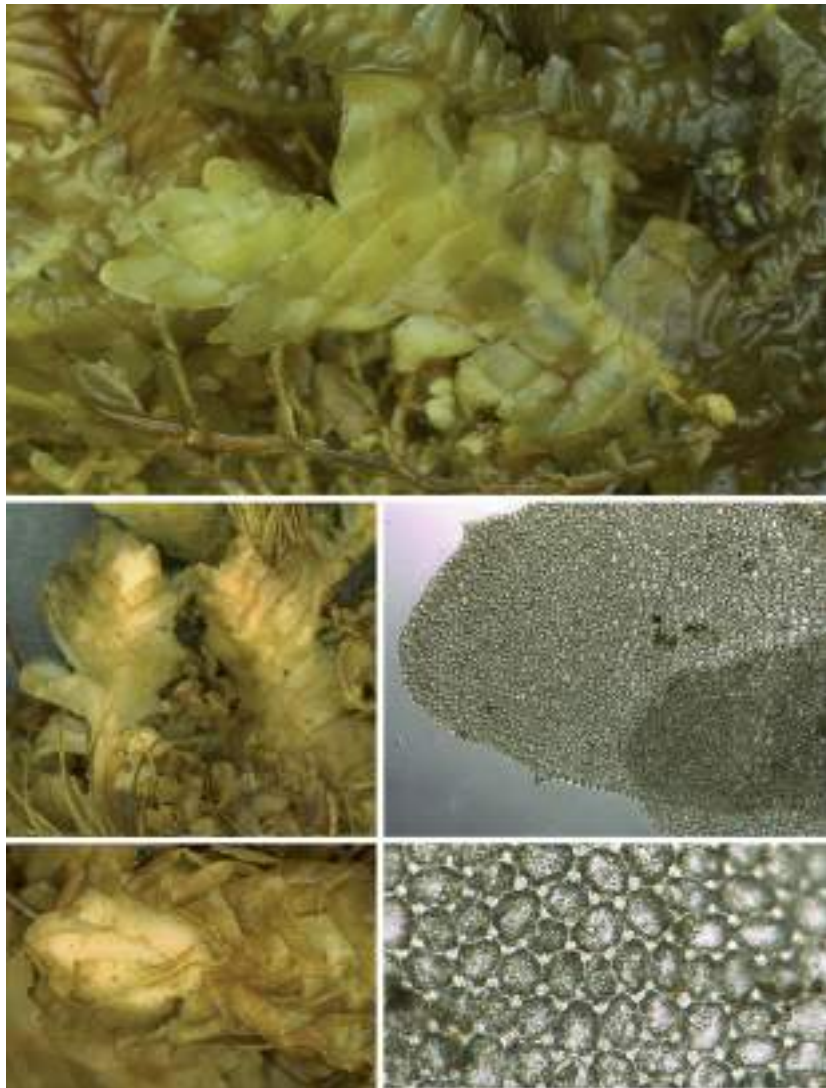
**Figs 344 and 345 (next page).** *Schiffneriolejeunea altimontana* Vanden Berghen  
 Plants epiphytic, glossy brown. Stems prostrate to ascending, 2-3 cm long. Leaves alternate, densely imbricate, convolute and wrapped around the stem when dry. Lobes with apex apiculate, 0.6-0.8 x 0.9-1.2 mm. Lobules inflated, free margin sinuate, 0.22-0.27 x 0.37-0.46 mm, with 1 apical tooth of 2-3 cells. Cells with trigones cordate, 15-20 x 21-28  $\mu$ m. Underleaves undivided, 0.6-0.75 x 0.6-0.82 mm, base not auriculate. Dioicous. Perianths smooth, with 3 distinct keels in the upper third, slightly exserted, 0.7-0.88 x 1.4-1.5 mm, rostrum indistinct or lacking. **Habitat:** Epiphytic in montane forest, 2200-2500 m. **Distribution in Rwanda:** Nyungwe NP: Uwinka, Mt. Muzimu, Pindura-Bweyeye. **Distribution in Africa:** DR Congo (Kahuzi-Biéga), Uganda, Tanzania.





**Figs 346 and 347 (next page).** *Schiffneriolejeunea pappeana* (Nees) Gradst. Plants epiphytic, brown to olive or blackish. Stems prostrate to ascending, 1.5-3.5(-6) cm long. Leaves alternate, densely imbricate, convolute and wrapped around the stem when dry. Lobes with apex obtuse, ovate-elliptical, 0.7-0.85 x 0.9-1.3(-1.8) mm. Lobules inflated, rectangular, 0.4-0.5 the length of the lobe, with 1 apical tooth. Cells with trigones cordate, 15-20 x 18-28  $\mu$ m. Underleaves undivided, 0.6-0.75 x 0.6-0.82 mm, base auriculate. Dioicous. Perianths smooth, without keels or only slightly keeled in upper part, deeply immersed, rostrum well developed. **Habitat:** Epiphyte in montane forest, 2000-2380 m. **Distribution in Rwanda:** Gishwati Forest: Gikungu. **Nyungwe NP:** 1 km E of Pindura, near small waterfall. **Distribution in Africa:** Guinea, Annobón, São Tomé, Bioko, Cameroon, Central African Republic, DR Congo, Ethiopia, Uganda, Kenya, Tanzania, Angola, Malawi, Zimbabwe, South Africa. Also Madagascar, Mauritius, Réunion.





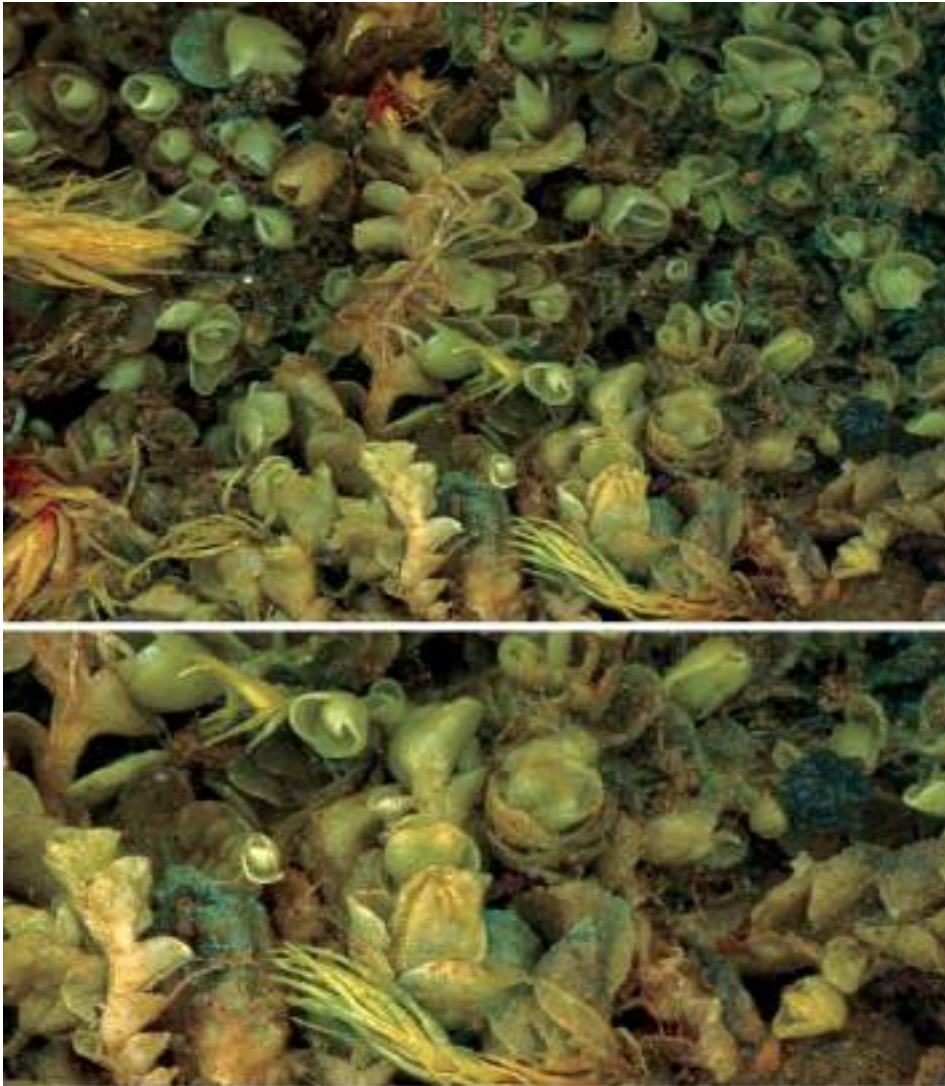
**Fig. 348. *Schistochila engleriana* Steph.**

Synonyms: *Gottschea engleriana* (Steph.) Grolle & Zijlstra; *Paraschistochila engleriana* (Steph.) Schust. Shoots 5-8 mm wide. Lower lobes of leaves 3.5 x 0.9-1.3 mm, (2.5-)3-4(-4.5) x as long as wide, ligulate with broadly rounded nearly entire apex to narrowly lanceolate with tapering acute coarsely serrate apex, dentition variable. Upper lobe with a straight suture extending for 1/2 the length of the lower lobe, convex, oblong to ovate-oblong, base not crossing stem, apex truncate with short apiculus to rounded without apiculus. Underleaves often absent, if present bifid, 0.3 x 0.2 mm. Cells 25-35  $\mu$ m wide, with nodular trigones. **Habitat:** Epiphytic or on dead wood in montane forest, 2000 m. **Distribution in Rwanda:** Nyungwe NP: Gisakura. **Distribution in Africa:** Tanzania, Malawi. Also Comoros.



**Figs 349 and 350 (next page). *Solenostoma borgenii*** (Gottsche ex Pears.) Steph. Synonym: *Jungermannia borgenii* Gottsche ex Pears. Plants green to brown. Rhizoids abundant on stem, brown or purple. Leaves nearly orbicular, 0.4-1 x 0.4-1 mm. Cells thin-walled, c. 23-35 x 20-27  $\mu\text{m}$ , trigones distinct. Dioicous. Perianths emergent, pyriform, abruptly narrowed to the mouth. **Habitat:** On damp peaty soil in ericaceous heath with *Andropogon shirensis*, *Hypericum-Dendrosenecio* subparamo, open *Dendrosenecio-Lobelia wollastoni* paramo, 2400-3900 m. **Distribution in Rwanda: Volcano NP:** Karisimbi, at E-slopes along trail to summit. **Nyungwe NP:** Rwasenkoko, waterfall c. 3 km E of Pindura. **Distribution in Africa:** São Tomé, Bioko, Cameroon, Congo-Brazzaville, DR Congo, Uganda, Kenya, Tanzania, Angola, Malawi, Zambia, Zimbabwe, Botswana, South Africa. Also Madagascar, Mauritius, Réunion.





**Fig. 351. *Solenostoma mildbraedii*** (Steph.) R.M.Schust.

Synonym: *Jungermannia mildbraedii* Steph. Plants green, yellow green, olive-brown or brownish-green. Shoots 0.5-3 cm long and 0.3-1.4 mm wide, prostrate to ascendant, rhizoids numerous, brownish to yellow-brown. Leaves ovate, rarely cordate to orbiculate, concave, decurrent only at dorsal margin. Cells isodiametric, (18-) 20-30  $\mu\text{m}$  in leaf center, trigones small or lacking. Paroicous. Perianths at maturity exceeding the bracts, ovate to clavate. **Habitat:** On damp peaty soil in ericaceous heath with *Andropogon shirensis*, *Hypericum-Dendrosenecio* subparamo, open *Dendrosenecio* paramo, 2400-3400 m.

**Distribution in Rwanda: Volcano NP:** Karisimbi, at E-slopes along trail to summit.

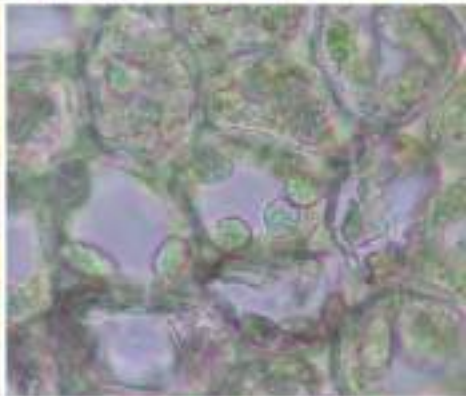
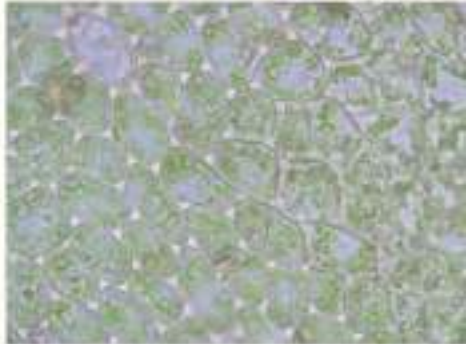
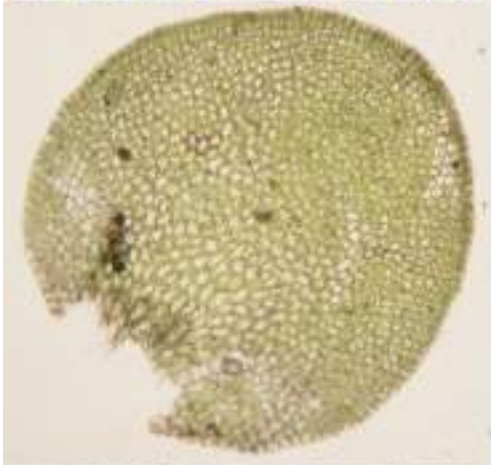
**Nyungwe NP:** Rwasekoko. **Distribution in Africa:** Uganda, Tanzania, South Africa.

**Note:** Difficult to distinguish from *S. borgenii* when sterile.





**Figs 352 and 353 (next page). *Solenostoma sphaerocarpum* (Hook.) Steph.**  
 Synonym: *Jungermannia sphaerocarpa* Hook. Plants yellowish-green to brown. Rhizoids abundant on stem, colourless. Leaves orbicular, 0.5-1.3 X 0.5-1.3 mm. Cells thin-walled, c. 25-35  $\mu$ m long, trigones distinct. Paroicous. Perianths emergent, broadly obovate, abruptly narrowed to the mouth. **Habitat:** Terrestrial in ericaceous heath with *Andropogon shirensis*, *Dendrosenecio-Lobelia stuhlmannii* paramo, open *Dendrosenecio-Lobelia wollastoni* paramo, *Alchemilla* mats interrupted by boulders in the alpine belt, 2400-4200 m. **Distribution in Rwanda: Volcano NP:** Bisoke, Sabinyo, Karisimbi, on E-slopes along trail to summit. **Nyungwe NP:** Rwasenkoko, waterfall c. 3 km E of Pindura. **Distribution in Africa:** Cameroon, DR Congo, Uganda, Tanzania, Malawi, Zimbabwe, Lesotho, South Africa. Also Madagascar, Réunion. Widespread in the Northern Hemisphere.





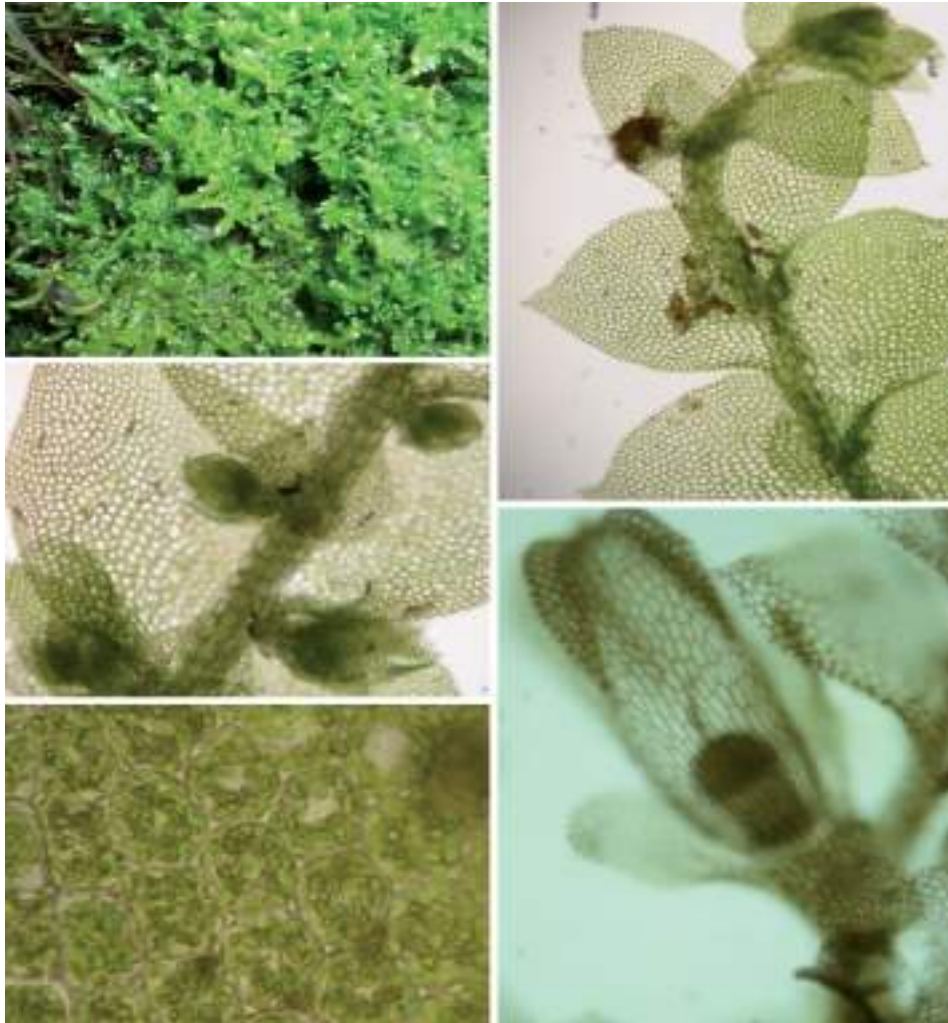
**Fig. 354. *Syzygiella concreta* (Gottsche) Spruce**

Plants rupicolous, small to large, 1-5 cm long, reddish-brown to purplish. Stems prostrate or erect. Leaves distant to moderately contiguous, obliquely to nearly lanceolately spreading, oblong-ligulate or oblong. 1 x 0.7 mm. Cells 26-33 x 32-40  $\mu\text{m}$ , with large trigones. **Habitat:** Rocky slopes in montane forest, 2000 m. **Distribution in Rwanda:** Nyungwe NP: Rugege. **Distribution in Africa:** DR Congo (Kahuzi-Biéga, 3200 m), Kenya (Mt. Kenya), Tanzania (Uluguru Mts.). Also Madagascar, Mexico, Cuba, Venezuela, Brazil, Tristan da Cunha. **Note:** The only collection from Rwanda made by J.-J. De Sloover is without precise locality.

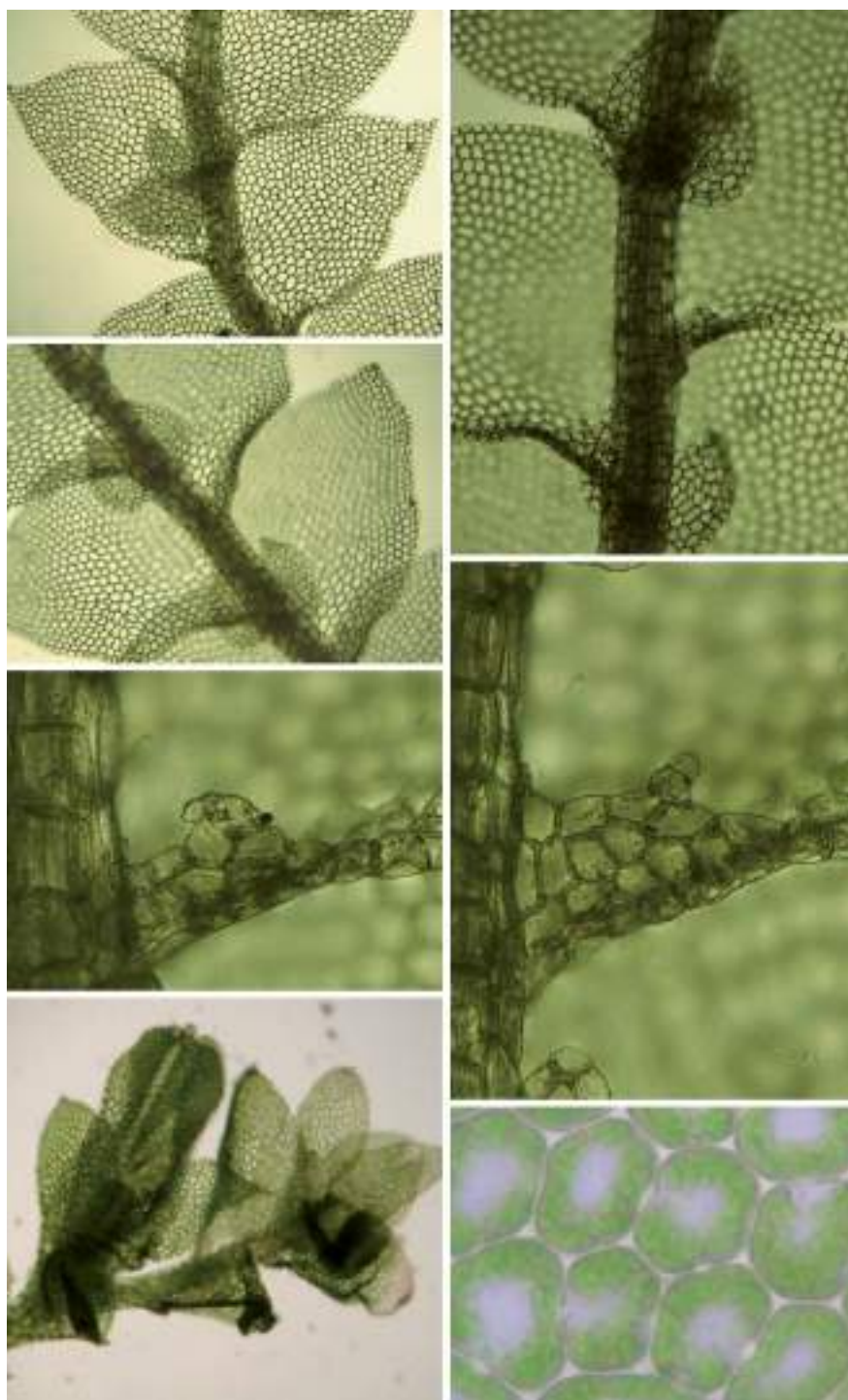


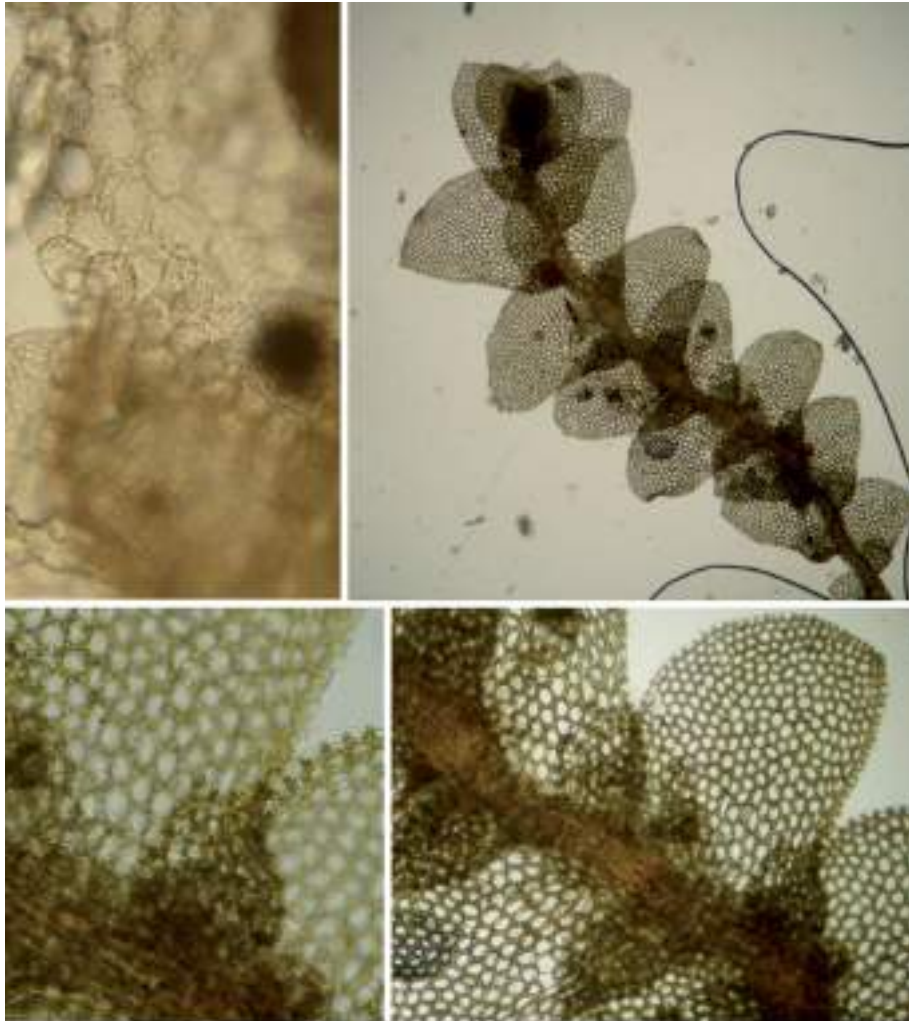
**Fig. 355. *Syzygiella geminifolia* (Mitt.) Steph.**

Synonyms: *Plagiochila* (?) *ruwenzorensis* Steph.; *Syzygiella ruwenzorensis* Steph. Plants rupicolous, small to large, 1-5 cm long, reddish-brown to purplish. Stems prostrate or erect. Leaves contiguous to imbricate, opposite to subopposite, obliquely spreading, triangular-ovate, 1-1.1 x 0.7-0.8 mm. Cells 26-33 x 32-40  $\mu\text{m}$ , with large trigones. **Habitat:** Rocky slopes in heath forest, 2000 m. **Distribution in Rwanda:** Nyungwe NP: Karamba, along abandoned road to Burundi. **Distribution in Africa:** São Tomé, Bioko, DR Congo, Ethiopia, Tanzania. Also Madagascar, Réunion.



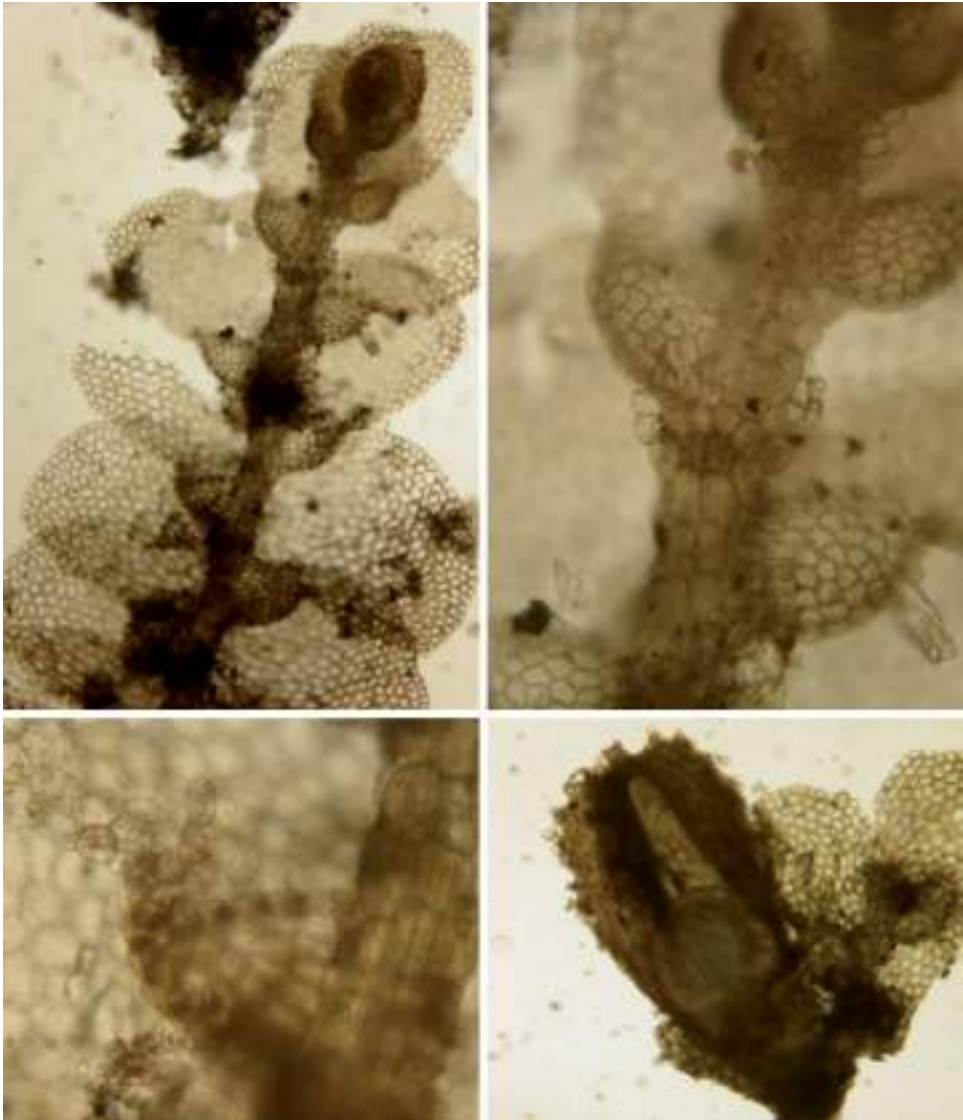
**Figs 356 and 357 (next page). *Taxilejeunea conformis* (Nees & Mont.) Steph.**  
 Plants flaccid, green, 0.5-1.8 mm wide. Leaves ovate, acuminate, 0.8 x 0.6 mm, apex acuminate, margin more or less crenulated with protuberant cells. Lobules very variable, 1/3-1/2 the length of the lobe, apical tooth one-celled, with hyaline papilla on proximal side. Cells pellucid, 18-25(-30) x 25-40  $\mu$ m in leaf centre, walls thin, trigones and intermediate thickenings small but distinct, cuticle often finely punctate. Underleaves broadly orbiculate, bifid to middle, sinus V-shaped, base rounded, 2-2.5 x the width of stem. Monoicous. Perianths clavate, exserted for 1/2 or more of its length, with 5 equal keels in the upper third to half, beak short, c. 40  $\mu$ m long. **Habitat:** Epiphytic or epiphyllous in montane forest, 2000-2300 m. **Distribution in Rwanda: Gishwati Forest:** Gikunku. **Nyungwe NP:** Kamiranzovu, Gisakura. **Distribution in Africa:** Sierra Leone, Ghana, Togo, Cameroon, Central African Republic, DR Congo, Burundi, Ethiopia, Uganda, Kenya, Tanzania, Angola, Malawi, South Africa. Also Comoros, Madagascar, Mauritius, Réunion.



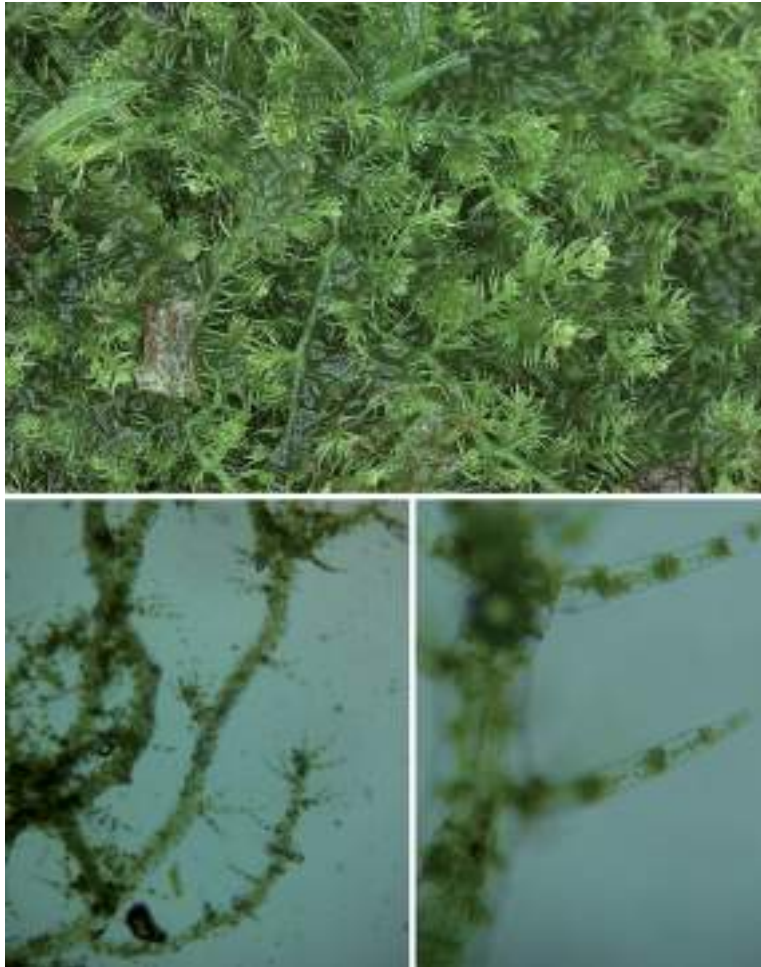


**Figs 358 and 359 (next page). *Taxilejeunea pulchriflora* Pears.**

Plants green, 0.6-1 mm wide. Leaves ovate, 0.4-0.5 x 0.3-0.45 mm, apex acuminate and deflexed, sometimes rounded. Lobules very variable, often reduced to a fold, if well developed inflated, with a strongly arched keel, 1/3-1/2 the length of the lobe, apical tooth one-celled, with hyaline papilla on proximal side. Cells pellucid, 18-25(-30) x 25-40  $\mu$ m in leaf centre, walls thin, trigones and intermediate thickenings small but distinct. Underleaves broadly orbiculate, bifid to middle, sinus V-shaped, base rounded, 1.5-2 x the width of stem. Monoicous. Perianths pyriform, exserted for 1/2 or more of its length, with 5 equal keels in the upper 1/3-1/2, the keels cristate. **Habitat:** Montane forest with *Dicranoloma billardieri*-mossballs in canopy, *Carapa grandiflora*-*Syzygium* swamp forest, 2000 m. **Distribution in Rwanda:** Nyungwe NP: Karamba, Kamiranzovu. **Distribution in Africa:** Guinea, Liberia, Sierra Leone, Ivory Coast, Ghana, Togo, Cameroon, Central African Republic, DR Congo, Kenya, Tanzania.

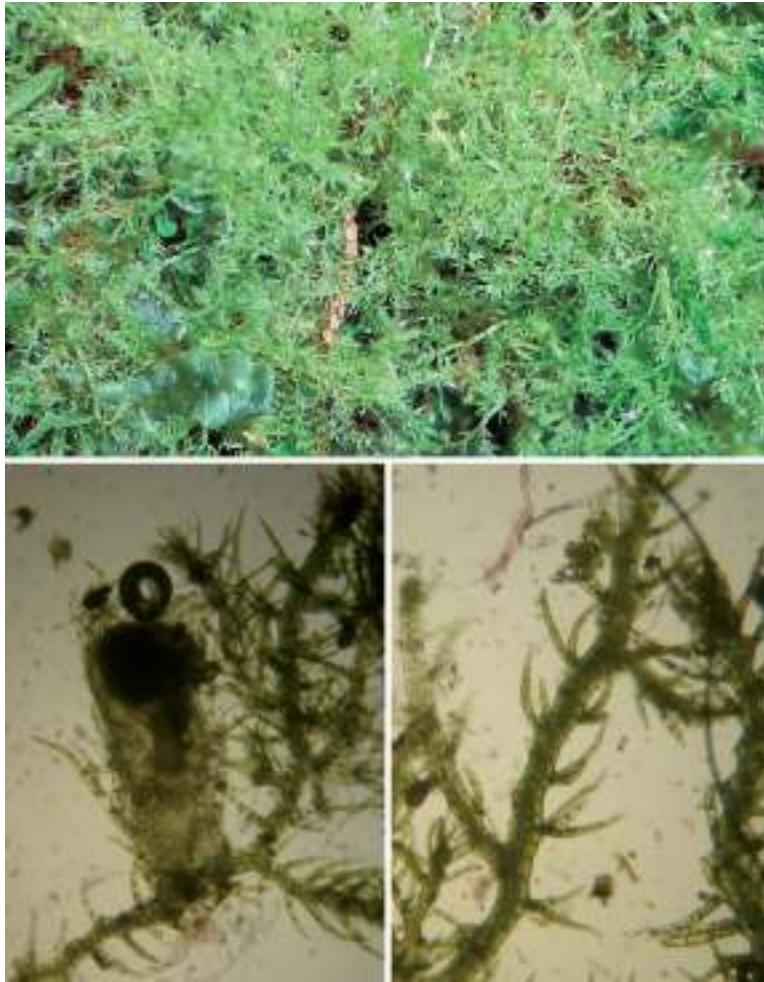




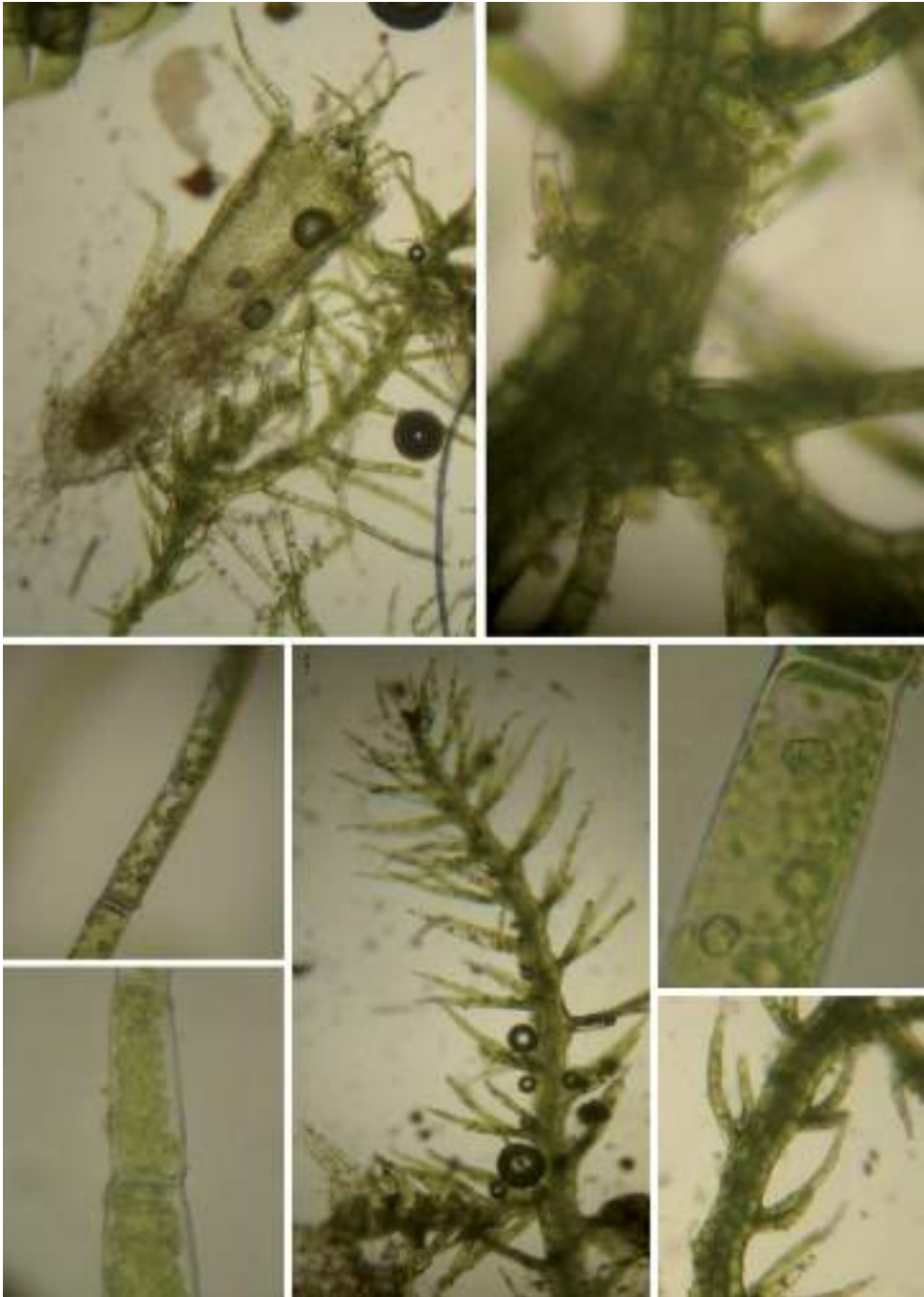


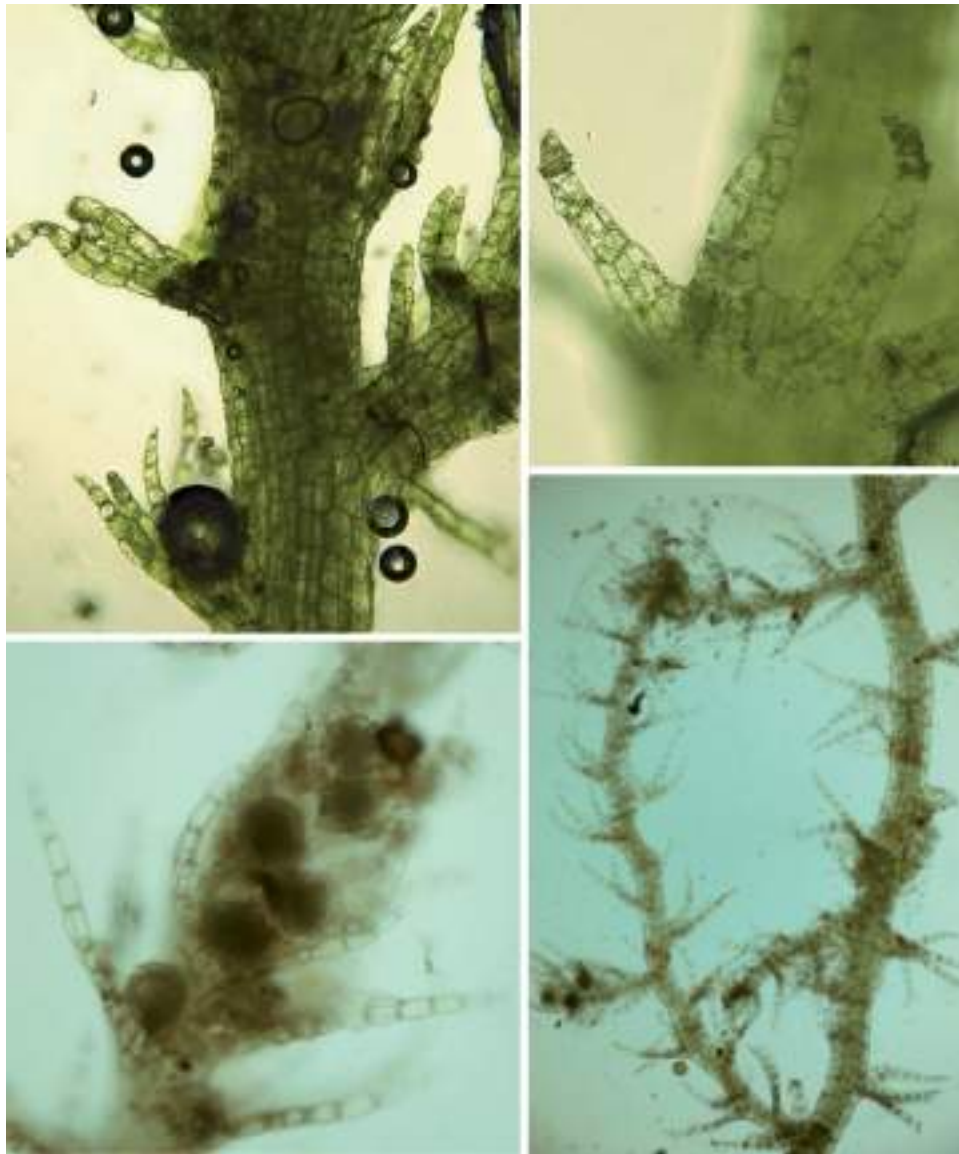
**Figs 360 and 361 (next page). *Telaranea coactilis*** (Spruce) J.J.Engel & G.L.S.Merr. Synonyms: *Arachniopsis coactilis* Spruce; *A. diacantha* auct. non (Mont.) Howe. Plants very small and fragile, on decaying wood or terrestrial, filamentous, with hair-like leaves, whitish-green. Stems irregularly branched, branches purely ventral-intercalary, flattened, very thin, with a hyalodermis. Rhizoids at base of underleaves, sparse. Leaves transverse, divided to the base into 1-2 uniseriate filaments, the filaments only 1 cell wide from base to apex and 8-10 cells long. Cells longer than wide, thin-walled, oil bodies not observed, eventually lacking. Underleaves lacking or very small, consisting of 2 small, adjacent cells, each with a slime papilla at apex. Autoicous. Perianths very long, cylindrical, mouth with long, bristle-like lacinia. **Habitat:** On soil, peat, rotten wood and on rocks, 2000-3200 m. **Distribution in Rwanda: Nyungwe NP:** Rwasekoko, Karamba, Kamiranzovu, Uwinka. **Distribution in Africa:** Sierra Leone, Ivory Coast, Ghana, Annobón, DR Congo, Tanzania, Zambia, Zimbabwe, Malawi, Mozambique, South Africa. Also Madagascar, Mascarenes, South America (Guyana, Brazil). **Note:** Probably all records of *Telaranea* (= *Arachniopsis*) *diacantha* from Africa and Madagascar belong to *T. coactilis*.





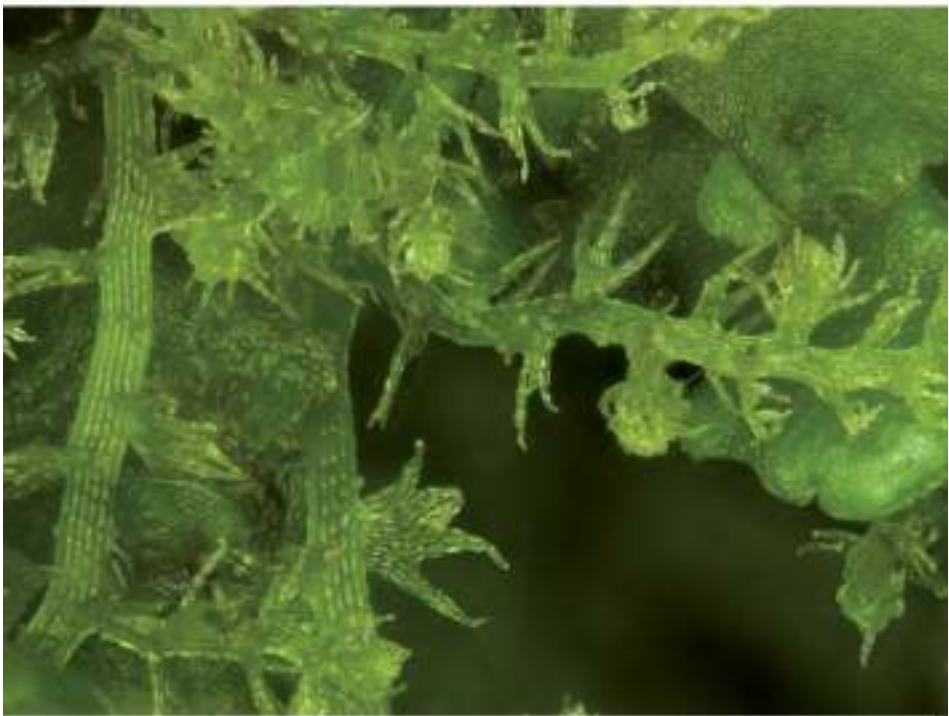
**Figs 362 and 363 (next page). *Telaranea redacta*** (Steph.) J.J.Engel & G.L.S.Merr. Synonyms: *Lepidozia redacta* Steph.; *Telaranea nematodes* auct. non (Gottsche ex Aust.) Howe. Plants very small and fragile, filamentous, with hair-like leaves, whitish-green. Stems “zig-zag”-like. Rhizoids at base of underleaves, sparse. Leaves transverse, to succubous, leaf lobes biseriate at base, uniseriate filaments distinctly constricted at septada. Underleaves very small, 2-3-lobed. Autoicous. Perianths subcylindrical, eplicate, mouth with few bristle-like lacinia, not constricted. **Habitat:** On rocky slopes in heath forest and on decaying wood or soil in montane forest, 2000-2400 m. **Distribution in Rwanda:** **Gishwati Forest:** Gikungu. **Nyungwe NP:** Karamba, Kamiranzovu, Uwinka. **Distribution in Africa:** Ghana, DR Congo, Burundi, Kenya, Tanzania, Zambia, South Africa. **Note:** Stephani (1914) described the species from the Nyungwe (= Rugege) forest as *Lepidozia redacta*. It was later listed as a synonym of *Telaranea nematodes* (Wigginton & Grolle, 1996) until Engel & Merrill (2004) raised it again to specific rank. *Telaranea nematodes* seems to be restricted to lowland- and mid-altitude rainforests in Western and Central Africa.





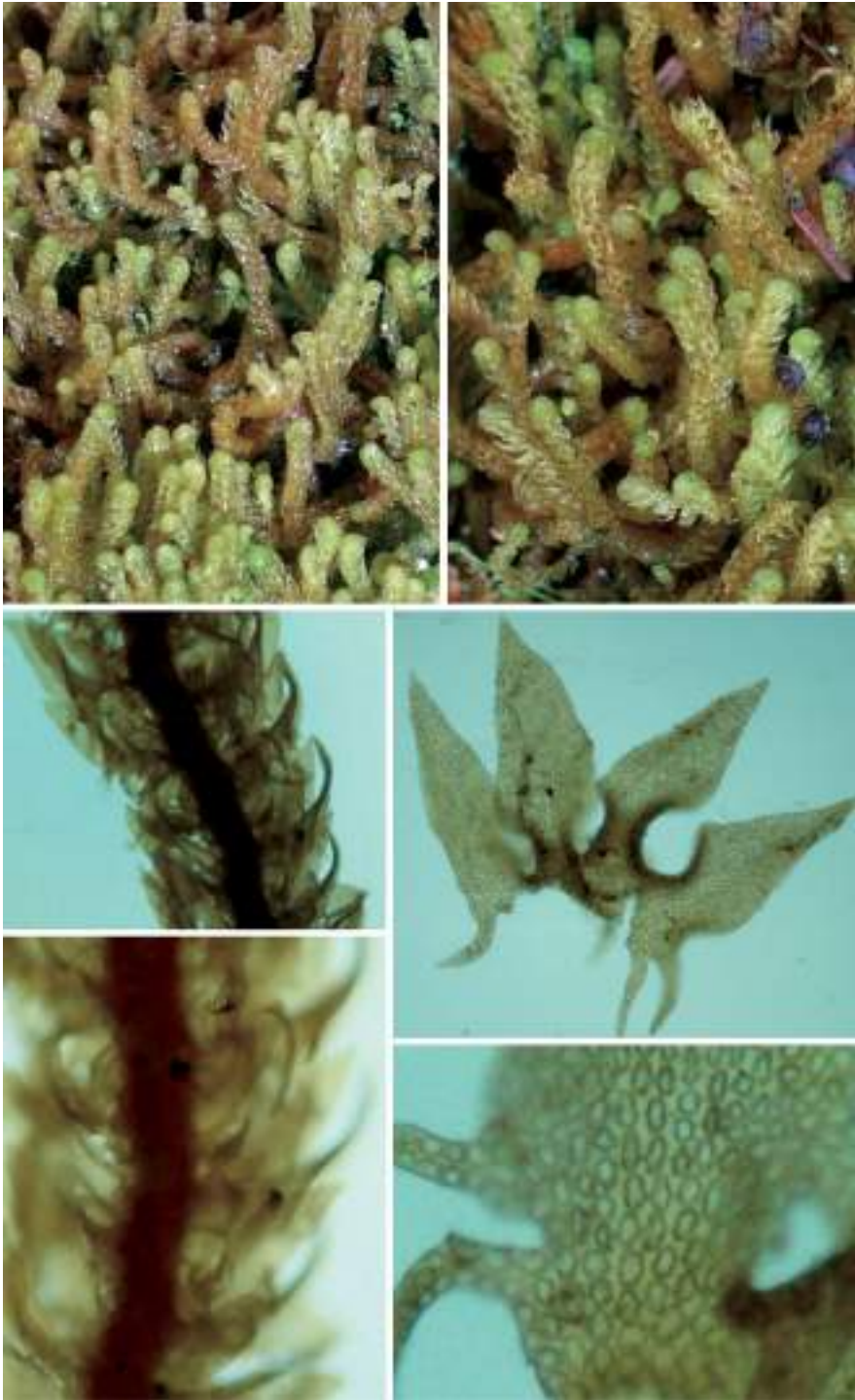
**Figs 364 and 365 (next page). *Telaranea trifida* (Steph.) R.M.Schust.**

Synonym: *Lepidozia trifida* Steph. Leaves (3) 4-lobed, the lobes 3-4 cells wide at base, the uniseriate row 4-5 cells long. Underleaves 4-lobed, the lobes with uniseriate row of 2 cylindrical cells. Autoicous. **Habitat:** The ecological amplitude seems to be rather narrow as it was collected only in swamps and peat bogs, 2330-2400 m. **Distribution in Rwanda:** **Nyungwe NP:** along road from Butare to Cyangugu at border of district, Rwasenkoko, 2330-2400 m. **Distribution in Africa:** Cameroon, DR Congo, Uganda.

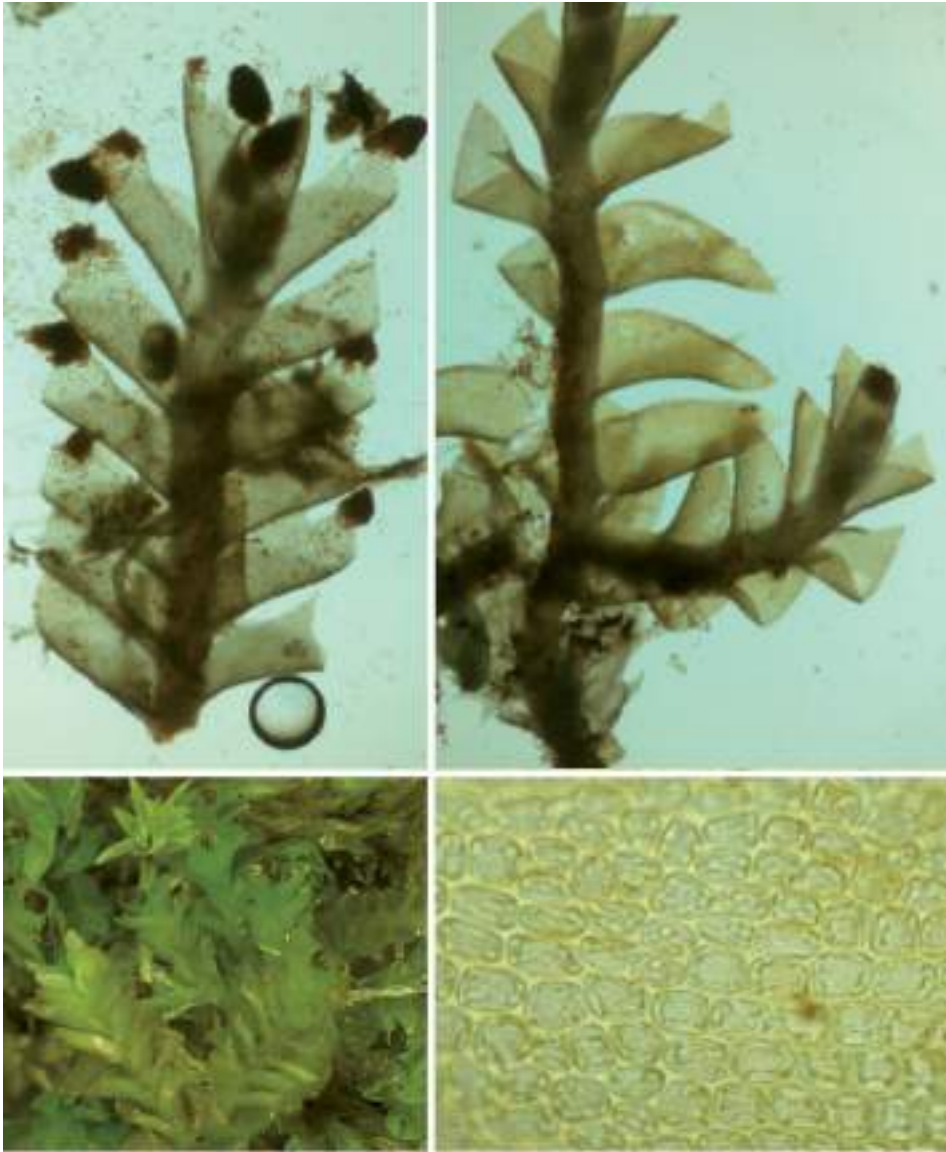




**Figs 366 and 367 (next page). *Tetralophozia cavallii* (Gola) Váňa**  
 Synonyms: *Chandonanthus cavallii* (Gola) S.W.Arnell; *C. quadrifidus* Steph. Plants epiphytic or rupicolous, small, reddish-brown, growing in tufts. Stems prostrate to suberect, simple, (0.6-)1-2 cm long. Leaves imbricate, transversely inserted, deeply symmetrically (3-)4-lobed, wider than long, c. 0.6 mm long, margin almost entire, ciliate near base, cilia up to 55  $\mu$ m long. Cells with indistinct trigones, nodulose, mid-leaf cells 18 x 19  $\mu$ m. Underleaves similar to leaves, but deeply 2-lobed, c. 0.55 mm long. **Habitat:** *Hagenia-Hypericum* forest, ericaceous forest and *Dendrosenecio-Lobelia* paramo, 3000-3900 m. **Distribution in Rwanda: Volcano NP:** Karisimbi, in the saddle between Mt. Bisoke and Mt. Karisimbi, Karisimbi, on E-slopes along trail to summit Bisoke, Sabinyo, Gahinga. **Distribution in Africa:** DR Congo, Ethiopia, Uganda, Kenya, Tanzania, Zimbabwe (?).





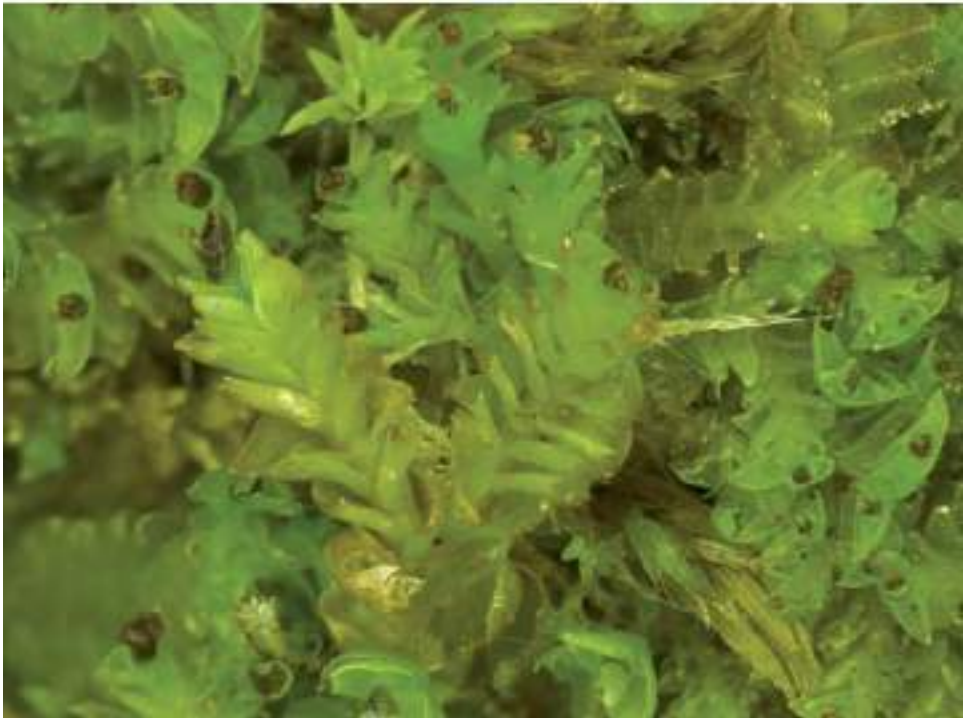
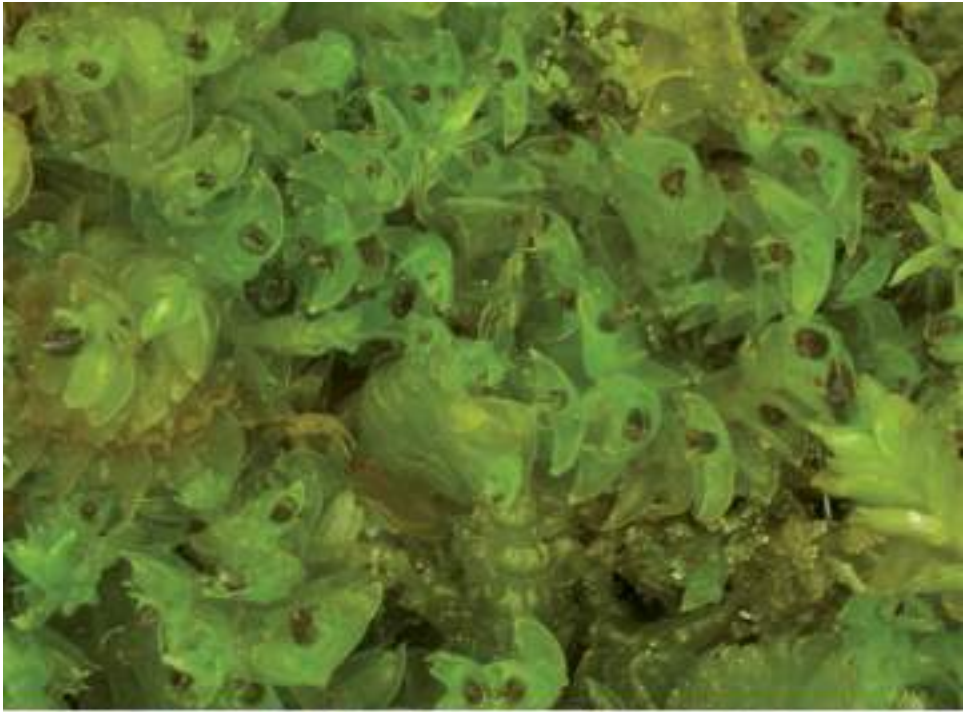


**Figs 368 and 369 (next page).** *Tritomaria exsecta* (Schmidel ex Schrad.) Schiffn. ex Loeske

Plants in loose or dense patches. Stems up to 1-2 cm long, flaccid, ascending to erect.

Leaves imbricate, suberect or spreading, canaliculate to concave, ovate, unequally (2-)3-lobed, 0.65-0.8(-1) mm long. Cells thick-walled, with minute trigones, 10-20 x 8-15  $\mu\text{m}$ . Gemmae in masses at apices of lobes of sterile plants. **Habitat:** *Hagenia-Hypericum* forest (with mossballs on branches), 3000-3300 m. **Distribution in Rwanda:** **Volcano**

**NP:** Karisimbi, in the saddle between Mt. Bisoke and Mt. Karisimbi. **Distribution in Africa:** Ethiopia, Uganda, Kenya, Tanzania, Malawi, South Africa.





**Figs 370 and 371 (next page).** *Tylimanthus laxus* (Lehm. & Lindenb.) Spruce  
 Synonym: *Tylimanthus ruwenzorensis* S.W.Arnell. Stems 2-3 (5) cm tall, arising from microphyllous stolons. Leaves obliquely ovate, ventrally secund, dorsally and ventrally decurrent (similar to *Plagiochila*), 2-4 x 0.8-2 mm, leaf apex variable, shallowly 2-lobed to retuse or rounded, leaf margin sometimes with rhizoids. Cells 22 x 35-45  $\mu$ m, with trigones. **Habitat:** Afroalpine species, *Lobelia stuhlmannii*-*Dendrosenecio adnivalis*-paramo, 3700 m. **Distribution in Rwanda:** Volcano NP: Karisimbi. **Distribution in Africa:** Ghana, Ethiopia, Uganda (Ruwenzori), Kenya (Mt. Kenya), Tanzania (Kilimanjaro, Uluguru mountains), Malawi. Also Réunion, Azores, Madeira, South America.



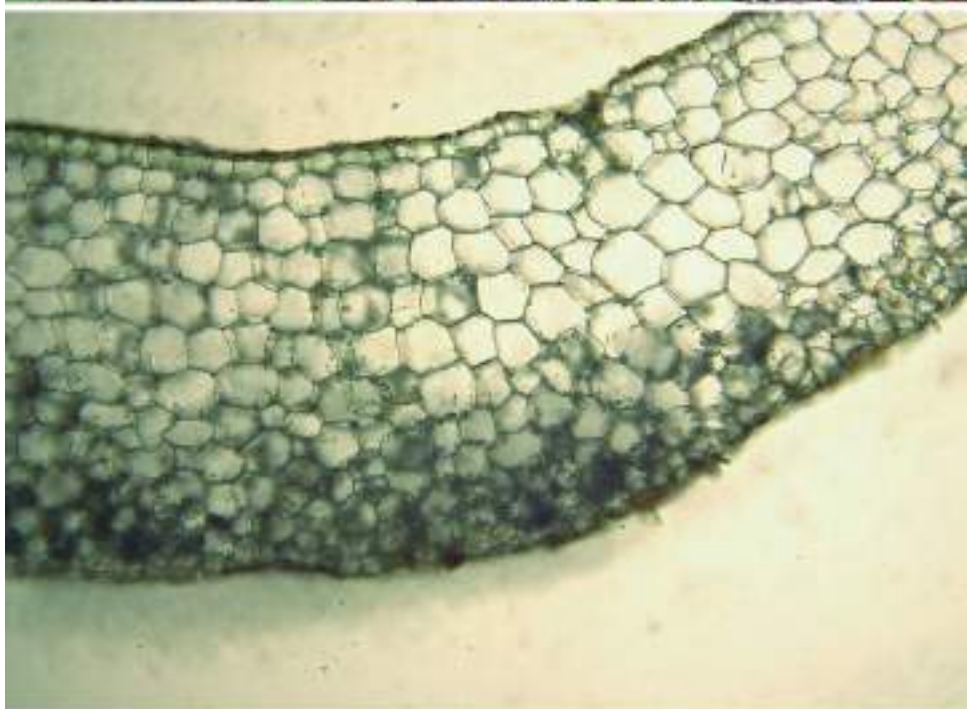
## 10. 2. Thallose Liverworts





**Figs 372 and 373 (next page). *Aneura pinguis* (L.) Dumort.**

Thallus dorsally concave, fleshy, yellowish-green to dark green, greasy in appearance, branches (20-)30-60(-70) x 3-7 mm, in the middle (9-)10-13(-20) cells thick. Dioicous. Calyptra clavate, up to 4-15 x 2 mm, fleshy, surrounding sporophytes. **Habitat:** Montane swamps and bogs, 2300-2500 m. **Distribution in Rwanda:** Nyungwe NP: Rwasenkoko, swamp along road to Bweyeye c. 2 km S of Pindura. **Distribution in Africa:** Tanzania, South Africa. Also Réunion, Seychelles. Subcosmopolitan and widespread in the Northern Hemisphere.





**Fig. 374. *Aneura pseudopinguis* (Herzog) Pócs**

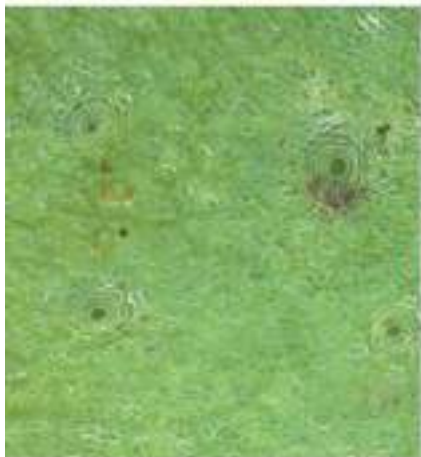
Synonym: *Riccardia pseudopinguis* Herzog. Thallus flat, translucent, green, opaque, closely adhering to the substrate (usually decaying wood or bark), branches up to 100 mm x 3-8 mm, in the middle only 5-7(-9) cells thick tapering to an unistratose margin 2-6 cells wide. Dioicous. Calyptra clavate, up to 5 x 1-2 mm, fleshy, surrounding sporophytes.

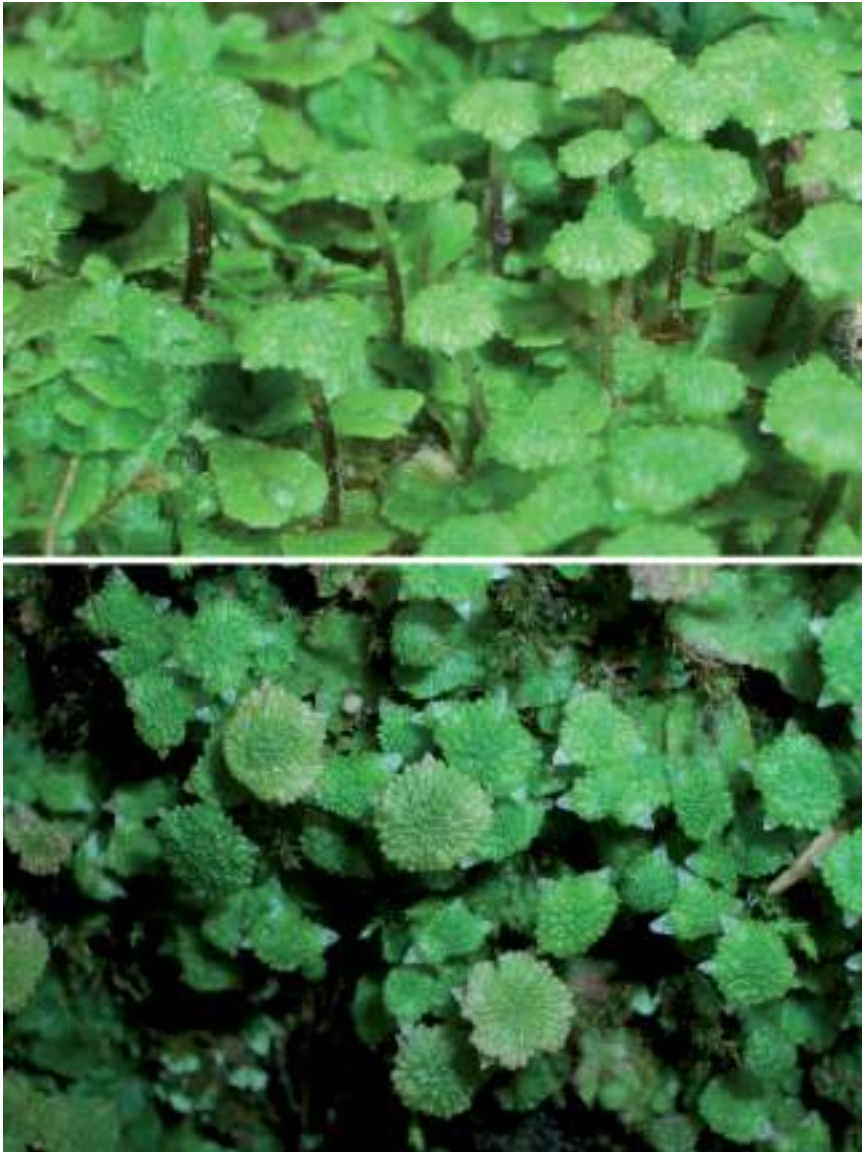
**Habitat:** Soil and rotten wood, 2000-2600 m. **Distribution in Rwanda:** Nyungwe NP: Kamiranzovu, Mt. Bigugu. **Distribution in Africa:** Ivory Coast, Bioko, Rio Muni, DR Congo, Uganda, Tanzania, Zimbabwe, South Africa. Also South America, Seychelles.





**Figs 375 and 376 (next page). *Asterella abyssinica*** (Gottsche) Grolle, Synonym: *Fimbriaria abyssinica* Gottsche in Gottsche *et al.* Thalli small to medium-sized, in crowded mats, green to light olive-green, simple or furcate. Ventral surfaces green, with large scales in two rows. Autoecious. Antheridia in sessile cushions. Gynoecial receptacles on 4-5 mm long stalk, carpocephala suborbicular, 3.5-4 mm diameter, pseudoperianth with 8-10 white segments. **Habitat:** *Hagenia-Hypericum* forest, on stream banks or damp rocks, 2000-3300 m. **Distribution in Rwanda: Volcano NP:** Karisimbi, in the saddle between Mt. Bisoke and Mt. Karisimbi, Kinigi, foot of Muhabura. **Nyungwe NP:** Cyamudongo. **Distribution in Africa:** Sierra Leone, Bioko, Cameroon, DR Congo, Burundi, Ethiopia, Tanzania, Malawi, Zimbabwe, South Africa.





**Fig. 377. *Asterella khasyana*** (Griff.) Pandé, K.P.Srivast. & Sultan Khan. Thalli small to medium-sized, in dense mats, green to light green, often reddish along the margins, simple or furcate, branches 3-6 x 2-4 mm. Ventral surfaces green, with large purple scales in two rows. Autoecious. Antheridia in sessile cushions. Gynoecial receptacles on 3-17 mm long stalk, carpocephala suborbicular, 3.5-5 mm diameter, the whole receptacle strongly warted above with large protruding air-chambers, pseudoperianth with 7-9 segments. **Habitat:** Open soil and road cuts with *Cyathodium africanum* and *Marchantia* spp., 1900-2000 m. **Distribution in Rwanda:** Nyungwe NP: Cyamudongo. **Distribution in Africa:** Burundi, Uganda. Also East Asia.



**Fig. 378. *Cyathodium africanum* Mitt.**

Thalli very thin, delicate, translucent, brilliant luminous green to yellowish green, not tinged with purple, often irregularly lobed, lobes 1-2(-4) mm wide, lacking midrib. Monoicous.

Involucres 2-valved, globose, c. 0.7-0.8 x 0.5 mm. **Habitat:** On moist soil and roadcuts, 1900 m. **Distribution in Rwanda: Nyungwe NP:** Cyamudongo, along road to Nyakabuye.

**Distribution in Africa:** Guinea, Sierra Leone, Ivory Coast, Ghana, Togo, Nigeria, Annobón, São Tomé, Bioko, Cameroon, Central African Republic, Congo-Brazzaville, DR Congo, Uganda, Tanzania, Malawi, Zimbabwe, Namibia. Also Cape Verde, Comoros, Madagascar.



**Figs 379 and 380 (next page).** *Dumortiera hirsuta* (Swartz) Nees in Reinw., Blume & Nees

Thalli dark green, very large, hygrophilous, translucent, 1- to several times furcate, 50-95(-200) x 8-13(-22) mm. Ventral surfaces green, with small colourless scales in 2 rows, and rhizoids forming a midrib. Monoicous. Male receptacles nearly sessile, circular and unlobed, c. 2.8 mm diameter, margins with stiff, bristle-like hairs. Female receptacles disciform, c. 3.8 mm diameter, on long stalks, becoming shallowly 6-8-10-lobed. **Habitat:**

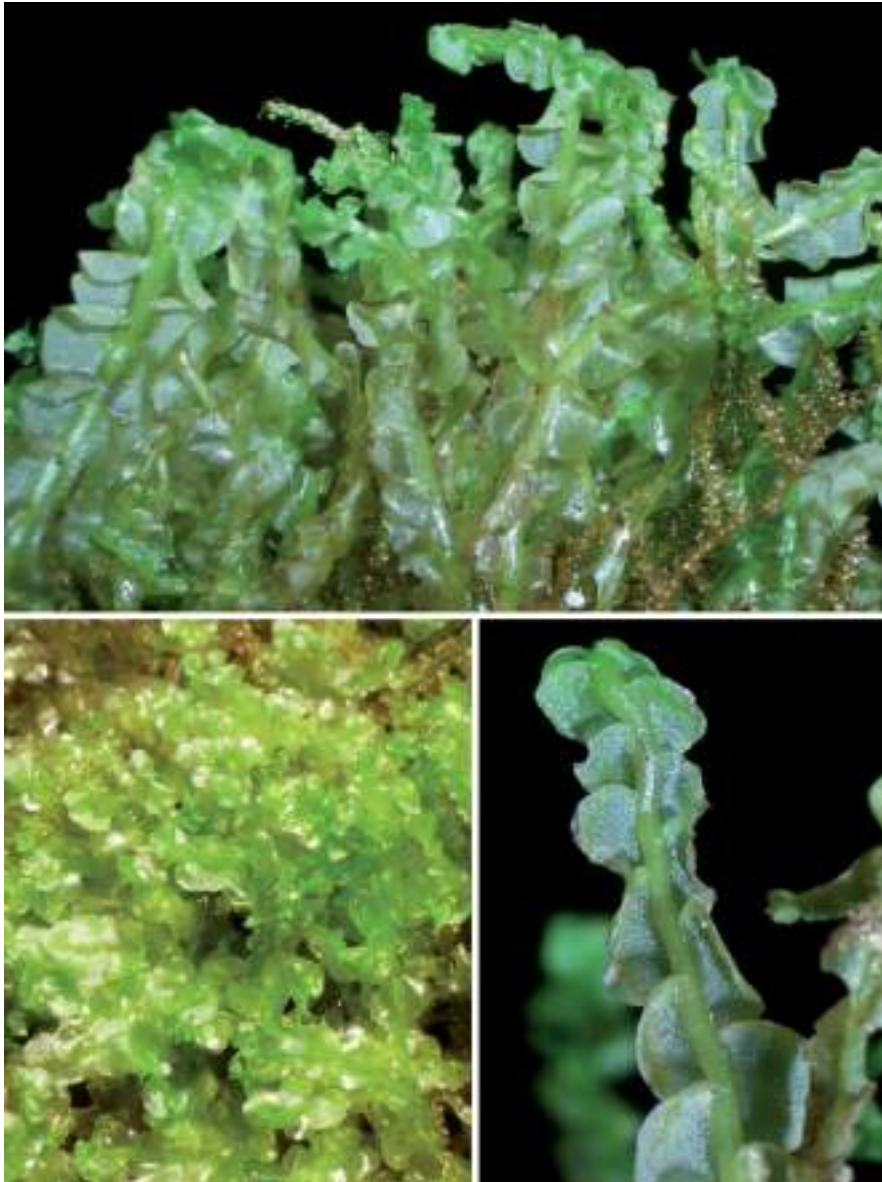
On soil and roadcuts in montane forest, mainly near rivers and streams in valleys under humid air conditions, 1700-2400 m. **Distribution in Rwanda:** Nyungwe NP: Cyamudongo, Gisakura, Kamiranzovu, Uwinka, Pindura-Bweyeye. **Distribution in Africa:** Sierra Leone, São Tomé, Bioko, Cameroon, DR Congo, Burundi, Ethiopia, Uganda, Kenya, Tanzania, Angola, Malawi, Zimbabwe, Mozambique, Swaziland, South Africa. Also Comoros, Madagascar, Mauritius, Réunion. **Note:** A widespread species known from Europe, North, Central and South America, Tropical Africa and Tropical Asia.





**Fig. 381. *Exormotheca pustulosa* Mitt.**

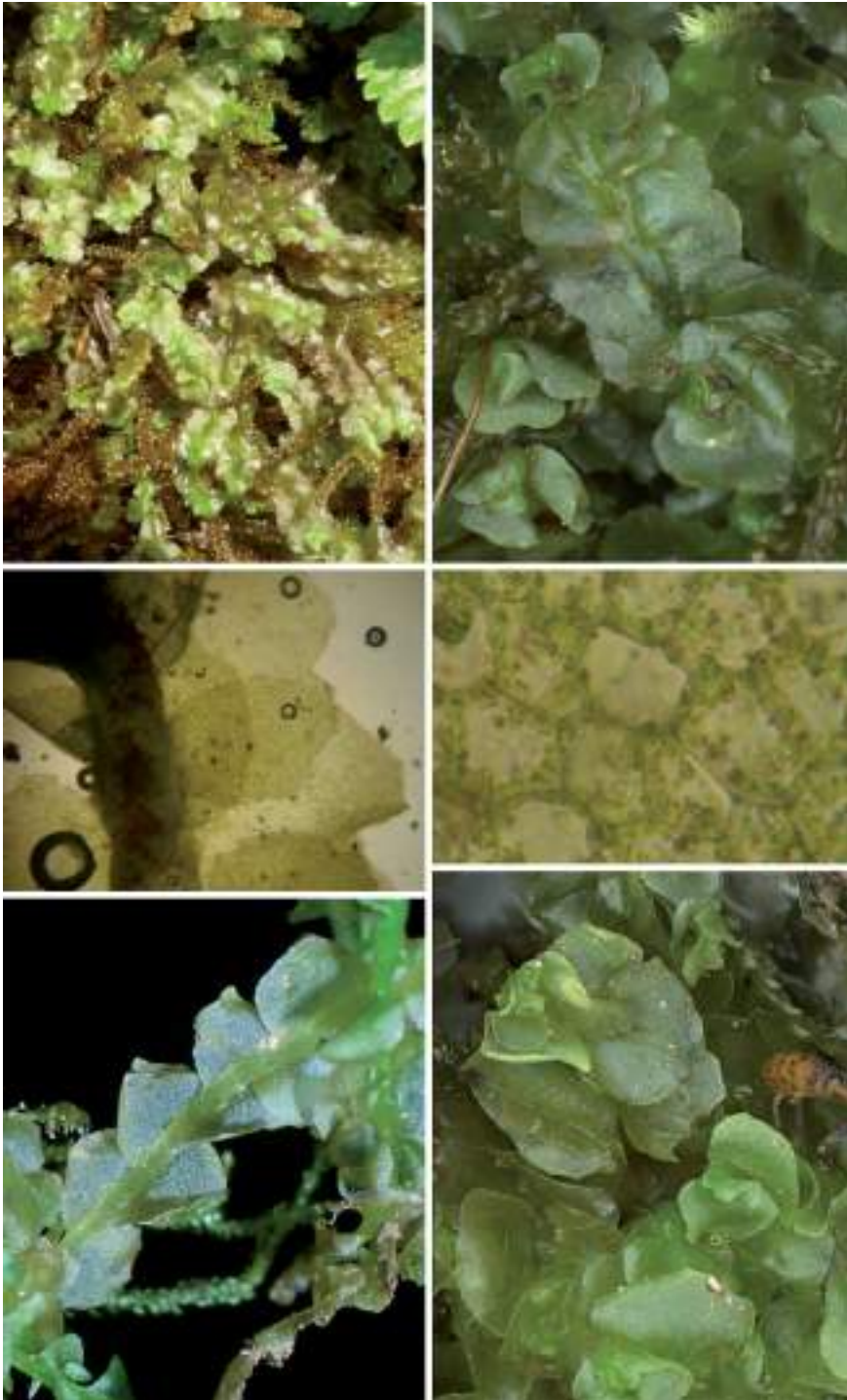
Thalli small, in crowded patches, silvery glaucous-green, branches simple or furcate, up to 8-9 x 2-3 mm. Dorsal surfaces slightly concave, completely covered with numerous conical evaginations. Ventral surfaces green, ventral scales purple or partly hyaline. Monoicous. Androecia in 1-3 rows along middle of thallus. Female receptacles sessile when young, later raised on a stalk at maturity up to 10 mm. **Habitat:** Quartzitic rocks, fissures with *Streptocarpus bindseilii* and *Stemodiopsis ruandensis*, 1712 m. **Distribution in Rwanda: Akagera:** Kibungo, near Rugarama. **Distribution in Africa:** Chad, Ethiopia, Kenya, Tanzania, Zimbabwe, Angola, Botswana, Namibia, Lesotho, South Africa. Also South Western Europe, North Africa, Atlantic Islands (Azores, Madeira, Canaries, Cape Verde, St. Helena), Arabia, Indian Ocean Islands.



**Figs 382 and 383 (next page). *Fossombronina pulvinata* Steph.**

Plants large, up to 4-6 cm long, forming dense cushions. Rhizoids purple. Leaves imbricate, entire, oblong, 4 × 7 mm, apex broadly truncate-rounded. Leaf cells 54 × 63 μm. Pseudoperianth and sporophyte unknown. **Habitat:** *Lobelia-Cyperus denudatus*-bogs, humid rocks in waterfalls, 2000-2450 m. **Distribution in Rwanda:** Nyungwe NP: Gisakura waterfalls, Rwasekoko. **Note:** Very large and distinct species but only known in sterile condition. The type specimen was annotated by Perold as *Fossombronina* sp. (sterile).







**Fig. 384. *Fossombronia pusilla* (L.) Nees**

Plants solitary or gregarious. Rhizoids violet-purple. Leaves  $\pm$  entire or lobed, crisped towards stem apex. Paroecious. Pseudoperianth campanulate. Spores brown to dark brown, 40-68  $\mu$ m, lamellae straight to sinuose, sometimes anastomosing on distal face. **Habitat:** On open soil and roadcuts, 2300-2450 m. **Distribution in Rwanda:** Gishwati Forest: Gikungu. **Nyungwe NP:** Uwinka. **Distribution in Africa:** D.R. Congo, Malawi, Lesotho. Also Europe, Cape Verde, Réunion.



**Figs 385 and 386 (next page). *Fossombronina rwandaensis* Perold**

Synonym: *Fossombronina capensis* auct. non S.W.Arnell. Plants in dense mats, shoots large, simple or once furcate, up to 20 x 3.2-4 mm. Stems prostrate, rhizoids purple. Leaves overlapping, widely spreading, irregularly rectangular, upper margin rounded. Cells thin-walled, 50-75 x 40-50 µm in middle of lamina. Dioicous. Plants predominantly male, female plants very rare. Capsule globose, 1 mm in diameter. Spores with ridges, loops, blobs or rarely reticulations, distal face with black ridges, irregularly branching and curving or unbranched, with up to 13 small areolae, proximal face with triradial mark indistinct to distinct. **Habitat:** Open soil and roadcuts in montane forest, 2000-2300 m. **Distribution in Rwanda:** **Gishwati Forest:** Gikungu, stream Bikeneko. **Nyungwe NP:** Gisakura, Karamba, Kamiranzovu. **Distribution in Africa:** Burundi.





**Figs 387 and 388 (next page).** *Jensenia spinosa* (Lindenb. & Gottsche) Grolle  
 Synonym: *Pallavicinia stephanii* Jack. Thalli pale green to reddish, dendroid, consisting of erect thalli arising from a prostrate rhizome, the erect part narrow and stalked below, 2-4 times furcate, midrib very broad and thick, to 1/2 of thallus width, thallus margin dentate-spinose. Branches of aerial frond 1-2 mm wide, usually  $\pm$  lingulate to slightly tapering, unistratose for 0.5-6.5 of width. Margin dentate to coarsely spinose. Inframarginals cells of unistratose area of frond branches 21-27 x 24-35(-42)  $\mu\text{m}$ . Female involucre a deeply lacinate cup. Sporophyte surrounded by a pseudoperianth. **Habitat:** Montane forest, *Hagenia-Hypericum* forest to subalpine paramo, on rocks, 2500-3600 m. **Distribution in Rwanda:** Volcano NP: Karisimbi, Bisoke. **Nyungwe NP:** Rwasenkoko. **Distribution in Africa:** Bioko, DR Congo, Uganda, Kenya, Tanzania, Malawi, South Africa. Also St. Helena, Mauritius, Réunion.





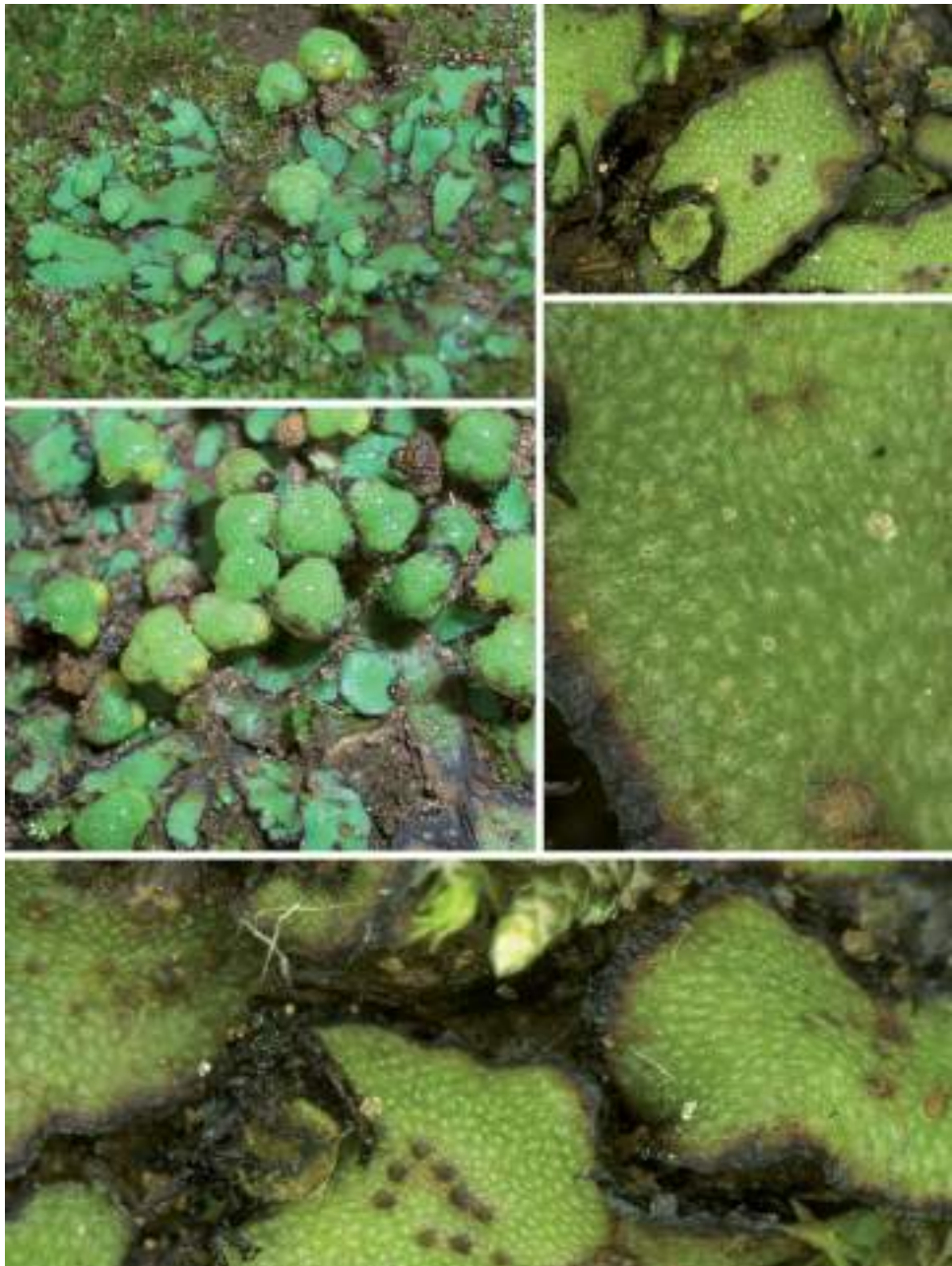
**Fig. 389. *Lunularia cruciata* (L.) Dumort.**

Thalli clear green, in crowded patches, glossy, 40-55 x 5(-10) mm. Scales hyaline. Asexual reproduction by discoid gemmae on thallus surface on the inner side of lunate gemmascups with entire margins. Dioicous, mostly sterile and with gemmae. **Habitat:** Secondary habitats, on soil in disturbed places roadsides, paths, also on damp soil and rocks, 1700-2800 m. **Distribution in Rwanda: Volcano NP:** Gahinga, Muhavura. **Gishwati Forest:** Gikungu. **Central Rwanda:** Huye (Butare). **Distribution in Africa:** Cameroon, DR Congo, Eritrea, Ethiopia, Uganda, Kenya, Tanzania, Malawi, Zimbabwe, Namibia, South Africa. Also Europe, North America, Asia, Australia, New Zealand.



**Figs 390 and 391 (next page). *Mannia capensis* (Steph.) S.W.Arnell**  
 Thalli small to medium-sized, in crowded patches, light green, laterally reddish, simple or furcate, up to 12 x 2-4 mm. Ventral surface black, scales in 2 ventral rows, black to reddish-black. Dioecious. Androecia with 2-4 rows of antheridia along center of branch. Gynoecial receptacles sessile, surrounded by dark purple lanceolate paleae. Carpocephala 2 mm diameter, papillose and not or scarcely lobed, stalk 5-25 mm long.  
**Habitat:** Rock fissures on quartzite, also on manioc fields, 1700 m. **Distribution in Rwanda:** Akagera: Kibungo, near Rugarama. **Distribution in Africa:** Kenya, Tanzania, Zambia, Zimbabwe, Namibia, South Africa.







**Figs 392 and 393 (next page). *Marchantia debilis* Goebel**

Synonyms: *Marchantia chevalieri* Steph. ex Bonner; *M. wilmsii* Steph. Thalli light green, furcate, with dark, narrow-longitudinal median band, 5-12 x 4.5-7.3 mm. Ventral surfaces with large violet to purple-brown scales in 4 rows. Dioicous. Male receptacles 7.5-9 mm in diameter, on stalks 7-16 mm long, palmate, dissected into (4-)5-7 rays, 1.5-3 mm long and c. 1.2 mm wide at base. Female receptacle (3-)4.5-7(-9) mm in diameter, deeply dissected into 8-10 lobes, 0.8-1.2 mm long, narrowed at base, widened towards apex. **Habitat:** On soil and roadcuts in montane forest, mainly near rivers and streams in valleys under humid air conditions, 1800-2200 m. **Distribution in Rwanda: Kivu-Lake:** Rwaza. **Nyungwe NP:** Cyamudongo, Gisakura, Pindura-Bweyeye. **Distribution in Africa:** Guinea, Sierra Leone, Ivory Coast, Ghana, Togo, Nigeria, Chad, Cameroon, Gabon, Congo-Brazzaville, DR Congo, Burundi, Uganda, Tanzania, Angola, Malawi, Zambia, Zimbabwe, Lesotho, Swaziland, South Africa. Also Morocco, Madagascar, Réunion.





**Figs 394 and 395 (next page). *Marchantia pappeana* Lehm.**

Synonyms: *Marchantia parviloba* Steph.; *M. planiloba* Steph. Thalli light to yellowish green, furcate, without dark median band, 10-15 x 7-8.5 mm. Ventral surfaces with large violet to purple-brown scales in 4 rows. Dioicous. Male receptacles 9-14 mm in diameter, on stalks 9-18(-32) mm long, palmate, dissected into 6-8 rays, 1.7-3.4 mm long and c. 3.5 mm wide. Female receptacle 8-11 mm in diameter, symmetrically divided into 9-11 lobes, 1.4-1.7 mm long. **Habitat:** On soil and roadcuts in montane forest, mainly near rivers and streams in valleys under humid air conditions, also in roadside ditches, 1900-2500 m.

**Distribution in Rwanda:** Volcano NP: Kinigi. **Gishwati Forest:** Lac Bulera, Lac Karago, Gikungu. **Nyungwe NP:** Rwasenkoko, Kamiranzovu, Gisakura, Pindura. **Distribution in Africa:** Guinea, Sierra Leone, Ivory Coast, Ghana, Togo, São Tomé, Bioko, Cameroon, Congo-Brazzaville, DR Congo, Burundi, Ethiopia, Uganda, Kenya, Tanzania, Angola, Malawi, Zambia, Zimbabwe, Lesotho, Swaziland, South Africa. Also Cape Verde, Madagascar, Mauritius.





**Figs 396 and 397 (next page). *Marchantia polymorpha* L. ssp. *montivagans* Bischl. & Boisselier**

Synonym: *Marchantia alpestris* (Nees) Burgeff. Thalli yellowish to dark green, furcate, up to 40-100 x 7.5-11 mm, leathery, without median longitudinal line. Ventral surfaces with large colourless or violet scales in 6 rows. Dioicous. Male receptacles c. 8 mm diameter, shallowly 8(-10)-lobed stalks, 4.5-15 mm long. Female receptacles c. 9.5-10 mm diameter, stalks 17-40 mm long, deeply divided into 9-11 rays. **Habitat:** Streams and sources in *Hagenia-Hypericum* forest and *Dendrosenecio* paramo, 2700-3500 m. **Distribution in Rwanda:** **Volcano NP:** Karisimbi, Bisoke, Muhavura. **Distribution in Africa:** Ethiopia, Uganda.





**Fig. 398. *Marchantia polymorpha* L. ssp. *ruderalis* Bischl. & Boisselier**  
 Synonym: *Marchantia latifolia* Gray. Thalli yellowish to dark green, furcate, up to 40-6 x 7-13 mm, not leathery, with discontinuous dark median line. Ventral surfaces with large colourless or violet scales in 6 rows. Dioicous. Male receptacles c. 8 mm diameter, shallowly 8(-10)-lobed stalks, 4.5-15 mm long. Female receptacles c. 9.5-10 mm diameter, stalks 17-40 mm long, deeply divided into 9-11 rays. **Habitat:** On soil in disturbed places, e.g. gardens and on paths, 1700-1800 m. **Distribution in Rwanda:** Musanze (Ruhengeri), probably introduced. **Distribution in Africa:** South Africa. Widespread in Northern Hemisphere.





**Figs 399 and 400 (next page). *Metzgeria consanguinea* Schiffn.**

Synonyms: *Metzgeria agnewiae* Kuwah.; *M. attenuata* Steph.; *M. elliotii* Steph.; *M. vandenberghenii* Kuwah. Plants green to yellowish-green, deep blue in dried specimens, sparsely to profusely branched. Branches short and curved, growing away from the substratum, branches of 2 types, attenuate (tapered) and non-attenuate, the attenuate part of the shoot in attenuate thalli retaining a narrow lamina bordering the costa to the apex. Thallus flat to convex. Costa with 2 rows of cortical cells on dorsal and ventral side, medullary cells 10-15, thick-walled. Hairs straight or flexuose, usually single. Gemmae sparse to abundant. Dioicous. **Habitat:** Epiphyte in montane forest up to *Dendrosenecio-Lobelia stuhlmannii* paramo, and paramo with *Alchemilla* mats interrupted by boulders in the alpine belt, 2000-4200 m. **Distribution in Rwanda: Volcano NP:** Karisimbi, at E-slopes along trail to summit. S-slope of Bisoke. **Nyungwe NP:** Gisakura, Karamba, Kamiranzovu, Uwinka, Rwasekoko. **Distribution in Africa:** Cameroon, DR Congo, Burundi, Ethiopia, Uganda, Kenya, Tanzania, Lesotho, South Africa.

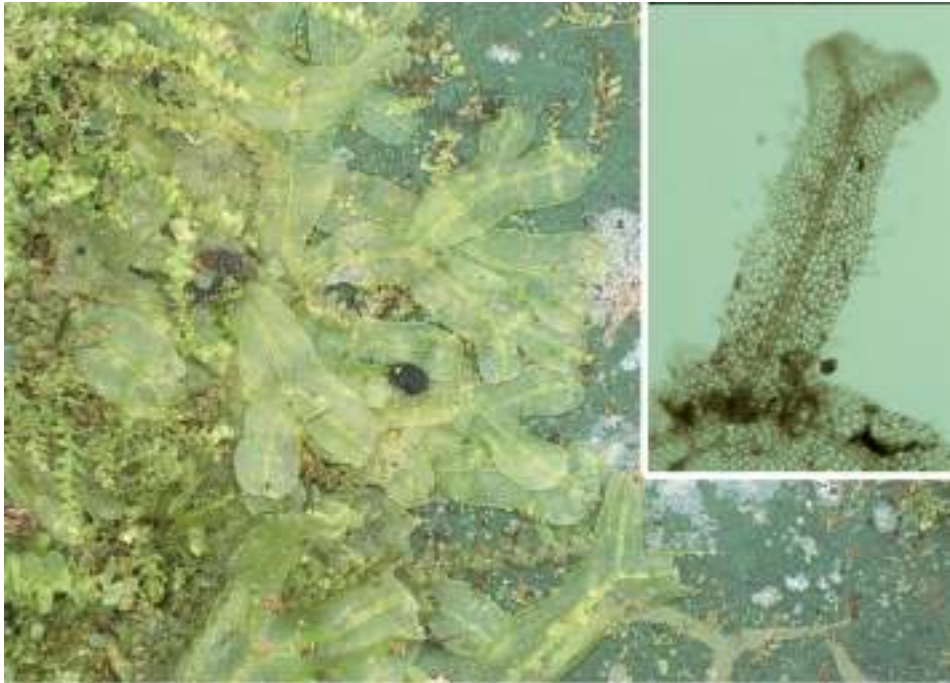


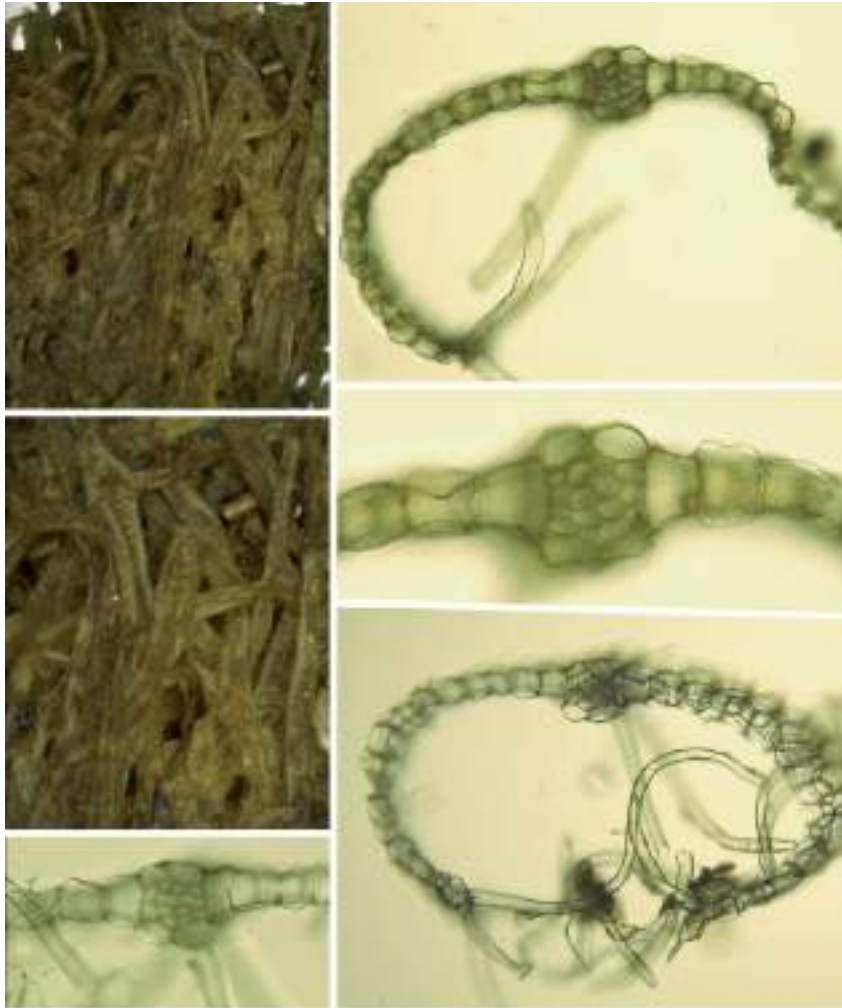


**Figs 401 and 402 (next page). *Metzgeria furcata* (L.) Dumort.**

Synonym: *Metzgeria thomeensis* Steph. Plants green to pale- or yellowish-green. Thalli 0.5-1.4 mm wide, up to 3 cm long, flat, margins usually plane, apices rounded, branching furcate. Dorsal surface without hairs, ventral surface without or with short hairs c. 40-200  $\mu\text{m}$  long. Thallus margin with sparse single straight or weakly curved hairs. Costa in cross section equally arched, with 2 rows of dorsal cortical cells and 2-3(-4) ventral cortical cells, medullary cells 12-18, thick-walled. Gemmae occasional on thallus margin. Dioicous.

**Habitat:** Epiphyte in montane forest, 2200-2400 m. **Distribution in Rwanda:** Nyungwe NP: Uwinka. **Distribution in Africa:** Sierra Leone, Ivory Coast, Ghana, Annobón, São Tomé, Bioko, Cameroon, Rio Muni, DR Congo, Ethiopia, Uganda, Kenya, Tanzania, Malawi, South Africa. Widespread in Northern Hemisphere.



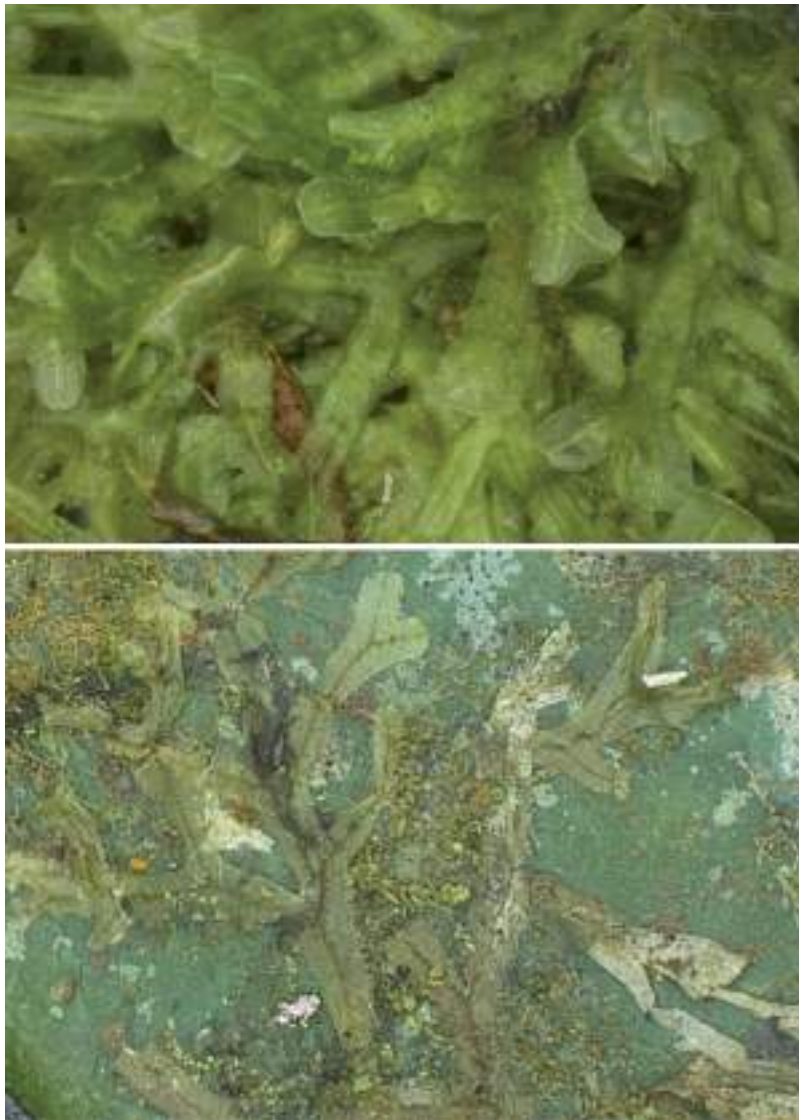


**Fig. 403. *Metzgeria leptoneura* Spruce**

Synonym: *Metzgeria australis* Steph. Plants green to yellowish-green. Thallus distinctly convex, margins strongly recurved to revolute, c. 10-20 x 0.7-1.2(-2.5) mm when flattened. Thallus margins with geminate, distinctly curved or falcate hairs, ventral surface of thallus lamina without hairs, ventral surface of midrib with falcate hairs. Midrib equally arched in cross-section, with 2 rows of dorsal cortical cells and 2-3 rows of ventral cortical cells, medullary cells 10-24, thick-walled. Gemmae occasional on thallus margin. Dioicous.

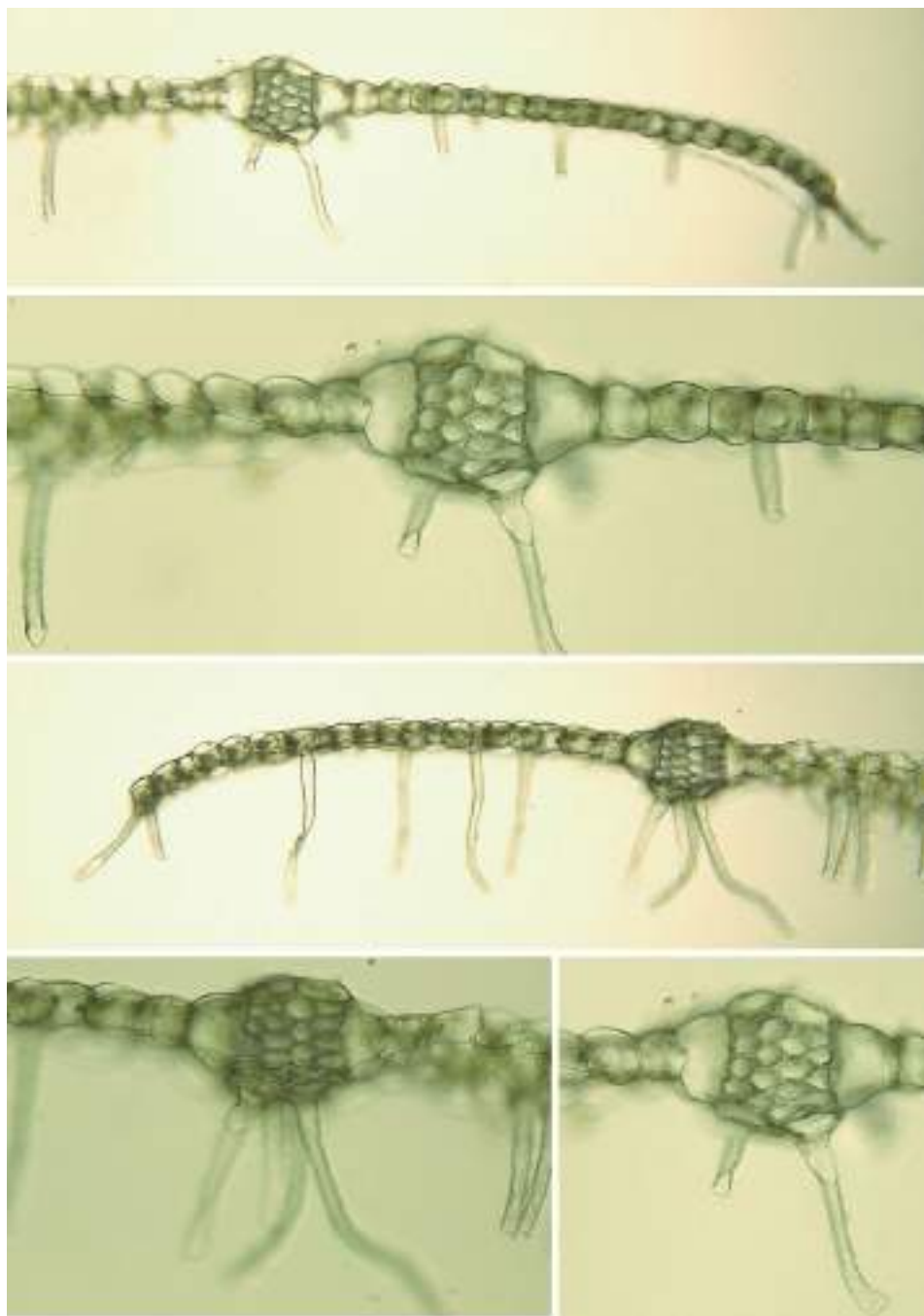
**Habitat:** Epiphyte in montane forest, *Hagenia-Hypericum* forest and *Dendrosenecio-Lobelia wollastoni* paramo up to the alpine belt with *Alchemilla* mats, 2000-4200 m.

**Distribution in Rwanda: Volcano NP:** Karisimbi, in the saddle between Bisoke and Karisimbi, on the E-slopes along trail to summit, Mt. Karisimbi, on E slope in the alpine belt. **Nyungwe NP:** Kamiranzovu. **Distribution in Africa:** São Tomé, DR Congo, Uganda, Tanzania, Malawi, Zimbabwe. **Note:** Subcosmopolitan, occurring widely in temperate and tropical regions.



**Figs 404 and 405 (next page). *Metzgeria madagassa* Steph.**

Synonym: *Metzgeria limbato-setosa* Steph. Plants green to yellow-green, up to 40 x 0.8-1.7 mm, often only 0.3-0.5 mm wide, branching irregularly furcate. Thallus often strongly convex with recurved margins to almost flat. Marginal hairs variable, with paired or single hairs, hairs dense on ventral surface of midrib. Costa with 2 rows of dorsal cortical cells and 2-3(-4) rows of ventral cortical cells, medullary cells 10-30, thick-walled. Gemmae on thallus margin flat, round or oval. Dioicous. **Habitat:** Epiphyte in montane forest, 2000-2500 m. **Distribution in Rwanda:** Volcano NP: Sabinyo. **Gishwati Forest. Nyungwe NP:** Rwasenkoko, Kamiranzovu, Uwinka. **Distribution in Africa:** DR Congo, Ethiopia, Uganda, Kenya, Tanzania, Zimbabwe, Mozambique, South Africa. Also Madagascar.

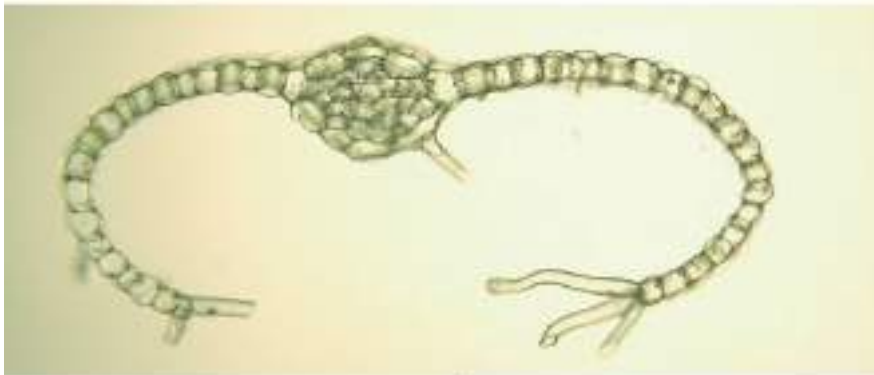


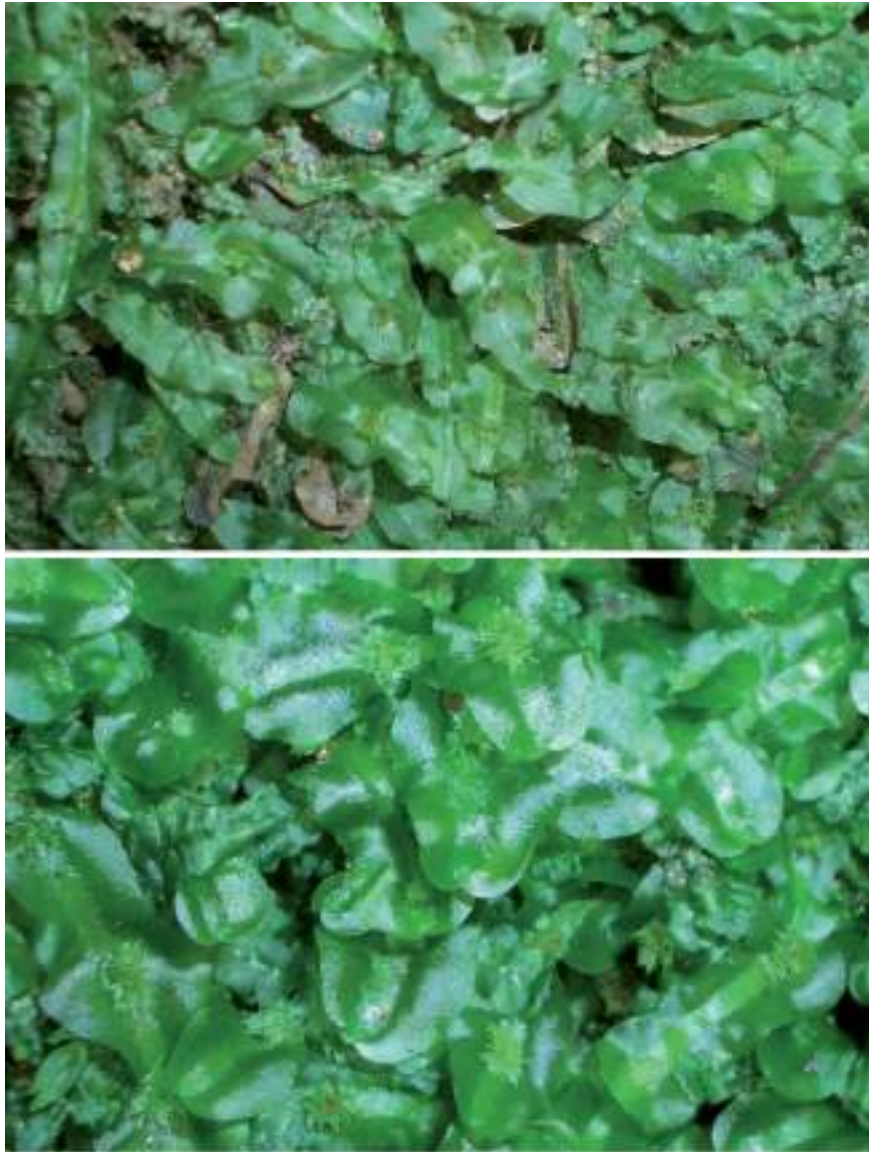


**Figs 406 and 407 (next page). *Metzgeria quadrifaria* Steph.**

Synonyms: *Metzgeria muscicola* Steph.; *M. hedbergii* Vanden Berghen. Plants green, yellowish-green or yellow, becoming bluish when dry. Thallus up to 60 x 0.7-1.7(-2.5) mm when flattened, irregularly furcate, margins inrolled to strongly convex, often nearly tubular. Dorsal surface of thallus without hairs, ventral surface with scattered hairs. Midrib with 3-4(-5) rows of dorsal cortical cells and (3-)4-6 rows of ventral cortical cells, medullary cells up to 30. Thallus margin single or geminate. Gemmae on thallus margin flat, oval or ribbon-like. Dioicous. **Habitat:** Epiphyte in *Hypericum-Dendrosenecio* subparamo and *Dendrosenecio-Lobelia stuhlmannii* paramo, 3400-3900 m. **Distribution in Rwanda:** **Volcano NP:** Karisimbi, at E-slopes along trail to summit. **Distribution in Africa:** Cameroon, DR Congo, Uganda, Tanzania, Zimbabwe, Lesotho, South Africa.







**Figs 408 and 409 (next page). *Pallavicinia lyellii* (Hook.) Carruth.** Thalli green, prostrate, simple or only sparsely branched, up to 60 x 3-6 mm, procumbent to ascending, often in mats, midrib to 1/8-1/6 of thallus width, with one central strand of narrow, thick-walled cells. Dioicous. Sporophyte surrounded by a tubular pseudoperianth. **Habitat:** On boggy ground, along stream banks and in swamps in montane forest, e.g. in *Carapa grandiflora*-*Syzygium* swamp forest, 1940-2300 m. **Distribution in Rwanda:** **Nyungwe NP:** Kamiranzovu, Uwinka. **Distribution in Africa:** São Tomé, DR Congo, Burundi, Uganda, Tanzania, Malawi, Zimbabwe, Lesotho, South Africa. Also Northern Hemisphere, Madagascar, Mauritius, Réunion.

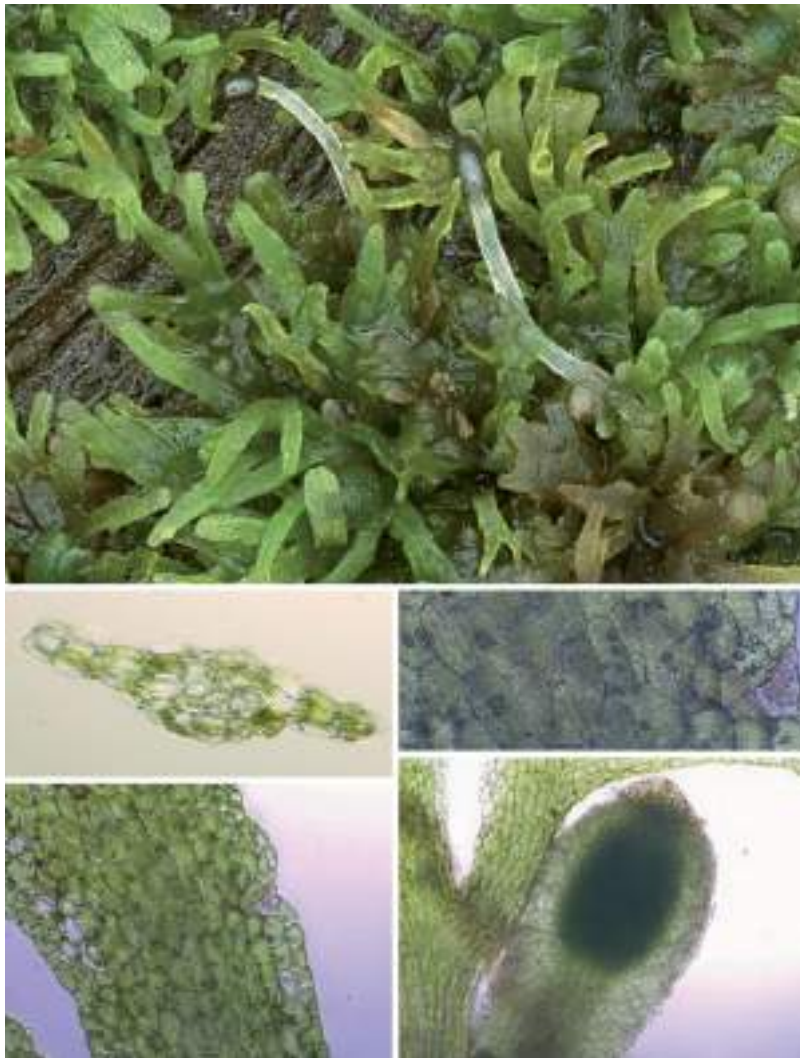




**Figs 410 and 411 (next page). *Plagiochasma rupestre* (J.R.Forst. & G.Forst.) Steph.**

Thalli medium-size to large, in dense patches, bluish-green, surface waxy, water-repellent, 8-25 x 4-6 mm, ventral surface green, scales reddish-pink or purple, in two rows. Monoicous. Androecia in sessile cushions, Gynoecial receptacles enclosed by purple-red paleae, carpocephala 2-3 mm wide, stalk up to 6 mm long. **Habitat:** Volcanic rocks in sunny exposition, 2300-2700 m. **Distribution in Rwanda: Volcano NP:** Foot and S slope of Muhabura. **Distribution in Africa:** Chad, Sudan, Eritrea, Ethiopia, Djibouti, DR Congo, Uganda, Kenya, Tanzania, Angola, Zimbabwe, Botswana, Lesotho, Namibia, South Africa. Also in the Mediterranean, Azores, Madeira, Canaries, Cape Verde, St. Helena, Ascension, Mauritius, Réunion.





**Fig. 412. *Riccardia amazonica*** (Spruce) Schiffn. ex Gradstein  
 Synonym: *Riccardia stephanii* (Besch.) E.W.Jones. Thallus small, stolons numerous, ascending fronds 2-4 mm tall, branching usually palmate. Main axes to 6 cells thick, not or only slightly winged, main branches 0.2-0.6 mm wide, broadly winged, ultimate branches with 2-5 marginal rows of unistratose cells and only 2-3 rows, 3-stratose in the middle of the branch. Cells 40-50 × 75 μm, oil bodies 1(-2) per cell. Monoicous or dioicous. Calyptra clavate, c. 1.3 mm long. **Habitat:** Montane forest, near rivers and streams in valleys, on decaying wood and bark, rarely on soil, 1900-2400 m. **Distribution in Rwanda: Nyungwe NP:** Gisakura, Kamiranzovu, Uwinka. **Distribution in Africa:** Sierra Leone, Ivory Coast, Ghana, Nigeria, Bioko, Cameroon, Gabon, Rio Muni, Congo-Brazzaville, DR Congo, Uganda, Kenya, Tanzania, Malawi, Zambia, Zimbabwe, Lesotho, South Africa. Also Madagascar, South America.

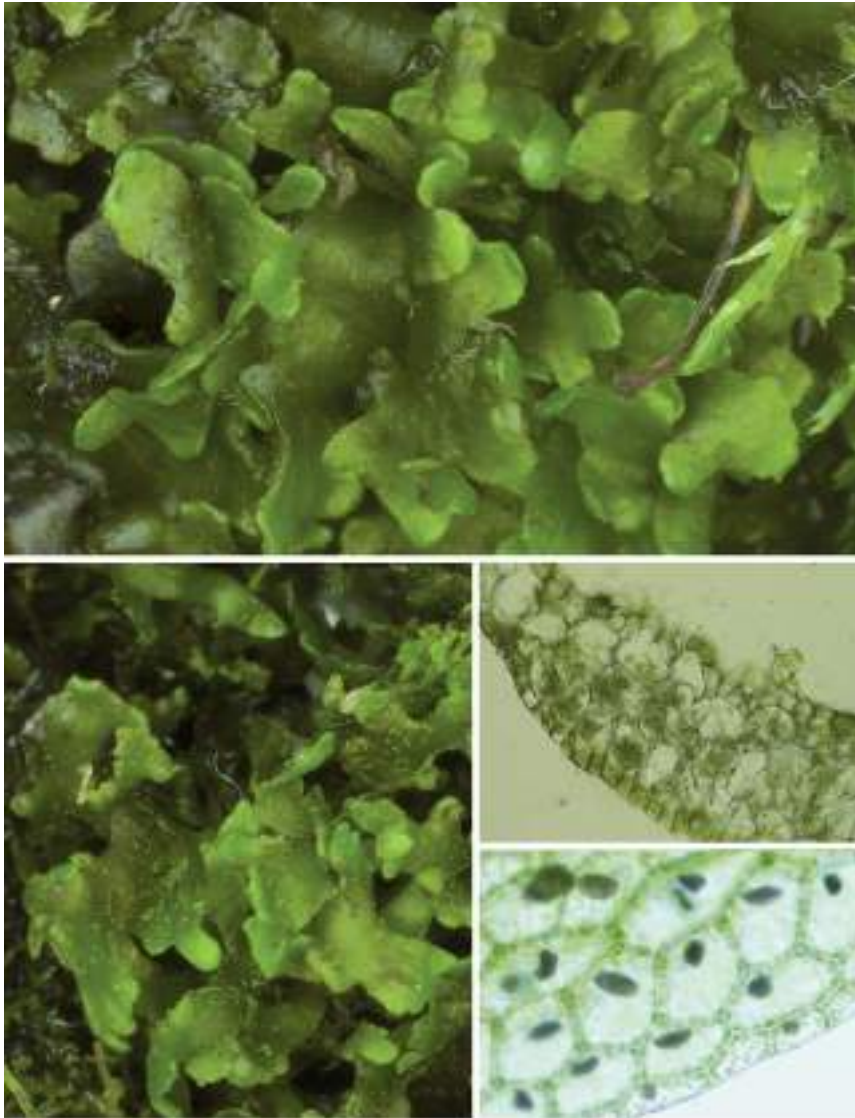


**Figs 413 and 414 (next page). *Riccardia limbata*** (Steph.) E.W.Jones

Thallus pinnate or bipinnate, usually 1-2 cm long. Main axes 5-9 cells thick, 0.5-0.9 mm wide, distinctly winged, ultimate branches, 3-4 cells thick with unistratose wings, 2-4 cells wide. Cortical cells in middle of branch 25-35 × 45-90 μm, branches 12-30 μm thick in cross section. Dioicous or sometimes monoicous. Calyptra clavate, c. 2 mm long. **Habitat:** Montane forest, near rivers and streams in valleys, on wet rocks, rotting wood, tree boles, less often on soil, 1900-2400 m. **Distribution in Rwanda:** Nyungwe NP: Gisakura, Kamiranzovu, Uwinka. **Distribution in Africa:** Sierra Leone, Ghana, Togo, Nigeria, Annobón, São Tomé, Bioko, Cameroon, Rio Muni, Congo-Brazzaville, DR Congo, Kenya, Tanzania, Malawi, Zambia, Swaziland, South Africa. Also Mauritius, Réunion.



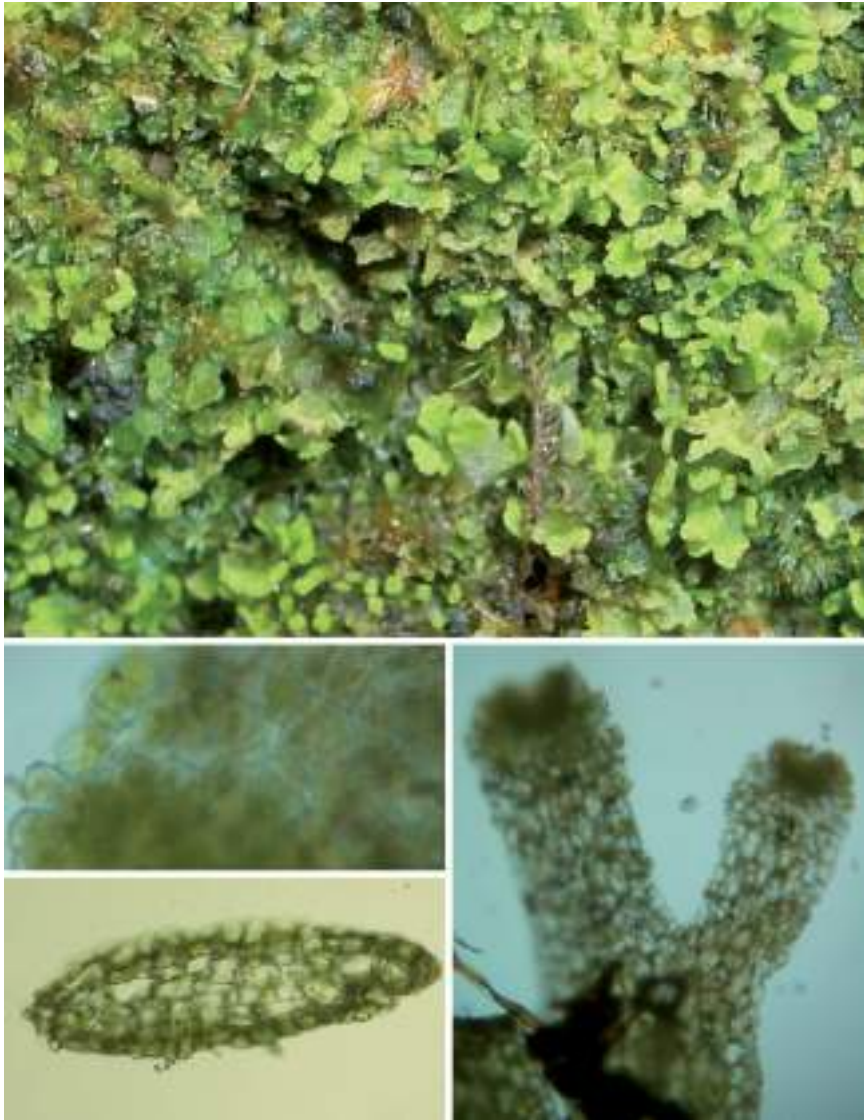




**Figs 415 and 416 (next page). *Riccardia longispica* (Step.) Pears.**

Thallus pinnate-bipinnate, often 2 cm long, apex deeply dissected. Main axes usually 0.8-1.2(-1.4) mm wide, segments  $\pm$  parallel-sided or only slightly widened upwards, 5-8 cells thick, with distinct border of 2(-3) rows of unistratose cells, ultimate branches distinctly narrower, up to 4 cells thick, with a border 4-5 cells wide. Cells with 1 oil body. Usually dioicous, sometimes monoicous. **Habitat:** Montane forest, near rivers and streams in valleys, on wet rocks, rotting wood and soil, 1900-2400 m. **Distribution in Rwanda:** **Nyungwe NP:** Gisakura, Kamiranzovu, Uwinka. **Distribution in Africa:** Cameroon, Rio Muni, Bioko, DR Congo, Uganda, Tanzania. Also Madagascar, Comoros, Réunion, Mauritius, Seychelles.

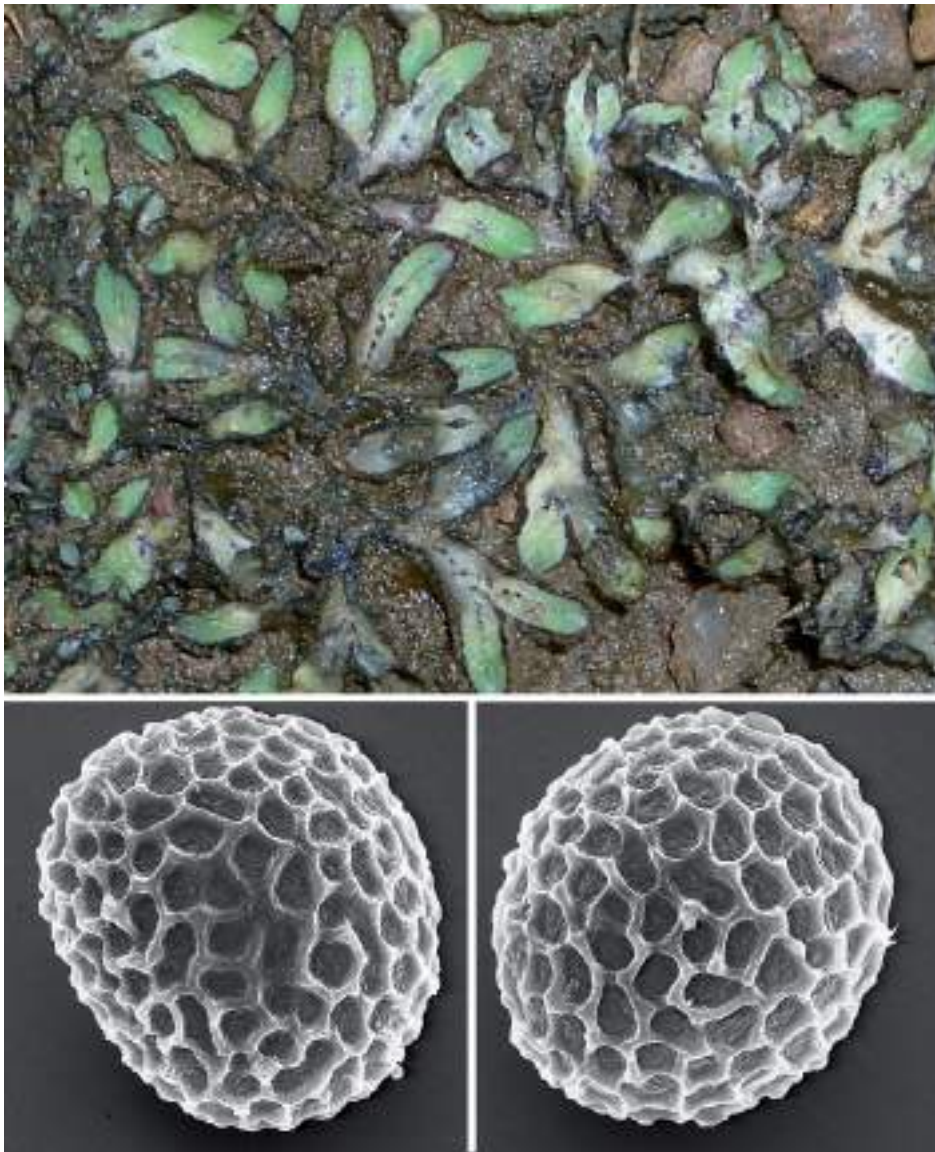




**Figs 417 and 418 (next page). *Riccardia* sp. sensu E.W.Jones**

Thalli pale-brown, growing in depressed mats, irregularly and shortly pinnate, branches 0.15-0.4 mm wide, apex of branches blunt, with cortical cells producing gemmae. Axis in cross-section often lunate, without wing or sometimes with 1 cell wide wing of elongated cells, 3-4 cells thick. Dorsal surfaces smooth, cells 35-45 × 50-60 μm, with few oil bodies (1-2). Dioicous. Male branches short or long, female branches generally from the margin of the axis, cup-like. **Habitat:** *Cyperus denudatus*-bogs, rotten wood in montane forest, 2200-2500 m. **Distribution in Rwanda:** Nyungwe NP: Uwinka, Rwasekoko. **Distribution in Africa:** Ghana, DR Congo. **Note:** The species resembles the European *Riccardia incurvata* Lindb.





**Fig. 419. *Riccia atropurpurea* Sim.**

Thalli small to medium-sized, in irregular or incomplete rosettes up to 20 mm in diameter, glaucous-green to greyish-green, branches linear to narrowly ovate, 5-10 x 0.8-1.5 mm. Scales with hyaline borders, rounded, fragile. Spores not distinctly polar, blackish brown, 75-105  $\mu\text{m}$  in diameter, with 10-12 thick walled areolae. **Habitat:** Ferricretes with shallow soil layer, 1300-1400 m. **Distribution in Rwanda: Akagera:** Lake Ihema, presque-île Mpanga, S of Lake Mpanga. **Distribution in Africa:** Ghana, Benin, Nigeria, Uganda, Kenya, Tanzania, Angola, Malawi, Zambia, Zimbabwe, Namibia, Botswana, Swaziland, South Africa.



**Fig. 420. *Riccia congoana* Steph.**

Synonyms: *Riccia rhodesiae* S.W.Arnell; *R. nigrosquamata* E.W.Jones. Thallus bluish or greyish green, large, scattered or in irregular partial rosettes, 25-30 mm in diameter, branches 6-12(-15) x 3-5 mm. Ventral scales large and conspicuous, 0.9 x 0.8 mm, entirely dark violet or sometimes with hyaline base. Spores yellowish brown, without wing and triradiate mark, surface with 6-8(-10) angular areolae across diameter. **Habitat:** Granitic and quartzitic rocks and ferricretes with shallow soil layer, 1100-1700 m.

**Distribution in Rwanda: Akagera:** Bugesera, Nyamata, Lake Ihema, Rugarama, île Rwamarenga in Lake Cyambwe presque-île Mpanga, S of Lake Mpanga, Ranch Rusumo NE Rusumo.



**Figs 421 and 422 (next page). *Riccia crinita* Taylor**

Synonym: *Riccia trichocarpa* Howe. Thalli small to medium-sized, in incomplete rosettes or patches, glaucous-green, branches 5 x 1-1.5 mm. Margin of thallus with long hyaline cilia and a few shorter cilia on upper surface of thallus above sporangia, cilia never arching and channelled. Spores triangular-globose, 100-120  $\mu$ m in diameter, ornamentation reticulate. **Habitat:** Ferricrete over shallow soil, 1300-1400 m. **Distribution in Rwanda: Akagera:** Lake Ihema, S of Lake Mpanga. **Distribution in Africa:** Niger, Nigeria, Uganda, Kenya, Tanzania, Malawi, Zimbabwe, Mozambique, Namibia, Botswana, Lesotho, South Africa. Also North America (from Oregon to California and Baja California, eastward to Arizona), Europe (chiefly mediterranean distribution), Canaries, North Africa, Socotra, Madagascar, Mauritius.



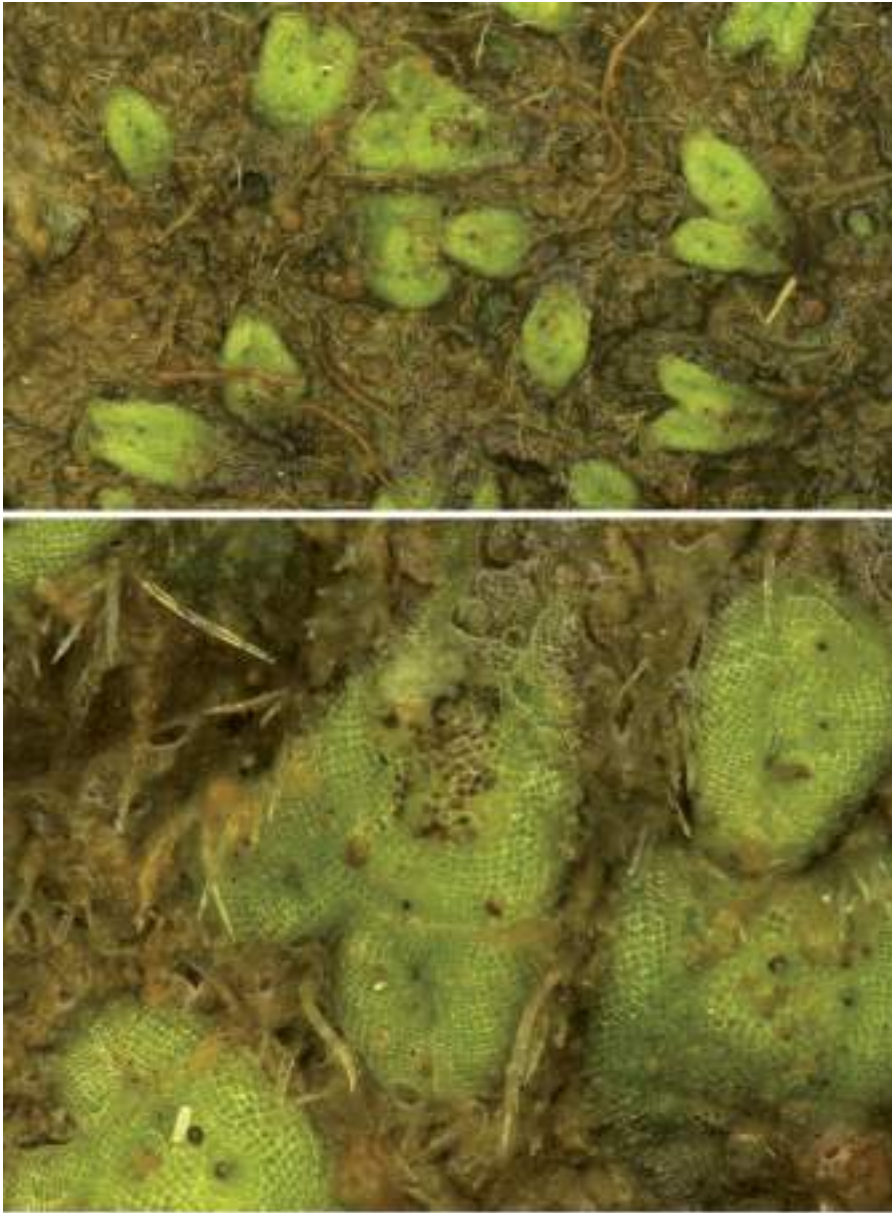




**Figs 423 and 424 (next page). *Riccia lanceolata* Steph.**

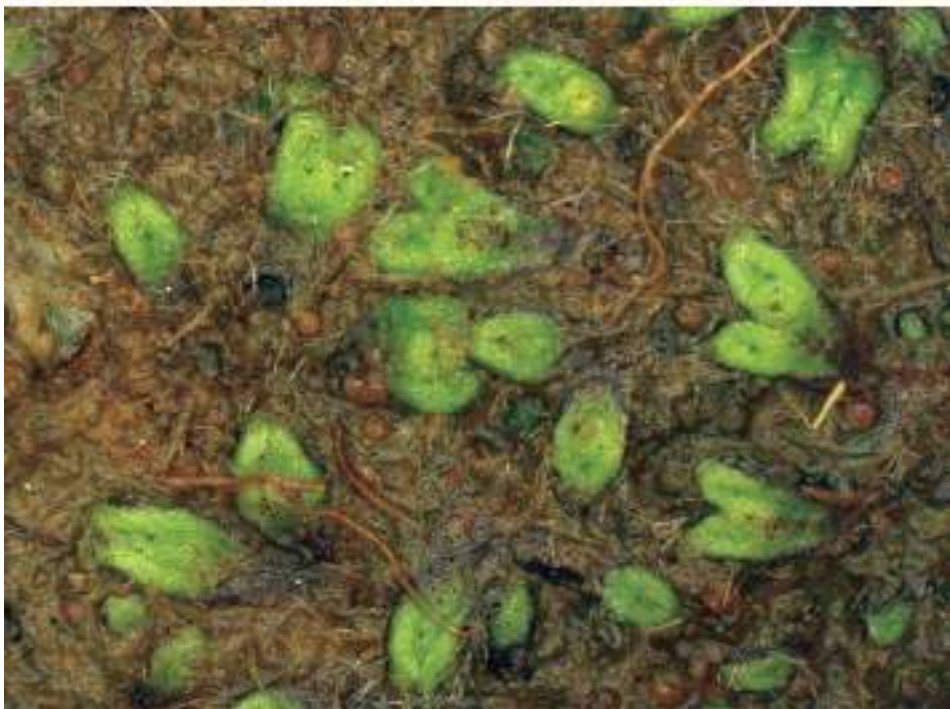
Thalli variable in size and shape, in crowded patches, rarely in rosettes, green to glaucous-green, branches 8.5 x 1-1.5 mm. Ventral scales deep violet, reaching or exceeding thallus margin. Spores distinctly polar, winged, 80-120  $\mu$ m in diameter, proximal face with well-defined triradiate mark, reddish brown, facets and distal face often with incomplete areolae. **Habitat:** Montane swamps, rock outcrops and inselbergs granitic rock plateaus, 1300-2450 m. **Distribution in Rwanda:** **Central Rwanda:** Gitarama, Cyubi, Ruhango, granitic rock plateau "Urutare ya Kamegeli". **Nyungwe NP:** Swamp near district border of Rusizi. **Akagera:** Rugarama, presque-île Mpanga, S of Lake Mpanga, Ranch Rusumo NE Rusumo. **Distribution in Africa:** Ivory Coast, Ghana, Benin, Nigeria, Eritrea, Ethiopia, Uganda, Kenya, Tanzania, Malawi, Zambia, Mozambique, South Africa.

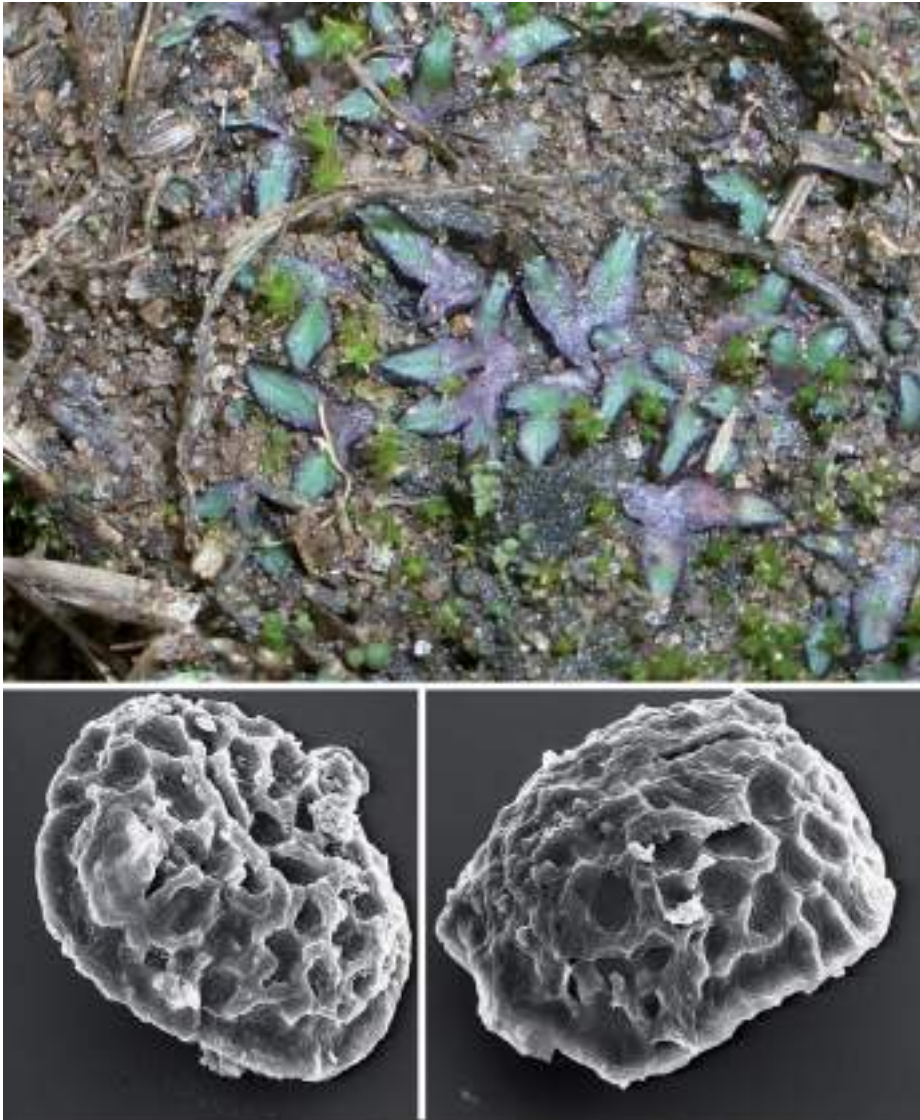




**Figs 425 and 426 (next page). *Riccia microciliata*** O.H.Volk & Perold

Thalli small, in incomplete rosettes or patches, glaucous-green, branches 1-3 x 0.6-0.8 mm. Margin of thallus with long hyaline cilia in several rows, crowded at apex, cilia arched and channelled. Spores triangular-globose, 80-92  $\mu$ m in diameter, ornamentation reticulate. **Habitat:** Ferricrete over shallow soil, 1300-1400 m. **Distribution in Rwanda:** Akagera: Bugesera, Lutete. **Distribution in Africa:** Kenya, Tanzania, Malawi, Zimbabwe, Mozambique, Namibia, Botswana, Swaziland, South Africa.





**Figs 427 and 428 (next page). *Riccia moenkemeyeri* Steph.**

Thallus medium sized, pale glaucous green, with violet ventral scales, branches lanceolate, 4-5(-10) x 1.5-2.5 mm. Scales not extending to thallus margin, dark wine-red and shiny or hyaline. Spores (65-)68-75(-85)  $\mu\text{m}$  in diameter, with distal face regularly areolate c. 9-10 areolae across diameter, areolae on proximal face incomplete or absent.

**Habitat:** Ferricretes at the edge of rock pools, partially under submerged conditions, 1300-1350 m. **Distribution in Rwanda: Akagera:** Bugesera, Nyamata, presque-île Mpanga, S of Lake Mpanga. **Distribution in Africa:** Gambia, Sierra Leone, Ivory Coast, Ghana, Nigeria, Bioko, Cameroon, Central African Republic, DR Congo, Tanzania, Angola, Malawi, Zambia, Zimbabwe, South Africa.





**Figs 429 and 430 (next page). *Riccia okahandjana* S.W.Arnell**  
 Thallus bluish green, in crowded patches or rosettes, 15-30 mm in diameter, branches 5-8(-10) x 1.5-1.8 mm. Ventral scales prominent, black, greatly exceeding the margin of thallus and usually inflexed over the thallus, at least at its apex, when dry. Spores wingless, densely papillose, 92-110  $\mu$ m in diameter. **Habitat:** Ferricretes with shallow soil layer, 1250-1500 m. **Distribution in Rwanda:** Akagera: Bugesera, Nyamata, Lake Ihema, île Rwamarenga in Lake Cyambwe, presque-île Mpanga, S of Lake Mpanga. **Distribution in Africa:** DR Congo, Uganda, Kenya, Tanzania, Angola, Malawi, Zimbabwe, Mozambique, Namibia, Botswana, Lesotho, Swaziland, South Africa. Also Arabian Peninsula.







**Fig. 431. *Riccia stricta*** (Lindenb.) Perold

Thallus light green, with linear branches, 5-10(-15) x 0.5-0.8-(1.2) mm. Scales hyaline.

Spores (50-)62-70(-75)  $\mu\text{m}$  in diameter, distal face with (4-)5-6 prominent areolae, proximal face with thick triradiate mark **Habitat:** Open damp soil in shaded or half-shaded position in mountain forests or formerly forested areas, also in stagnant water, 1600-2500 m. **Distribution in Rwanda:** **Gishwati Forest:** Gakarara, Gikungu. **Busaga Forest. Lake Kivu:** Cyongoroka. **Nyungwe NP:** Cyamudongo, Uwinka, Kamiranzovu, waterfall E of Pindura. **Distribution in Africa:** Ivory Coast, Ghana, Togo, Niger, Nigeria, Bioko, Cameroon, DR Congo, Burundi, Sudan, Ethiopia, Uganda, Kenya, Tanzania, Angola, Malawi, Zambia, Zimbabwe, Mozambique, Botswana, Lesotho, South Africa.



**Fig. 432. *Riccia vulcanicola*** Eb.Fisch.

Thallus soft-textured, medium sized, usually grey-green to yellowish green, dorsal surface vesicular-areolate, with distinct pores or gaps in the epidermis, soon lacunose and spongy, rosettes 10-14 mm in diameter. Main segments broadly subquadrate-obovate or orbiculate, rounded obtuse, 1.7-3 mm wide. Monoicous. Spores numerous, triangular globular, yellow brown to light-brown, 52-60 x 56-70  $\mu\text{m}$ , wing thin, c. 10  $\mu\text{m}$  wide, areolae complete, distal face with large areolae, each c. 12-17  $\mu\text{m}$  in diameter, areolar walls thin, 5-7.5  $\mu\text{m}$  high, edges crenate, not extended to wing margin. **Habitat:** Moist and compact soil along paths in the *Hagenia* belt and in *Dombeya-Hagenia* secondary forest, 2400-3300 m. **Distribution in Rwanda: Volcano NP:** Between Karisimbi and Bisoke, Gahinga. **Gishwati-Forest:** Gikungu. Only known from the Virunga Volcanoes and the adjacent Gishwati Forest. **Note:** The species probably is perennial, thus also differing from the closely related annuals *R. crystallina* L. and *R. cavernosa* Hoffm.



**Fig. 433. *Ricciocarpus natans* (L.) Corda**

Thalli yellow-green to olive green, form leathery, often with purple margins, thallus segments furcate, 8-14 x 3-7 mm, usually forming rosettes, floating on water. **Habitat:**

Aquatic, growing with other free floating elements as *Azolla pinnata* var. *africana*, *Utricularia inflexa*, *Lemna perpusilla* and *Wolffiopsis welwitschii* at the edge of the *Cyperus papyrus*-belt, 1250-1600 m. **Distribution in Rwanda: Lake Kivu:** between Ruhengeri and Gisenyi. **Akagera:** Lake Ihema, Birengera, Lake Mpanga, Lake Mugesera by Karengwe.

**Distribution in Africa:** Ghana, Nigeria, Cameroon, DR Congo, Uganda, Kenya, Tanzania, Zambia, Mozambique, Botswana, South Africa. Cosmopolitan.



**Figs 434 and 435 (next page). *Symphyogyna brasiliensis* Nees & Mont.**

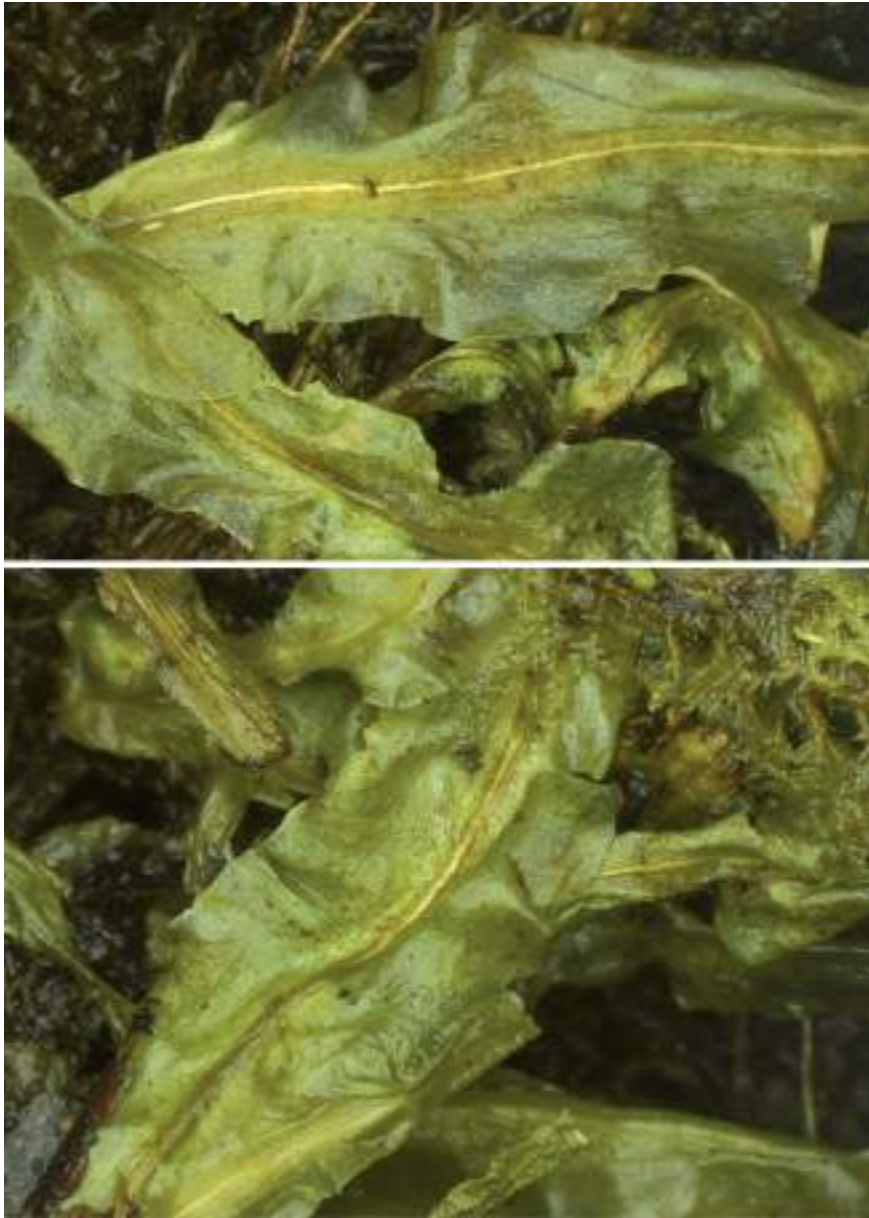
Synonym: *Symphyogyna lehmanniana* Nees & Mont. Thalli green to yellowish green, often slightly tinted with orange or red, with usually weakly-incurved margins, 2.5-4.5(-5.5) mm wide, arising from stolons and often sharply contracted at apex. Marginal slime-hairs lacking. Dioicous. Archegonia in clusters scattered on the midrib, each cluster protected by a tiny scale. Involucres lacking. Sporophyte surrounded by a fleshy calyptra, pseudoperianth lacking. **Habitat:** On peaty soil in *Lobelia mildbraedii*-*Cyperus denudatus* bog, 2450 m. **Distribution in Rwanda: Nyungwe NP:** Rwasenkoko. **Distribution in Africa:** Sierra Leone, Ghana, Nigeria, Bioko, Cameroon, DR Congo, Burundi, Uganda, Tanzania, Angola, Malawi, Zambia, Zimbabwe, Swaziland, South Africa. Also South America, St. Helena, Ascension, Madagascar, Mauritius, Réunion.





**Figs 436 and 437 (next page). *Symphyogyna podophylla* (Thunb.) Nees & Mont.**  
 Synonym: *Symphyogyna rigida* Steph. Plant dendroid, with furcate branches. Branches of aerial frond (2-)2.5-3(-4) mm wide, usually elongate-ovate, unistratose for (0.5-)0.7-0.75 of width. Margin dentate to  $\pm$  shortly spinose. Inframarginal cells of unistratose area of frond branches 50-60(-65) x 50-75  $\mu$ m. Cuticle of frond branches smooth. Female involucre a  $\pm$  deeply lacinate scale. **Habitat:** On moist soil or rocks in montane forest up to the *Dendrosenecio-Lobelia stuhlmannii* paramo, 2000-3600 m. **Distribution in Rwanda:** **Volcano NP:** Karisimbi, Bisoke, Sabinyo, Gahinga, Muhavura. **Gishwati Forest:** Gikungu. **Nyungwe NP:** Waterfall c. 3 km E of Pindura, Kamiranzovu, Uwinka. **Distribution in Africa:** Bioko, Cameroon, DR Congo, Ethiopia, Uganda, Kenya, Tanzania, Malawi, Zambia, Zimbabwe, South-Africa. Also Mauritius, Réunion.





**Fig. 438. *Symphyogyna volkensis* Steph.**

Thalli grass-green (without secondary pigmentation), usually flat, procumbent, (3-)5-9(-10) mm wide. Margin entire. Marginal slime-hairs present (often, however, soon disappearing at some distance from shoot tip). **Habitat:** Rocks and streams in montane forests, 2450-3300 m. **Distribution in Rwanda:** **Volcano NP:** Karisimbi, Gahinga. **Nyungwe NP:** Rwasekoko. **Distribution in Africa:** DR Congo, Uganda, Kenya, Tanzania.



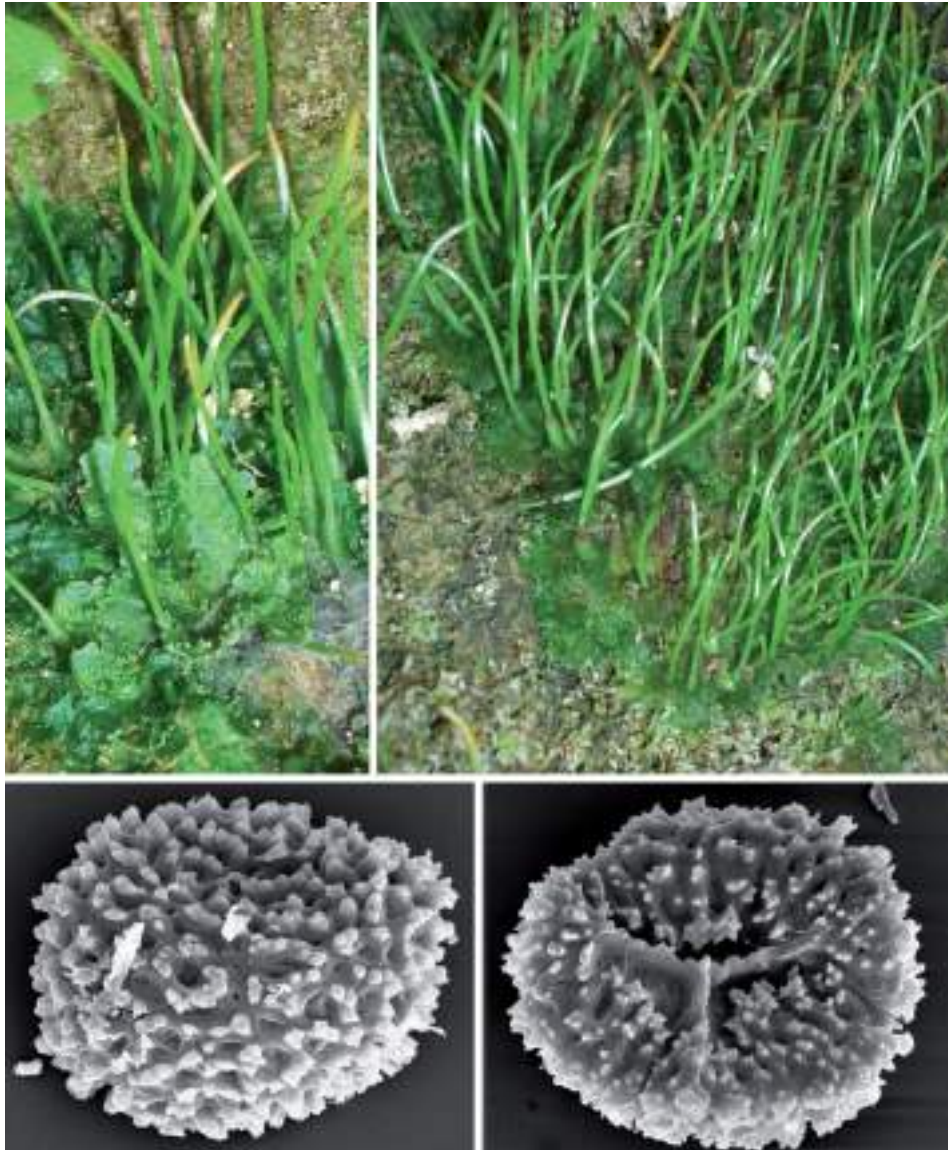


**Fig. 439. *Targionia hypophylla* L.**

Thalli leathery, linear, deep green, up to 30 x 2.7-3.5 mm, margin black or blackish-purple, ruficolous. Dorsal surfaces finely reticulate, with small whitish pores. Ventral surfaces with black or blackish purple scales in two rows. Autoicous or dioicous. Gynoecia ventrally below apex of thallus. **Habitat:** Quartzitic rocks fissures, humid roadside in montane forest, 1700-2300 m. **Distribution in Rwanda: Volcano NP:** Foot of Muhabura. **Nyungwe NP:** Cyamudongo. **Akagera:** near Rugarama. **Distribution in Africa:** Ghana, Nigeria, Chad, Bioko, Cameroon, Djibouti, Eritrea, Ethiopia, Uganda, Kenya, Tanzania, Malawi, Zambia, Zimbabwe, Lesotho, Namibia, South Africa. Also North America, Europe, the Mediterranean, Cape Verde, Comoros, Madagascar, Réunion.

### 10.3. Hornworts





**Fig. 440. *Anthoceros caucasicus* Steph.**

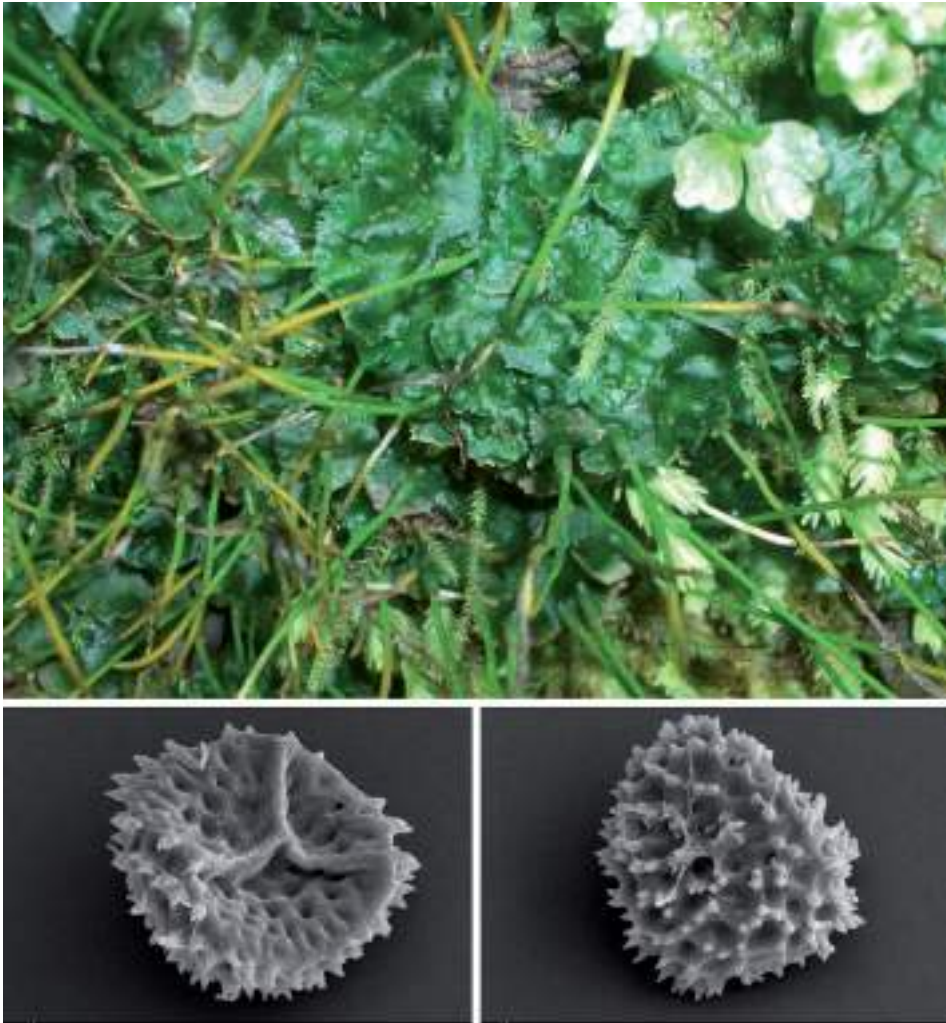
Synonym: *Anthoceros mandonii* Steph. Thallus-margin remotely or somewhat pinnately dissected into broad rectangular lobes. Capsule c. 1-3 cm long. Spores (42-)45-50(-55)  $\mu$ m in diameter, distal surface with short, often sinuate and shortly branched lamellae, or a network of lamellae forming ridges and peaks, proximal surface with conspicuous trilete ridges and sinuate lamellae. **Habitat:** Open soil and roadcuts along paths in montane forests, 1600-2000 m. **Distribution in Rwanda: Nyungwe NP:** Cyamudongo Forest.

**Distribution in Africa:** Sierra Leone, DR Congo. Also Southern Europe, Caucasus, Azores, Madeira, Canaries, Caribbean Islands, Central America.



**Fig. 441. *Anthoceros myriandroecius* Steph.**

Thallus-margin densely dissected into narrow rectangular, truncate lobes, sometimes crispate. Capsules up to 3 cm long. Spores 50-60  $\mu\text{m}$  in diameter, distal surface with baculate to spinate up to 4  $\mu\text{m}$  long tubercles, proximal surface covered with small subglobose tubercles. **Habitat:** Open soil in montane swamps between Cyperaceae, 2500 m. **Distribution in Rwanda: Nyungwe NP:** Rwasekoko, Pindura. **Distribution in Africa:** Kenya, Tanzania.



**Fig. 442. *Anthoceros punctatus* L.**

Thallus-margin remotely or somewhat pinnately dissected into broad rectangular lobes. Capsules up to 5-7 cm long. Spores 42-62  $\mu\text{m}$  in diameter, distal surface with numerous spines or tubercles, tubercles compressed and often divided distally, proximal surface foveolate and nearly smooth. **Habitat:** Open soil and roadcuts along paths in montane forests, 1600-3000 m. **Distribution in Rwanda:** **Volcano NP:** between Sabyinyo and Gahinga, Lac Ruhondo. **Gishwati Forest:** Gikungu. **Nyungwe NP:** Gisakura. **Central Rwanda:** Butare. **Distribution in Africa:** DR Congo. Also Europe, Canaries, Cape Verde, North America, South America.



**Fig. 443. *Anthoceros sambesianus* Steph.**

Thallus-margin remotely or somewhat pinnately dissected into broad rectangular lobes. Spores 34-42  $\mu\text{m}$  in diameter, distal surface covered with spinulate tubercles less than 3  $\mu\text{m}$  long, often united at base, proximal surface with indistinct reticulate ridges and small subglobose tubercles. **Habitat:** Open soil and roadcuts along paths in montane forests, 2100-2500 m. **Distribution in Rwanda:** Nyungwe NP: Uwinka, Karamba. **Distribution in Africa:** Zambia, Zimbabwe.



**Fig. 444. *Notothylas flabellata* Steph.**

Thalli lobed or dichotomously branched, forming small rosettes usually 1-2 cm long, variously lobed or lacinate, with large mucilage-containing cells, large intercellular cavities lacking. Capsules short, usually not exceeding 5 mm of length, lying more or less horizontally on thallus, almost entirely covered by involucrem, columella lacking. Spores black, tuberculate on both faces, 25-30  $\mu\text{m}$  in diameter. **Habitat:** Open soil and roadcuts along paths in montane forests, 2000 m (usually below 1000 m). **Distribution in Rwanda:** Nyungwe NP: Cyamudongo Forest. **Distribution in Africa:** Cameroon, Angola.



**Fig. 445.** *Phaeoceros carolinianus* (Michx.) Prosk.

Thalli deep to dark green, fleshy, variable in size, usually forming rosettes, without a midrib, margins entire to crenate. Dorsal surfaces smooth. Transverse sections solid, without mucilaginous cavities, with scattered *Nostoc* colonies. Monoicous. Capsules when mature erect, linear, with epidermal stomata and well developed columella, up to 3-4 cm long. Spores yellow, with distal surfaces densely papillate to spinulate throughout.

**Habitat:** Open soil and roadcuts along paths in montane forests, 1600-3000 m.

**Distribution in Rwanda:** Volcano NP: Sabinyo, Gahinga, Muhavura, Mukamira between Ruhengeri and Gisenyi. **Gishwati Forest:** Gikungu. **Central Rwanda:** Lac Bulera, Butare.

**Nyungwe NP:** Cyamudongo Forest, Rwasenkoko, Uwinka, Gisakura. **Distribution in Africa:** Sierra Leone, Cameroon, DR Congo, Ethiopia, Uganda, Kenya, Tanzania, Angola, Zimbabwe, Malawi, Namibia, South Africa. Also Europe, Iceland, North America, Canaries, Madeira, Cape Verde, Madagascar, Réunion, Asia.





**Fig. 446. *Phaeoceros fulvisporus*** (Steph.) Hasegawa

Synonym: *Anthoceros fulvisporus* Steph. Similar to *Phaeoceros carolinianus* and differing mainly in the spores with distal surfaces densely papillate with scattered lamellae consisting of several papillae united at base. **Habitat:** Open soil and roadcuts along paths in montane forests, 2400-2500 m. **Distribution in Rwanda:** Nyungwe NP: Rwasenkokoko.

**Distribution in Africa:** Tanzania, South Africa.

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