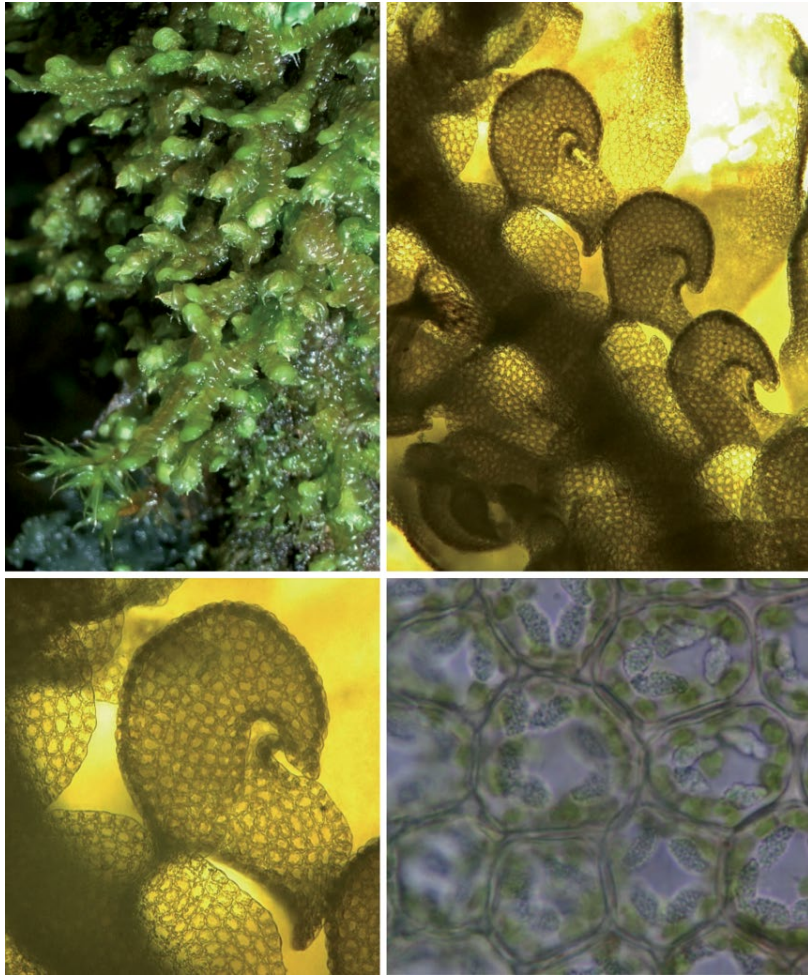


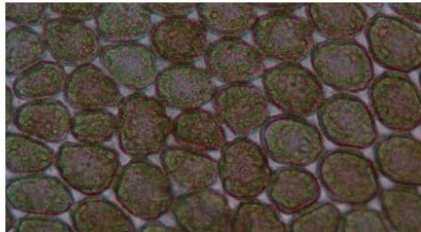
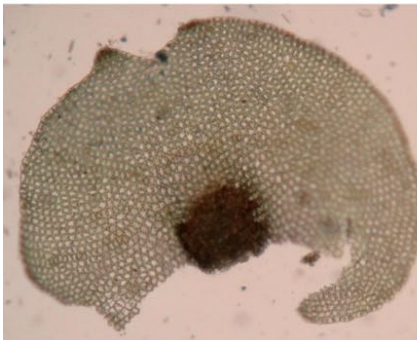
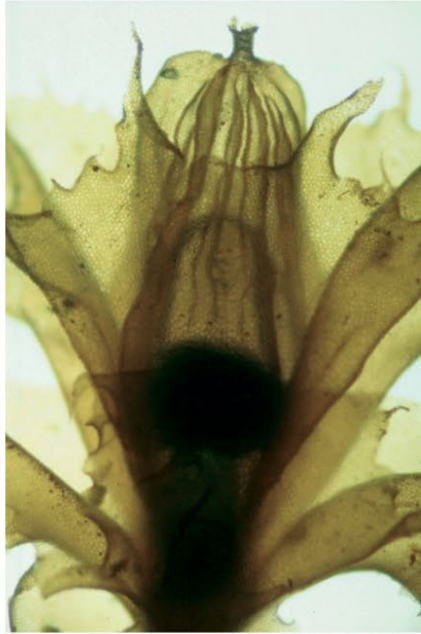


Figs 197 and 198 (next page). *Frullania apiculata* (Reinw., Blume & Nees.) Dumort. Plants dark brown to reddish, regularly pinnate-bipinnate, main axes forming fronds up to 2-5 cm long. Leaves imbricate. Leaf lobes oval, 0.5-0.8(-1) x 0.35-0.65(-0.8) mm, rounded and mucronate at apex, truncate at base. Lobules 0.18-0.25 mm long, 2-2.6 x as long as wide, on a stalk equalling or exceeding in length the diameter of the lobule, parallel to the stem, mouth projecting beyond lobe margin. Underleaves 2-3 x as wide as the stem, bilobed for 0.25-0.35 of their length. Autoicous. Perianths claviform, trigonous, smooth. **Habitat:** Epiphytic in montane forest, 2000 m. **Distribution in Rwanda :** **Nyungwe NP:** Karamba, Kamiranzovu, Uwinka. **Distribution in Africa:** Guinea, Ghana, Cameroon, Gabon, Rio Muni, DR Congo. Also Comoros, Madagascar, Mauritius, Réunion, Seychelles.





Figs 199 and 200 (next page). *Frullania arecae* (Spreng.) Gottsche
 Plants olive-green to reddish- or purplish brown, irregularly pinnate, main axes forming fronds up to 10 cm long. Leaves imbricate. Leaf lobes broadly ovate, 1-1.6 x 1.4-1.8 mm, convex, with basal auricle, rounded at apex, extending across stem. Lobules 0.55-1.5 x 0.2-0.5 mm, parallel to the stem, saccate portion helmet-shaped, rostrum large or small, decurrent, sometimes laminal portion longer than saccate part or lobule entirely laminal. Underleaves orbicular, 4-5 x as wide as the stem, bilobed for 0.1 of their length, base cordate or auriculate. Autoicous. Perianths cylindrical, with 8-10 long and smooth keels. **Habitat:** Epiphyte, e.g. on *Sinarundinaria*, *Erica* and *Dendrosenecio erici-rosenii*, occasionally on ground or roadcuts, 2330-3600 m. **Distribution in Rwanda: Volcano NP:** Karisimbi, in the saddle between Bisoke and Karisimbi, on the E-slopes along trail to summit. **Nyungwe NP:** Rwasekoko, along road from Butare to Cyanguu at border of Rusizi District. **Distribution in Africa:** Sierra Leone, Ghana, Nigeria, São Tomé, Bioko, Cameroon, DR Congo, Burundi, Ethiopia, Uganda, Kenya, Tanzania, Malawi, Zimbabwe, Mozambique, South Africa. Also Madagascar, Mauritius, Réunion.



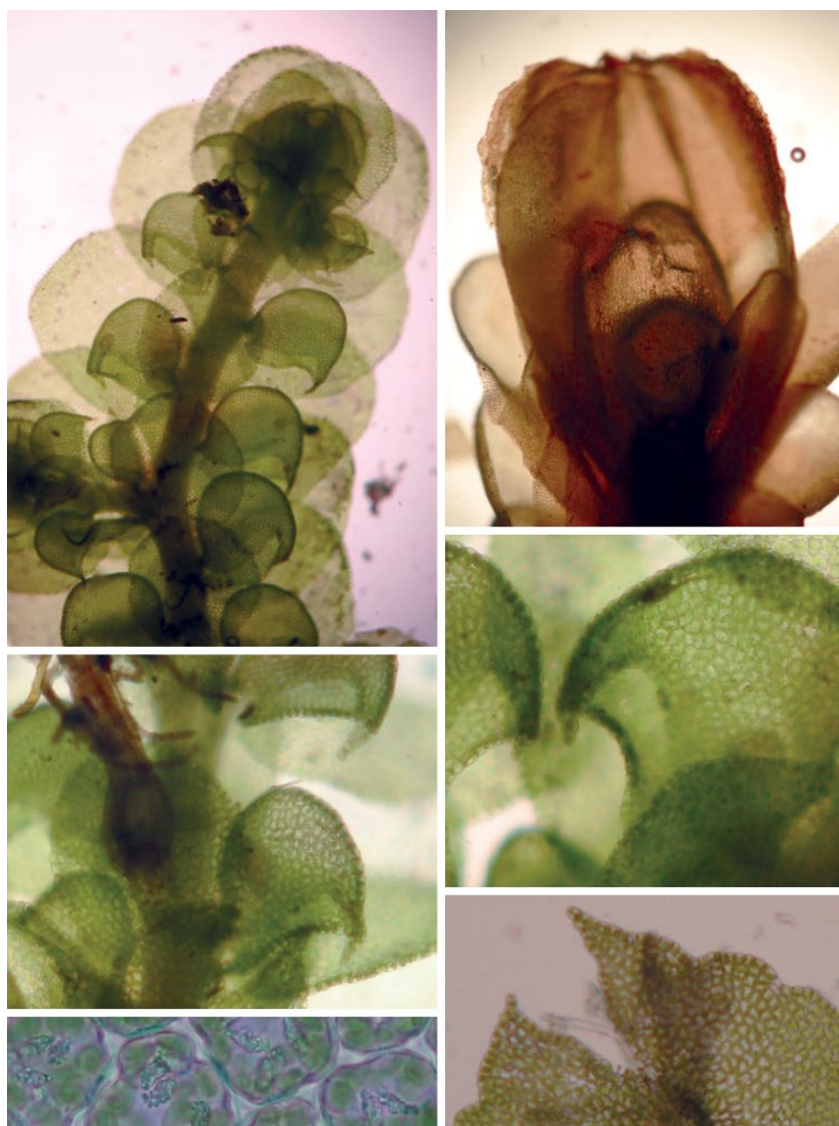


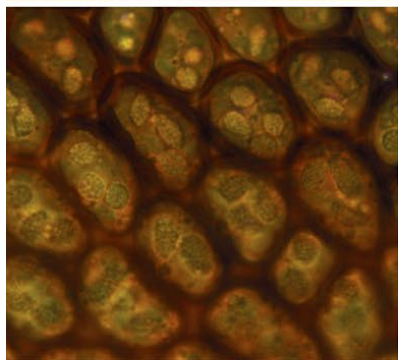
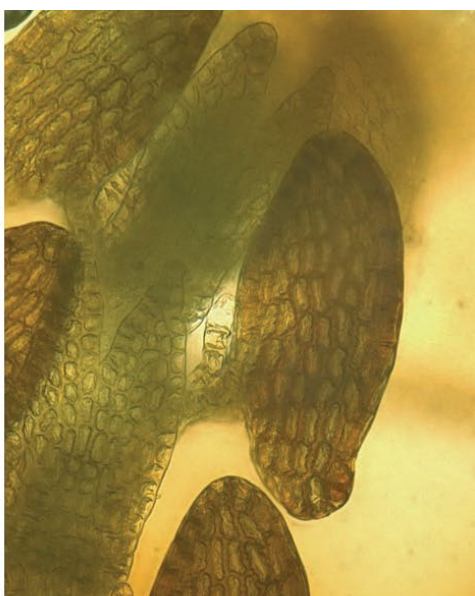
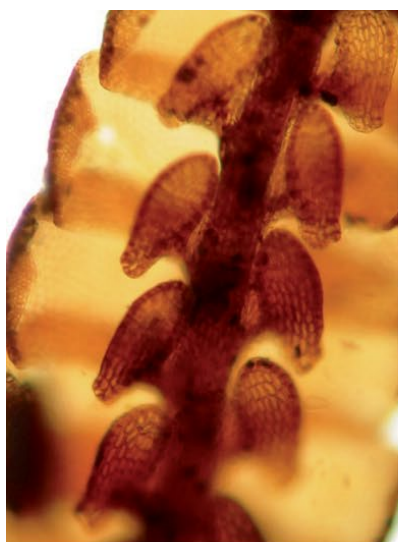
Fig. 201. *Frullania cafraria* Steph.

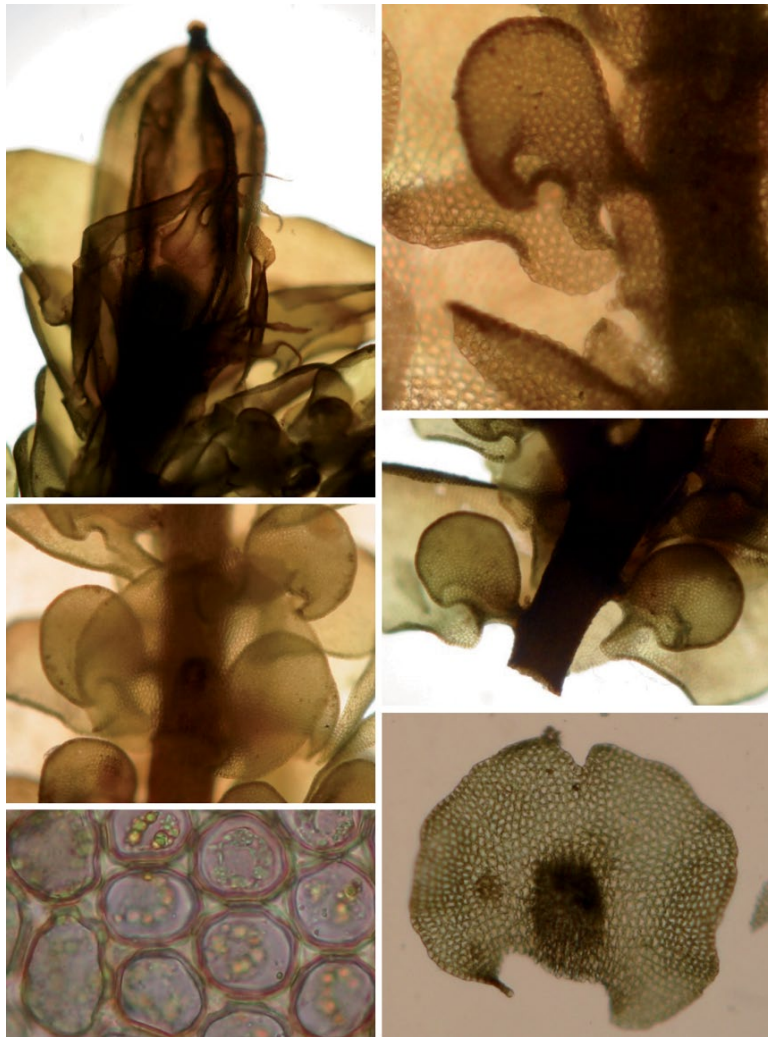
Plants olive-green to reddish- or purplish brown, large, irregularly pinnate, main axes forming lax mats. Leaves imbricate. Leaf lobes circular, 1-1.6(-2) x 1-1.25(-1.6) mm, convex, with basal auricle, rounded at apex. Lobules 0.4-0.65 mm long, helmet-shaped to widely bell-shaped, always with a curved apiculus. Underleaves suborbicular, 3-5 x as wide as the stem, very shortly bilobed. Dioicous. Perianths trigonous, claviform, smooth or with narrow verrucose keels. **Habitat:** Epiphytic in montane forest, also on planted trees. **Distribution in Rwanda: Central Rwanda:** Huye (Butare). **Distribution in Africa:** Nigeria, Bioko, Cameroon, Rio Muni, Eritrea, Ethiopia, Djibouti, Uganda, Kenya, Tanzania, Angola, Malawi, Zambia, Zimbabwe, South Africa. Also Madagascar, Mauritius, Réunion.



Figs 202 and 203 (next page). *Frullania capensis* Gottsche

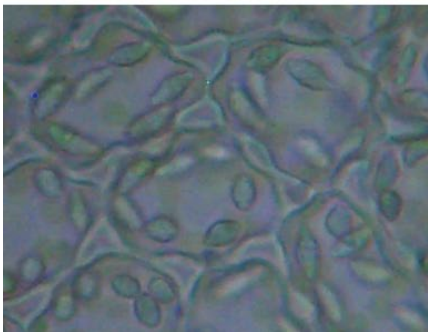
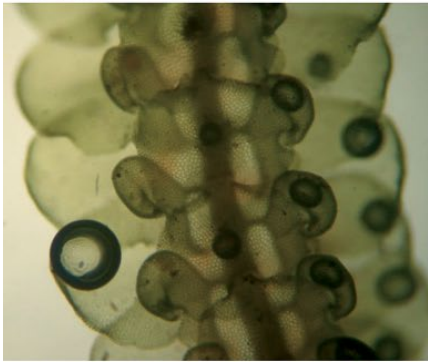
Plants dark reddish- or purplish brown to black, regularly pinnately branched. Leaves distant to slightly imbricate. Leaf lobes concave, ovate-reniform, 0.4-0.6 x 0.6-0.75(-0.8) mm, rounded at apex. Lobules clavate, attenuate at base, parallel to stem or, in branches, with apex directed to stem, 0.1-0.3 x 0.18-0.22 mm. Underleaves 1.2-2 x as wide as the stem, bilobed for 1/4-1/3 of their length, base cuneate. Monoicous. Perianths clavate, trigonous. **Habitat:** On quartzitic rocks in montane forest, 2000 m. **Distribution in Rwanda:** Nyungwe NP: Karamba. **Distribution in Africa:** Tanzania, Zimbabwe, Mozambique, South Africa. Also Madagascar, Réunion.

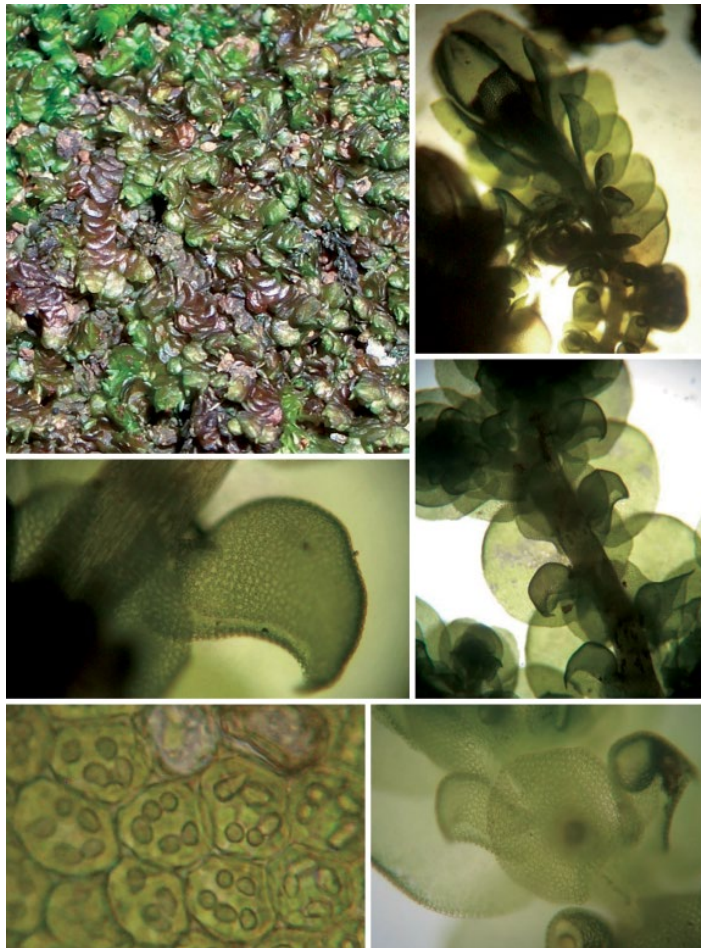




Figs 204 and 205 (next page). *Frullania depressa* Mitt.

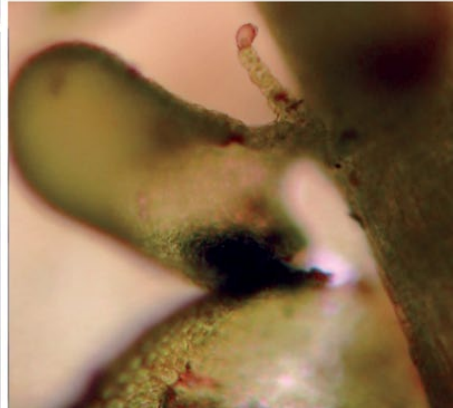
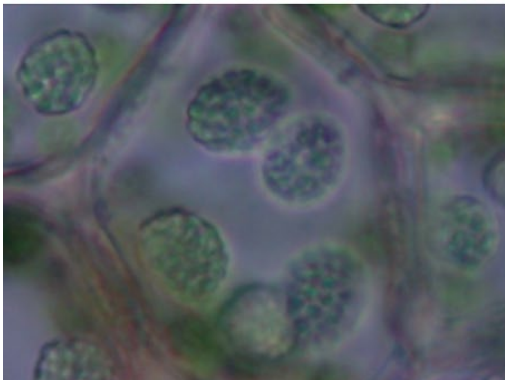
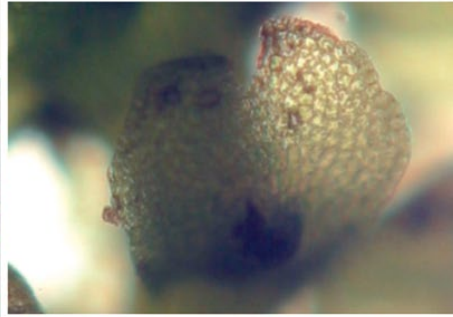
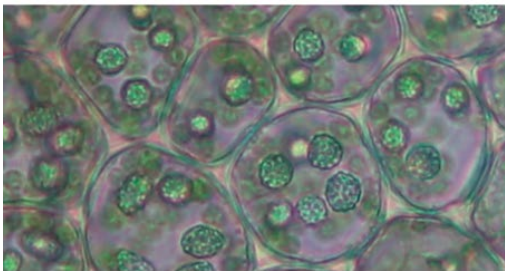
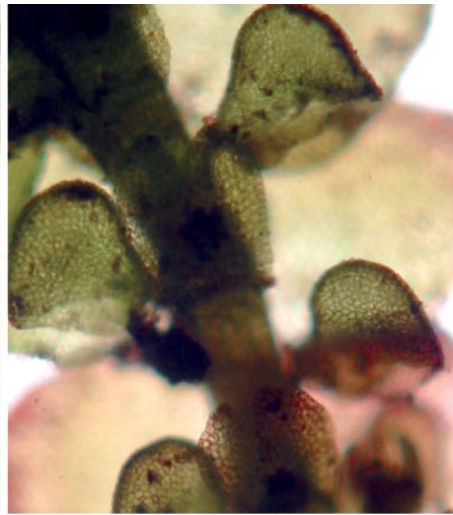
Plants brown to nearly purple-black, irregularly pinnate, main axes forming mats. Leaves imbricate. Leaf lobes oval or ovate, 0.8-1.4(-1.8) x 0.6-1(-1.25) mm, with basal auricle, rounded at apex. Lobules (0.35-)0.6-0.7(-0.8) x 0.3-0.4(-0.6) mm, diverging obliquely from the stem, inflated around apex, forming a rostrum on distal side, compressed towards mouth. Underleaves suborbicular, 3-5 x as wide as the stem, bilobed for 0.1-0.2 of their length, base rounded to cordate. Autoicous. Perianths subcylindrical, compressed, with 2 lateral and 2 ventral keels, dorsal face plane or with 1-3 low keels. **Habitat:** Epiphyte, e.g. on bark of *Erica* between 2330 and 2500 m. **Distribution in Rwanda:** Nyungwe NP: Rwasekoko, Uwinka, along road from Butare to Cyangugu at border of Rusizi District. **Distribution in Africa:** Sierra Leone, Nigeria, Bioko, Cameroon, DR Congo, Burundi, Ethiopia, Uganda, Kenya, Tanzania, Malawi, Zimbabwe, Lesotho, South Africa. Also Comoros, Madagascar.

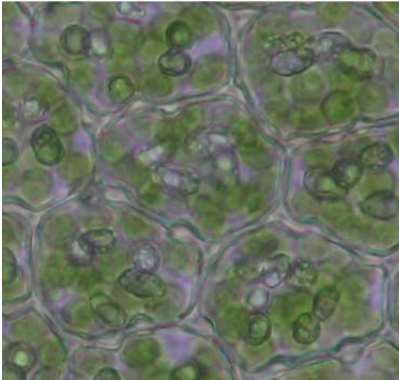
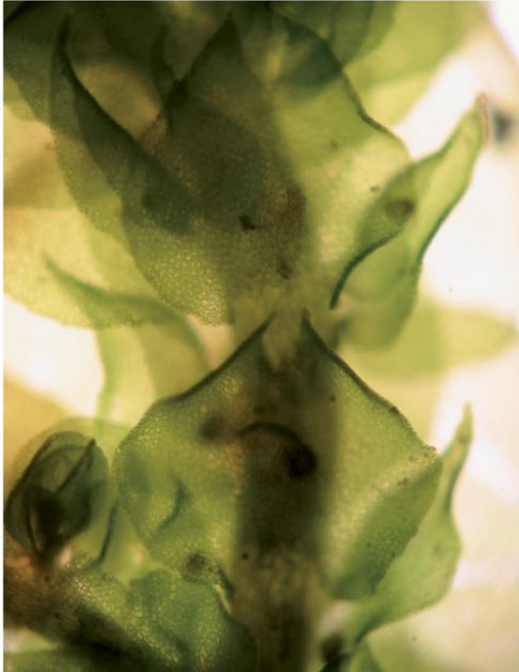
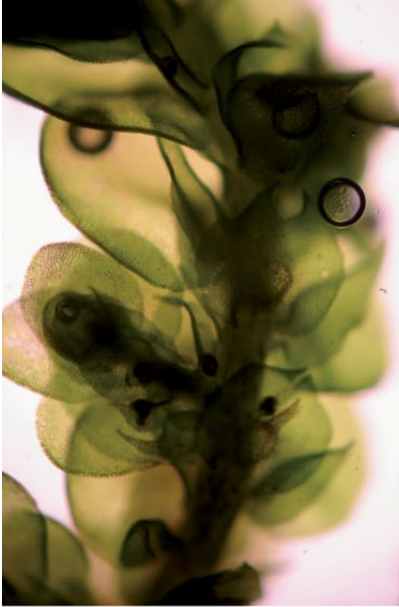




Figs 206, 207 and 208 (next pages). *Frullania ericoides* (Nees) Mont.

Plants dull green to dark brown, irregularly pinnate. Leaves laxly imbricate when dry, curved upwards and squarrose when moist. Leaf lobes oval to round, 0.9-1.1 x 0.6-0.7(-0.95) mm, with basal auricle, rounded at apex, extending across stem. Lobules 0.2-0.38 mm long, very variable in size, well developed about as long as wide, sometimes lobule entirely laminal. Underleaves 2-4 x as wide as the stem, longer than wide, bilobed for 0.15-0.35 of their length, base cuneate. Dioicous. Perianths claviform or cylindrical, trigonous, sometimes with 1-2 weak supplementary keels, upper part with short processes. **Habitat:** On rocks and on bark of trees in montane forest, savanna and cultivated landscape, 1300-2500 m. **Distribution in Rwanda:** Gishwati Forest: W of Gakarara. **Nyungwe NP:** Rwasenkoko. **Central Rwanda:** Butare, Rubona, Songa. **Akagera:** Lake Ihema, Lake Mpanga region. **Distribution in Africa:** One of the most widespread species. Guinea, Sierra Leone, Ghana, Togo, Nigeria, Annobon, Bioko, Cameroon, Congo-Brazzaville, Central African Republic, Gabon, DR Congo, Burundi, Ethiopia, Uganda, Kenya, Tanzania, Angola, Zambia, Zimbabwe, Malawi, Mozambique, South Africa. Also Canaries, Cape Verde.





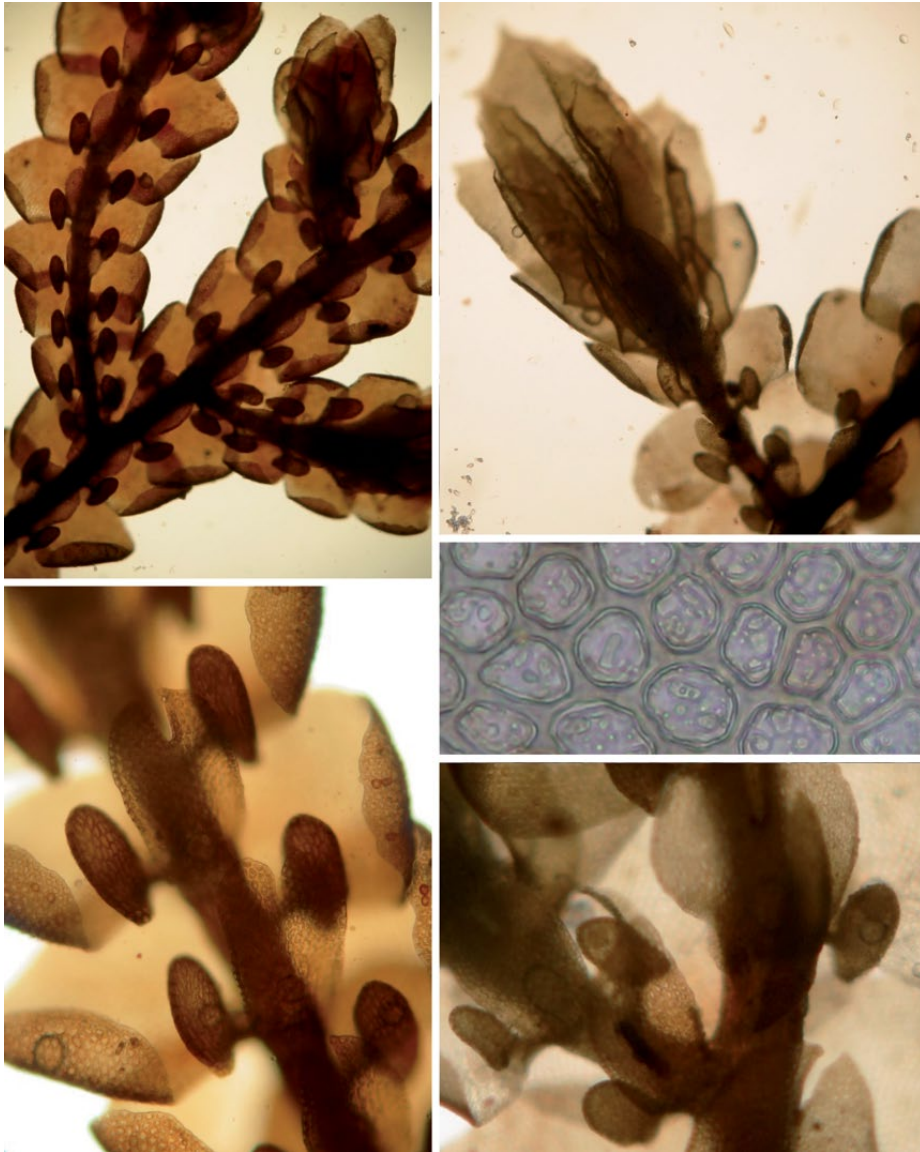


Fig. 209. *Frullania imerinensis* Steph.

Plants brown, regularly pinnate or bipinnate. Shoots 2-4(-6) cm long and 0.9-1.1(-1.5) mm wide. Leaves imbricate. Leaf lobes 0.75-1 x 0.58-0.75 mm, rounded at apex, concave, ovate to reniform, obtuse to rounded at base, incurved at apex. Lobules clavate, 0.25-0.45 mm long, 2-2.5 x as long as wide, arranged parallel to the stem, mouth attenuate. Underleaves 2.5-3 x as wide as the stem, bilobed for 0.25-0.35 of their length. Dioicous. Perianths claviform or fusiform, trigonous, smooth, 2-2.1 x 0.6-0.8 mm. **Habitat:** Epiphytic in montane forest. **Distribution in Rwanda:** Nyungwe NP: Recorded by De Sloover without precise locality. **Distribution in Africa:** Madagascar, Seychelles.

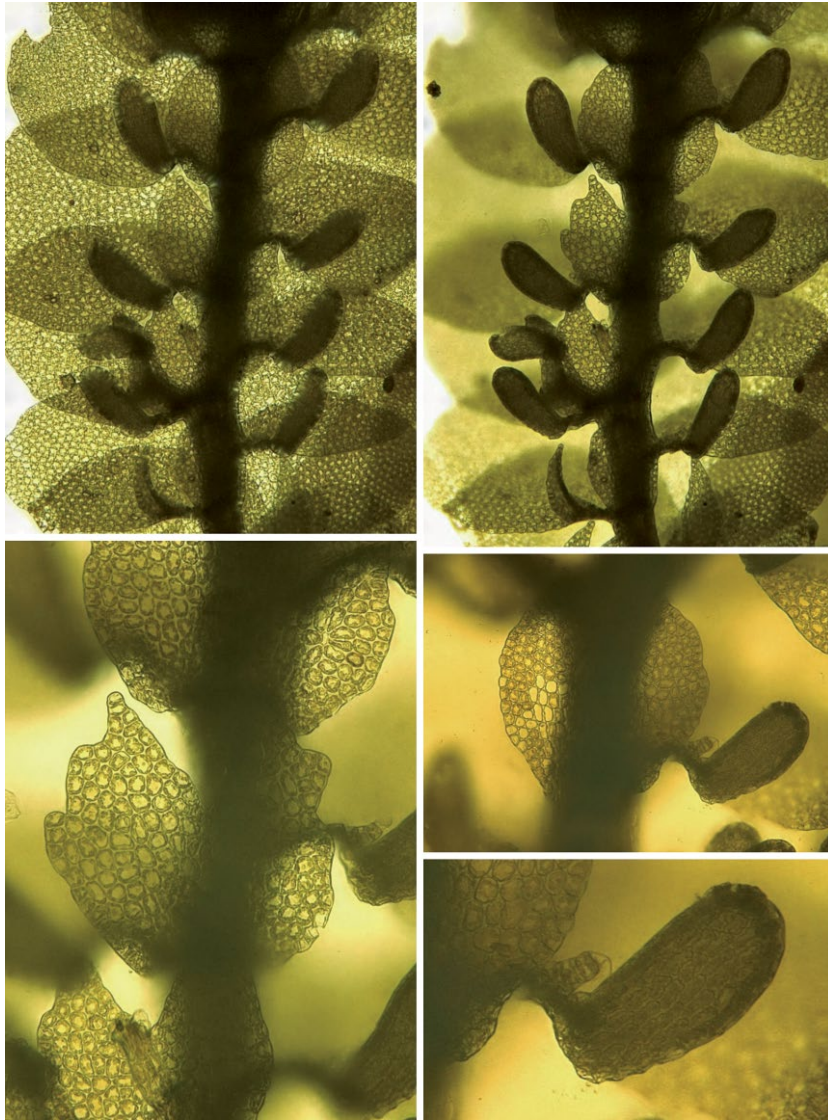
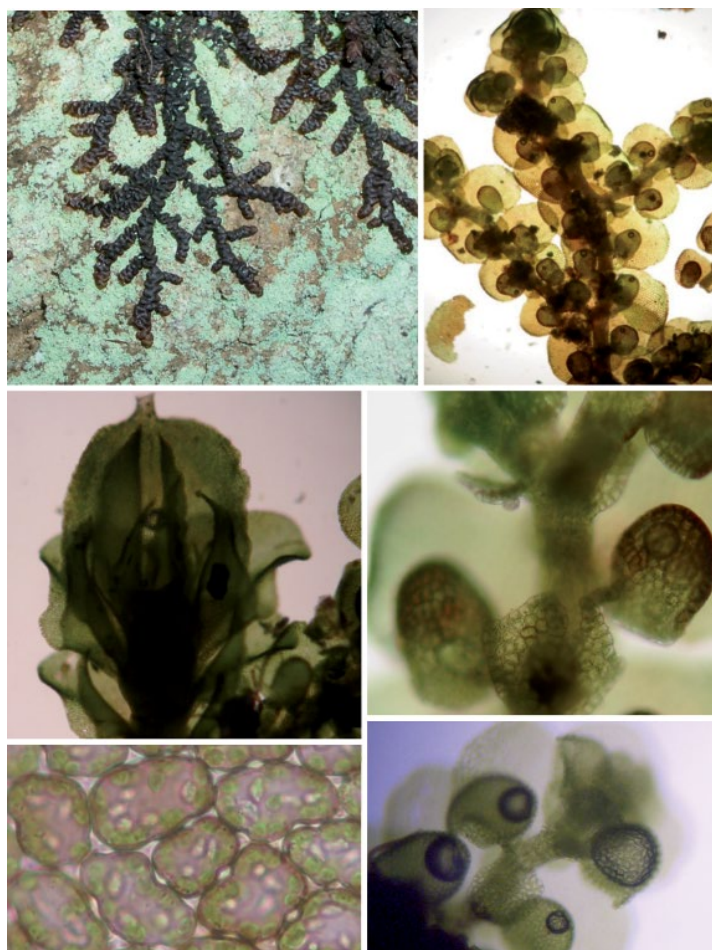


Fig. 210. *Frullania lindenbergii* Lehm.

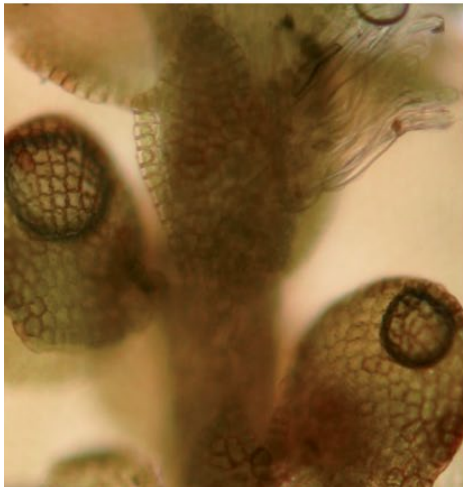
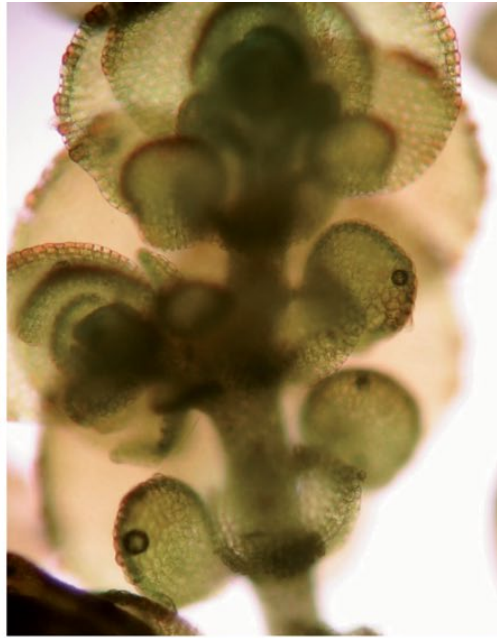
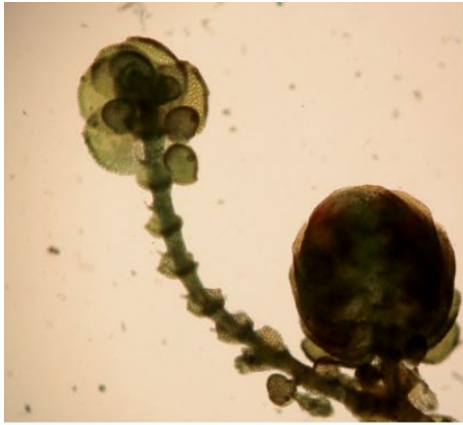
Plants pale-green, yellow-brown to carmin-brown, regularly bipinnate. Leaves imbricate, squarrose when moist. Leaf lobes ovate, 0.6-0.9(-1.2) x 0.9-0.1.2(-1.5) mm, rounded to obtuse at apex. Lobules with distinct peduncle, cylindrical-clavate, attenuate at base, forming an angle of (20-)30-45° with stem, up to 90° in young branches, 0.1-0.2 x 0.24-0.45 mm. Underleaves (2-)3-5 x as wide as the stem, bilobed for 1/4-1/3 of their length, lobes acute, usually with 1-2 teeth at lateral side. Monoicous. Perianths clavate, trigonous.

Habitat: Epiphytic in montane forest, 2000 m. **Distribution in Rwanda:** Nyungwe NP: Gisakura. **Distribution in Africa:** Tanzania, Zimbabwe, Mozambique, South Africa. Also Réunion.



Figs 211 and 212 (next page). *Frullania obscurifolia* Mitt.

Plants dark reddish- or purplish brown to black, irregularly branched. Leaves distant to slightly imbricate, squarrose when moist, sometimes caducous. Leaf lobes ovate, 0.3-0.6 x 0.28-0.45 mm, with basal auricle, rounded at apex. Lobules large relative to lobe, often 0.5 or more of lobe length, 0.2-0.3 x 0.12-0.2 mm. Underleaves 1.2-2 x as wide as the stem, bilobed for 0.5-0.75 of their length, base cuneate. Dioicous or autoicous. Perianths ovoid, with 5 principal keels. **Habitat:** Epiphytic, rarely rupicolous in montane forest, savanna, gallery forest and cultivated landscape, 1300-2500 m. **Distribution in Rwanda:** **Lake Kivu:** Rubavu (Gisenyi). **Gishwati Forest:** W of Gakarara. **Nyungwe NP:** Rwasekoko. **Central Rwanda:** Lac Bulera. **Akagera:** Bugesera, Lake Ihema, Lake Mpanga region. **Distribution in Africa:** Sierra Leone, Ghana, Nigeria, Annobón, Cameroon, Congo-Brazzaville, DR Congo, Burundi, Ethiopia, Djibouti, Uganda, Kenya, Tanzania, Angola, Malawi, Zambia, Zimbabwe, Mozambique, Lesotho, Swaziland, South Africa. Also Comoros, Madagascar, Mauritius, Réunion, Rodriguez, Seychelles. **Note:** *De Sloover* 13548, cited by Vana *et al.* (1979) from Rwanda as *F. variegata* has numerous propagules and thus represents typical *F. obscurifolia*.



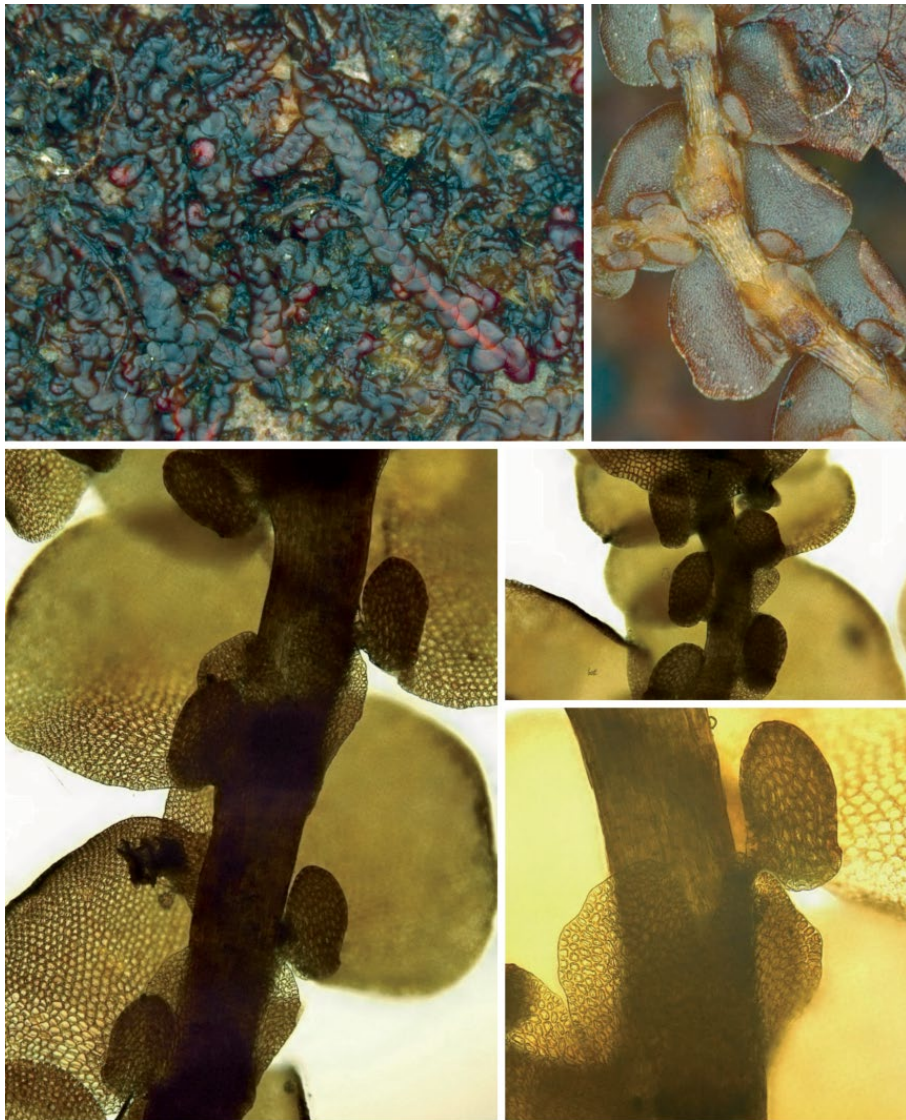
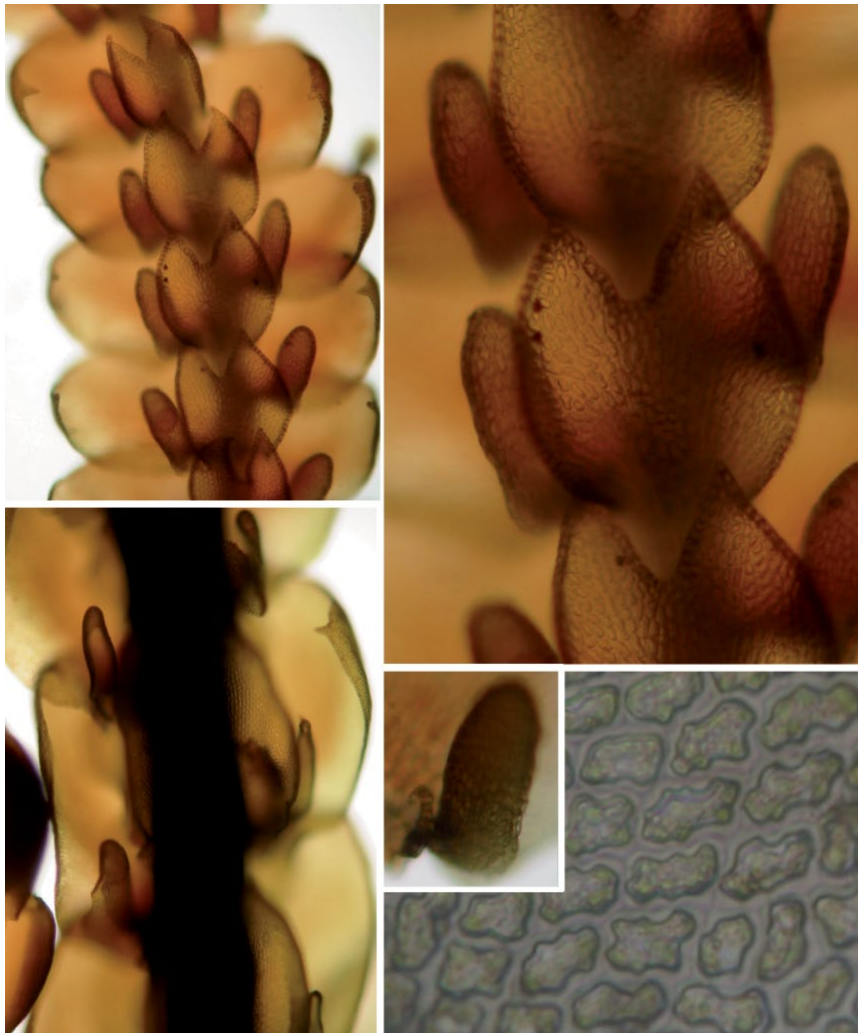


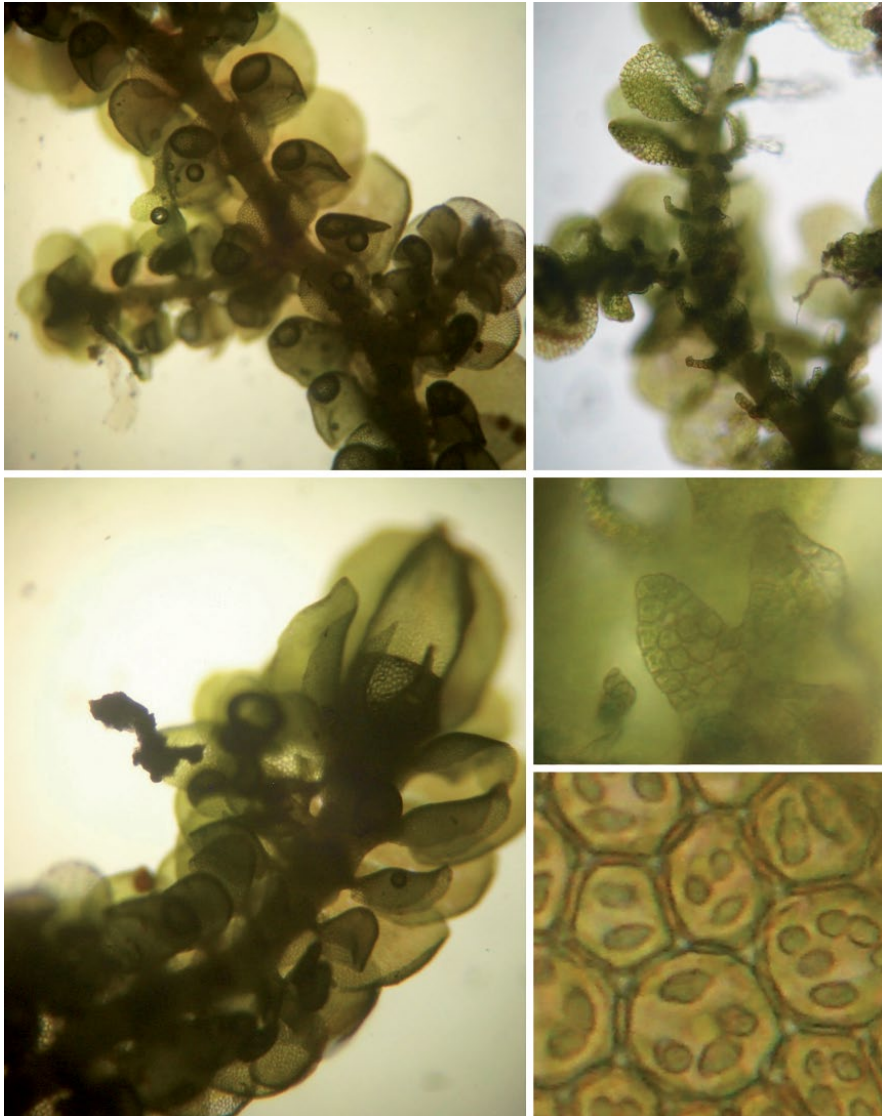
Fig. 213. *Frullania schimperi* Nees in Gottsche, Lindenb. & Nees
 Plants brown to nearly black, regularly or irregularly pinnate to bipinnate, 4-6 cm long. Leaves imbricate. Leaf lobes concave, ovate-reniform, 0.8-1 x 0.6-0.9(-1) mm, rounded or apiculate at apex. Lobules 0.2-0.3 mm long, 2 x as long as wide, claviform, nearly parallel to stem, narrowed at base. Underleaves suborbicular to oval, 3-5 x as wide as the stem, bilobed for 0.25 of their length. Dioicous. Perianths claviform or fusiform, trigonous. **Habitat:** Epiphytic on roadside trees, probably also in montane forest, 1400 m. **Distribution in Rwanda:** Lake Kivu: Rubavu (Gisenyi). **Distribution in Africa:** Cameroon, Burundi, Ethiopia, Kenya, Tanzania. Also Madagascar.



Figs 214 and 215 (next page). *Frullania serrata* Gottsche

Synonym: *Frullania mildbraedii* Steph. Plants olive-green to dark brown, pinnate-bipinnate, fronds 5-10 cm long in loose tufts. Leaves imbricate. Leaf lobes concave, oval, 1-1.2 x 0.75-0.85(-1.2) mm, rounded and obtuse at apex, usually apiculate, auriculate at base. Lobules claviform-cylindrical, 0.24-0.36 mm long, 2.5-3.5 x as long as wide, often hidden by underleaves. Underleaves 4-5 x as wide as the stem, bilobed for 0.3 of their length. Autoicous. Perianths fusiform, trigonous, smooth. **Habitat:** Epiphyte on trunks of trees, on branches and occasionally on rocks, in montane forest and cultivated landscape, 2000-2700 m. **Distribution in Rwanda:** Lake Kivu: Rubavu (Gisenyi). **Nyungwe NP:** Rwasenkoko, waterfall c. 3 km E of Pindura, Karamba, along abandoned road to Burundi. **Distribution in Africa:** São Tomé, Cameroon, DR Congo, Ethiopia, Uganda, Kenya, Tanzania, Zimbabwe, Malawi, Mozambique, South Africa. Also Comoros, Madagascar, Mauritius, Réunion.





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.