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WESTERN MOUNT KENYA BRYOPHYTES - I

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ABSTRACT

The bryophyte composition of the western side of Mt Kenya between 2,400 and 5,199 m was studied. Ninety-nine species were identified, 66 belonging to Bryopsida and 33 to Hepaticopsida. The greatest diversity in terms of species numbers and life forms comes from the montane forests where ideal conditions of temperature, rainfall, humidity and altitude for bryophyte growth are found. This diversity decreases as altitude increases.

INTRODUCTION

Mt Kenya lies about 170 km north of Nairobi on Kenya's Eastern Highlands. Its mass is a large volcanic cone with a diameter of about 120 km at its base. Its summit area has a jagged glacial topography of aretes (knife-edge ridges), pyramidal peaks, U-shaped valleys and rock basins containing glacial lakes known as tarns. The lower slopes are drained by many streams in steep-sided valleys, forming a radial drainage pattern (Nyamweru, 1987).

The climate of Mt Kenya is dominated by the Tropical Easterly Wind Belt. Rainfall comes with the monsoon: dry conditions prevail from December to March, wet conditions occur from March to May and from mid-October to December. Precipitation at 3,000 m is estimated at 1,525 mm whereas mean annual temperature is 7.2 °C, mean maximum is 16.2 °C and mean minimum is 1.7 °C. The southern and western slopes, because of the prevailing winds, are by far the wettest.

The distribution of vegetation is influenced by climatic factors of rainfall and temperature and altitude. The forest lies between approximately 1,900 m and 3,300 m, containing areas of indigenous forests and areas of forest plantations, merging into the bamboo (*Arundinaria alpina*) and *Hagenia-Hypericum* zones with increasing altitude. This zone merges into that of giant heather (*Dendrosenecio keniodendron*), often forming prominent stands up to 4 m high, interspersed with clumps of tussock grass. Above this area, open moorlands continue right up towards the base of the peaks where the vegetation becomes sparse and small as the climate becomes drier and cooler except along streams or in boggy areas.

METHOD AND MATERIALS

The study is based on collections of specimens in the field and their identifications in the laboratory.

COLLECTING LOCALITIES

The collecting localities are situated along the Naro Moru Route up the mountain from 2,400 m upwards, along the Southern and Northern Naro Moru River in the Teleki Valley, around the tarns and up to the peak of Batian at 5,199 m asl.

ECOLOGY

The bryophytes collected are found on a great variety of habitats. Many are terrestrial, growing on the ground, by stream banks or boggy areas; some are found on rocks or on wet rock clefts and others occur as epiphytes on trunks and branches of trees, shrubs and giant groundsels.

LIST OF SPECIES

This publication is the first of a series of four to present the 99 species of bryophytes (mosses and liverworts) collected from western Mt Kenya. Basically a morphological study, the characteristic morphological characters which aid identification in the field and in the laboratory are presented here. The descriptions are, therefore, incomplete. The first three publications present the 66 species of Bryopsida with their accompanying illustrations and the fourth publication presents 33 species of Hepaticopsida with illustrations. In the following list the bryophytes are arranged in systematic order which, with a few exceptions, follows Smith (1978) for the mosses and Schuster (1966) for the liverworts. The collector's name and collecting numbers follows the specific name. The abbreviations stand for: MSC for M.S. Chuah, BR for J.E. Braggins, ADQ for A.D.Q. Agnew and S. Agnew and P for T. Pocs and Pocs *et al.*

= BRYOPSIDA =

Sphagnaceae

Sphagnum davidii Warnst. (fig. 1)

MSC 30, 34, 27a, 144a

Altitude range: 3,500–3,700 m

Plants terri-colous, medium to large, greenish-yellow to light brown, forming tall tufts in acidic substrate. Stems erect, to 8 cm tall; in cross-section, cortex of large thin-walled hyaline parenchyma; central cylinder of outer small thick-walled and inner thin-walled parenchyma. Branches stout, short of limited growth in closely set fascicles. Rhizoids lacking in mature gametophyte. Stem-leaves small, thin, scale-like 1.5 mm long, sessile, spirally-arranged; margin entire, apex rounded; nerveless. Branch-leaves overlapping, closely set, ovate below to acute truncate-dentate tip; margin entire; upper margin inrolled; nerveless. Specimen sterile.

Legend: 1-portion of stem bearing a tuft of branches; 2-lateral branch; 3-stem leaf; 4-branch leaf; 5-upper leaf cells; 6-lower leaf cells; 7-basal leaf cells.

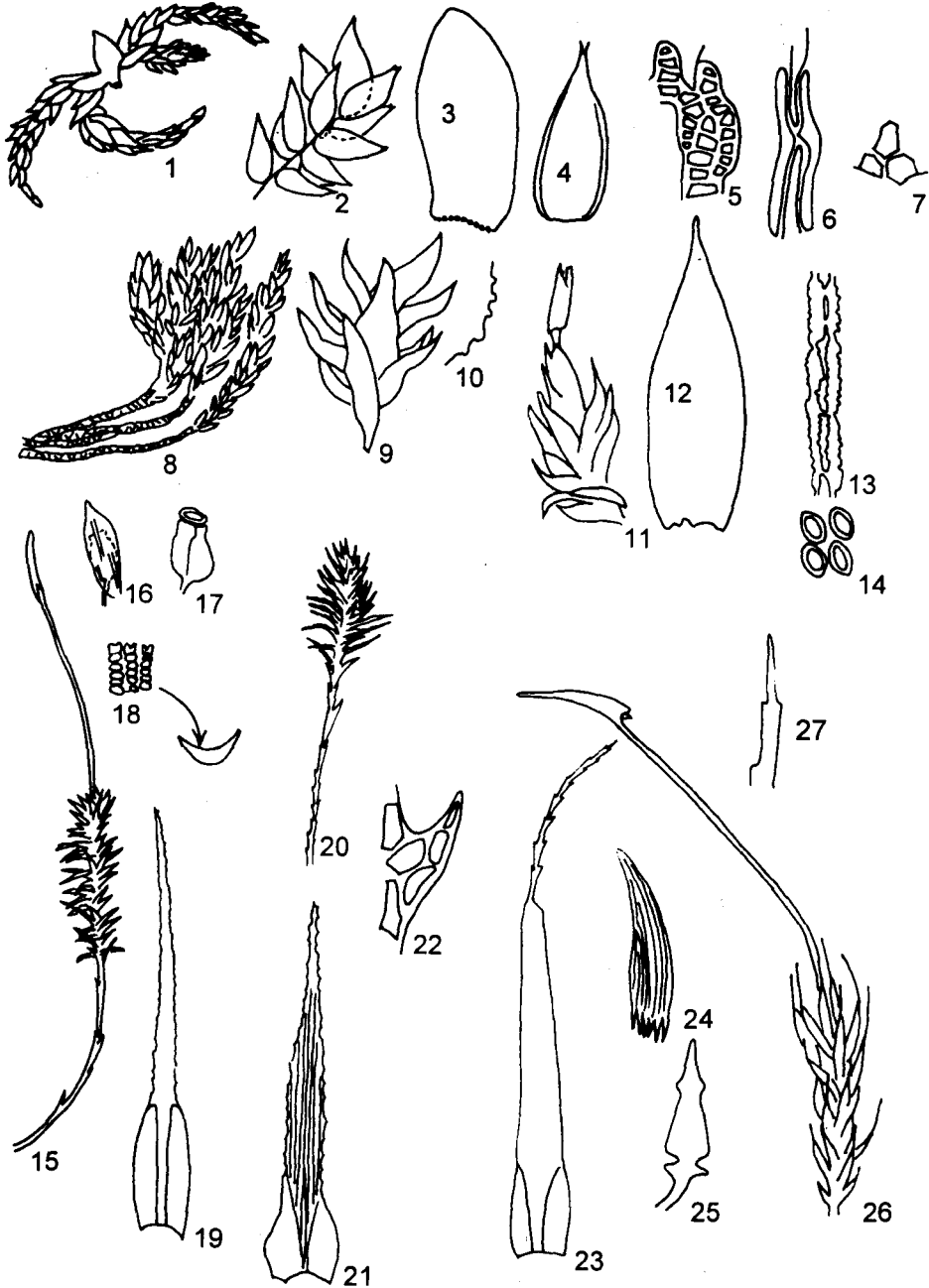


Figure 1. Legend see text

Andreaeaceae***Andreaea cucullata* Dix. (fig. 1)**

MSC 126b, 133b, 141a, 244, 260, 240, 263a, 121b, 174c, 242, 575

Altitude range: 3,700–4,985 m

Plants rupicolous, small, reddish-brown to blackish cushions, disintegrates easily when dry.

Stems erect, to 1.5 cm long, irregularly branched. Leaves crowded, small, oval to oblong; margin entire, incurved. Nerveless. Back of young leaves strongly papillose. Basal cells narrowly rectangular, sinuose with incrassate walls, shorter above; cells near apex rounded, hexagonal, incrassate. Capsule emergent, reddish-brown, four-valved.

Legend: 8-several stems; 9-portion of stem; 10-papillae on back of young leaf; 11-portion of apex with sporophyte; 12-leaf; 13-basal leaf cells; 14-upper leaf cells.

Polytrichaceae***Polytrichum commune* Hedw. (fig. 1)**

MSC 16a, ADQ 1023

Altitude range: 2,900–3,000 m

Plants terricolous, robust, tall and green. Stems strong, unbranched to 15 cm long. Leaves to 1 cm long, narrowly lanceolate, acuminate; margin toothed; sheathing base glossy and colourless. Leaf lamellae with notched terminal cells. Sporophyte to 9 cm long. Capsule four-sided. Calyptra hairy.

Legend: 15-plant with young sporophyte; 16-capsule with calyptra; 17-four-angled mature capsule; 18-leaf lamellae; 19-leaf.

***Pogonatum urnigerum* (Hedw.) P. Beauv. (fig. 1)**

MSC 82

Altitude: 3,550 m

Plants up to 10 cm tall, unbranched. Stems reddish-brown crowned by widely spreading leaves. Leaves lanceolate, acute to 0.5 mm long. Sheathing base broad; midrib broad, margin toothed, each tooth of several cells, apex pointed.

Legend: 20-plant; 21-leaf; 22-tooth.

***Polytrichum piliferum* Hedw. (fig. 1)**

MSC 4, 235a, 31, 274b, 94a, 36, 50a, 248, 35, 33

Altitude range: 3,000–4,300 m

Plants terricolous, reddish-brown, leaves crowded into short terminal tuft. Stems erect to 2 cm long, unbranched, bare of leaves for 1–1.5 cm closely set leaves at least 0.5 cm. Leaves to 4.5 mm long, closely appressed to stem when dry; sheathing base broad and colourless; narrow, green expanded limb ending into hyaline toothed hair point measuring one-third the length of leaf. Nerve broad. Seta 1.5 cm long, reddish; calyptra hairy, light to reddish-brown.

Legend: 23-leaf; 24-hairy calyptra; 25-young capsule; 26-plant with sporophyte; 27-leaf apex.

Ditrichaceae***Distichium capillaceum* (Hedw.) B.S.G. (fig. 2)**

MSC 39

Altitude: 4,200 m

Plants, medium to large, slender, forming compact soft tufts, green above, brown below.

Stems erect, radiculose, to 11.5 cm long. Leaves markedly distichous, reflexed when

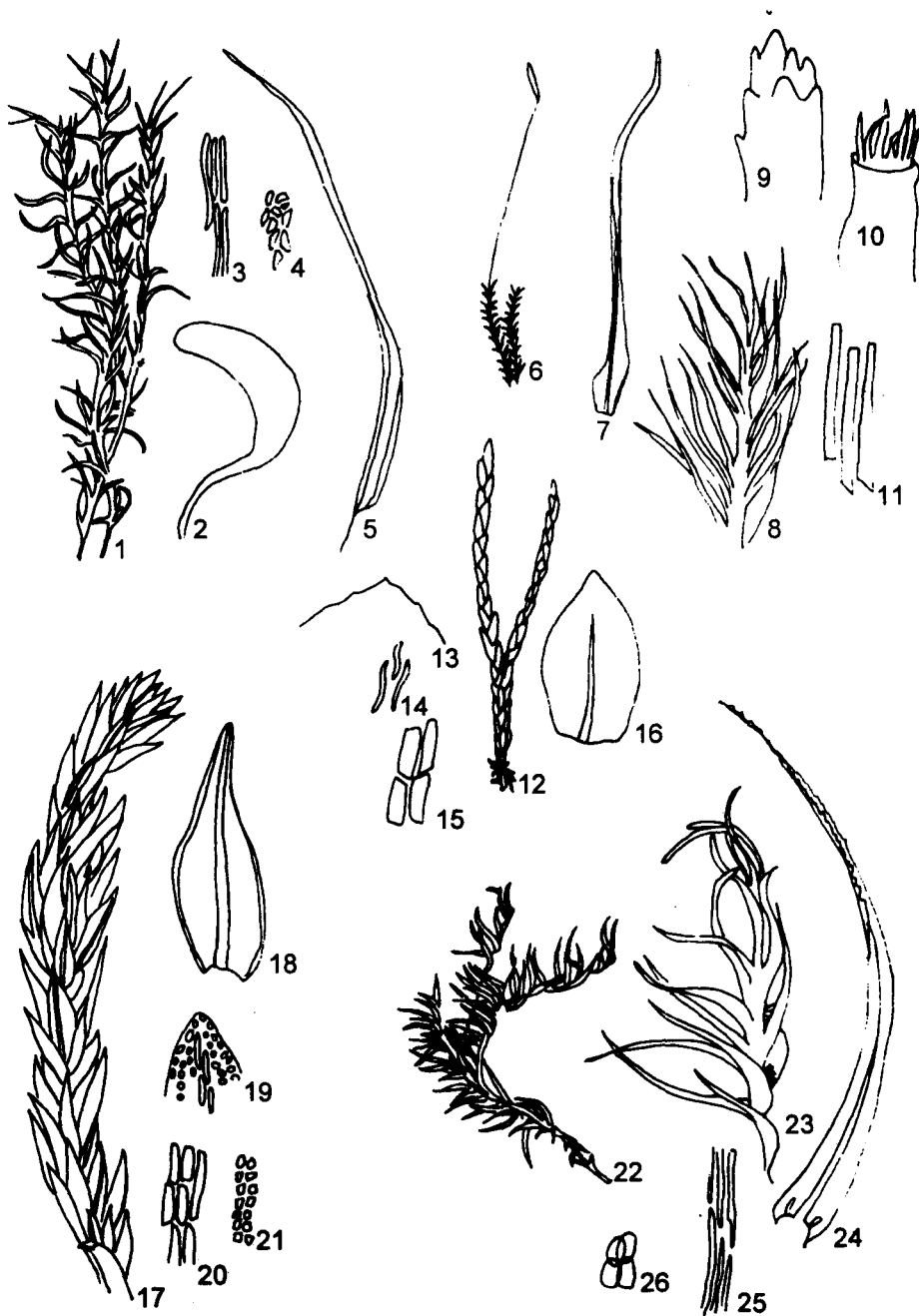


Figure 2. Legend see text

moist, basal part a whitish sheath, leaf narrows abruptly consisting mainly of nerve, tapering to long fine point. Capsule erect, cylindrical. Seta reddish.

Legend: 1-several shoots; 2-capsule; 3-basal sheath cells; 4-upper sheath cells; 5-leaf.

Dicranaceae

Atractyllocarpus alticaulis (Broth.) Williams. (fig. 2)

P 9236/AH

Altitude: 3,000 m

Plants yellowish-green, growing in tufts on ground. Stems to 1.5 cm long. Leaves long, slender, 0.5 cm long, tapering from fairly broad base to long fine point. Basal leaf cells hyaline, long, rectangular up to 51 μ m long. Plants commonly fertile; seta light brown up to 3 cm long. Capsule cylindrical up to 2.5 mm long.

Legend: 6-fertile plant; 7-leaf; 8-part of shoot; 9-leaf tip; 10-peristome teeth; 11-basal leaf cells.

Aongstroemia julacea (Hook.) Mitt. (fig. 2)

P 9240/P

Altitude: 3,300 m

Plants yellowish-green, terricolous. Stems slender, julaceous, up to 1.5 cm long. Leaves appressed to stem, short, oval, 1.5 mm long; apex rounded to apiculate; margin plane; nerve ending below apex. Upper leaf cells vermicular 48 μ m long; basal cells rectangular 48 μ m long.

Legend: 12-plant; 13-leaf tip; 14-upper leaf cells; 15-basal leaf cells; 16-leaf.

Ceratodon purpureus (Hedw.) Brid. (fig. 2)

MSC 236a, 50b, 274c

Altitude range: 3,000–3,950 m

Plants reddish-brown in tufts on soil. Stems branched to 1.5 cm long. Leaves ovate to narrowly lanceolate; margin recurved. Nerve percurrent. Basal cells rectangular; mid-leaf cells quadrate to irregularly hexagonal.

Legend: 17-plant; 18-leaf; 19-leaf tip; 20-basal leaf cells; 21-mid leaf cells.

Dicranum johnstonii Mitt. (fig. 2)

MSC 322

Altitude: 3,100 m

Plants terricolous and epiphytic, robust with leaf tips curved to one side. Stems to 10 cm long, branched, tomentose. Leaves 1 cm long, soft and glossy, flexuose when dry, lanceolate tapering to channelled subula; margin entire below, serrated above. Nerve narrow. Basal cells rhomboidal; mid leaf cells vermicular. Seta yellowish above, reddish below. Capsule cylindrical, curved, 4 mm long.

Legend: 22-plant; 23-part of shoot; 24-leaf; 25-mid leaf cells; 26-basal leaf cells.

Campylopus jamesonii (Hook.) Jaeg. (fig. 3)

MSC 1

Altitude: 3,000 m

Plants terricolous, robust, yellowish-green in tufts. Stems to 14 cm long, tomentose, reddish brown tomentum. Leaves to 1.4 mm long, lanceolate, gradually tapering to apex; margin entire below, toothed close to apex. Nerve broad, percurrent. Basal (alar) cells enlarged, hyaline, thick walled; upper cells rectangular.

Legend: 1-leaf; 2-leaf base with radicles (alar region-shaded); 3-cells just above alar region; 4-alar cells; 5-marginal cells near leaf apex; 6-plant.

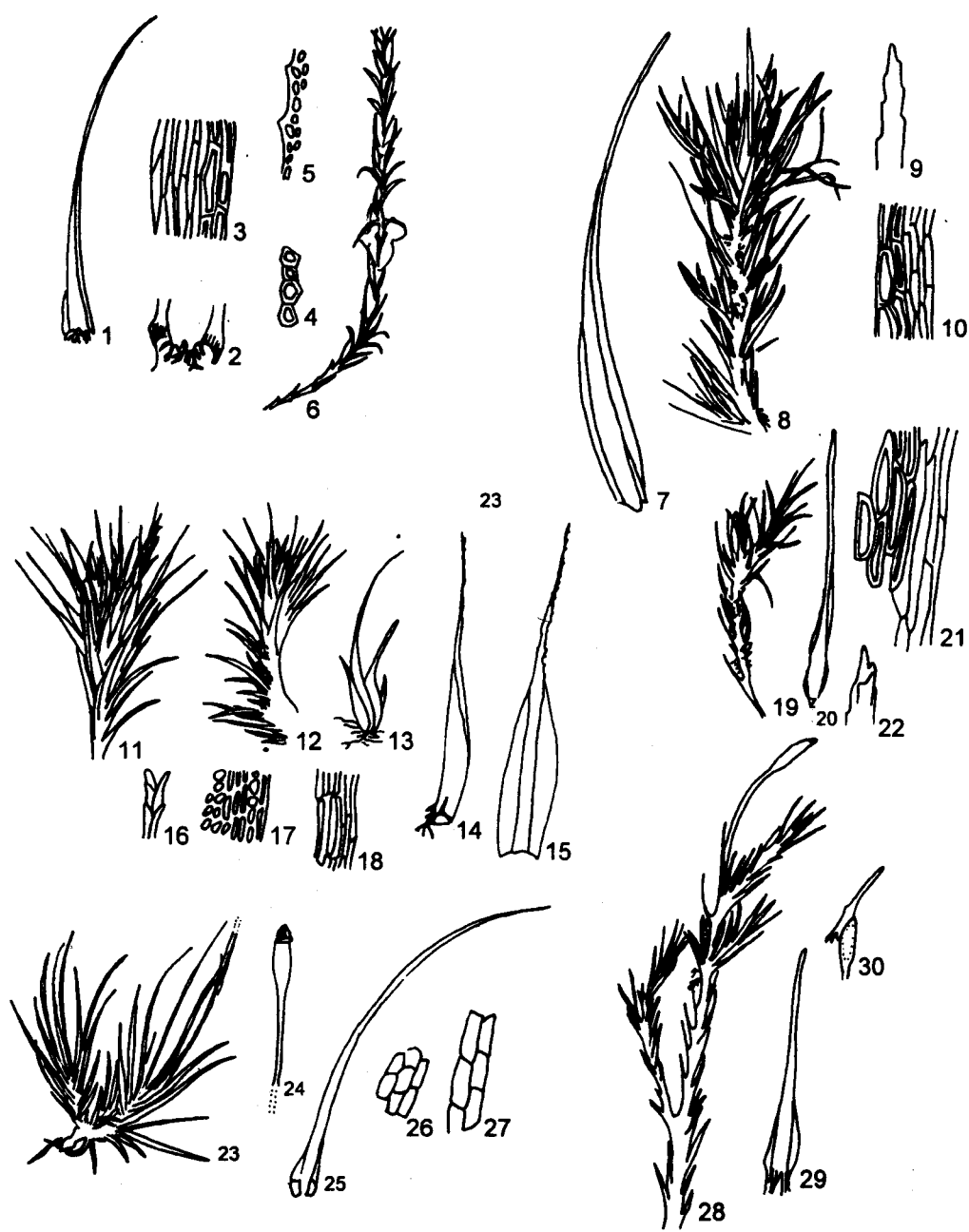


Figure 3. Legend see text

Campylopus nivalis (Brid.) Brid. (fig. 3)

MSC 188b, 94c, 149a, 139b, 272b, 209b, 207, 195, 196

Altitude range: 2,900–4,490 m

Plants terricolous, yellowish green in extensive tufts. Stems 1–2 cm long, unbranched, tomentose; tendency to break off shoots resulting in light green fragments on surface of green carpets of the moss. Leaves lanceolate, gradually contracted to long slender subula; margin entire below, toothed towards leaf apex. Nerve broad, percurrent. Basal cells rectangular, auricles absent; midleaf cells trapeziform to rectangular. Vegetative reproduction by means of shoot tips

Legend: 7-leaf; 8-part of shoot; 9-leaf tip; 10-basal cells.

Campylopus hildebrandtii (C. Muell.) Jaeg. (fig. 3)

MSC 189a

Altitude: 3,600 m

Plants yellowish green in compact tufts at base of *Lycopodium saururus*. Stems erect, to 8 cm long, branched, with reddish brown tomentum. Leaves linear, lanceolate, tapering to long slender subula. Nerve broad. Auricles absent. Cells rectangular.

Legend: 11, 12-parts of shoot; 13-vegetative propagule; 14, 15-leaves; 16-leaf apex; 17-mid leaf cells; 18-marginal leaf cells.

Campylopus pilifer Brid. (fig. 3)

MSC 247b, 229

Altitude range: 3,000–4,100 m

Plants rupicolous, robust, greenish yellow with prominent hyaline hair points, forms large tufts. Stems up to 5 cm long, branched. Leaves to 6 mm long, lanceolate, broad base tapering to long fine toothed hair point. Nerve broad. Basal cells rectangular to linear.

Legend: 19-plant; 20-leaf; 21-marginal leaf cells; 22-leaf apex.

Campylopus dicranoides Ther & Nav. (fig. 3)

MSC 307a

Altitude: 2,400 m

Plants terricolous, forming greenish yellow tufts. Stems 1–1.5 cm long. Leaves curved to one side, filiform, long, slender ending in a subula; nerve broad. Basal alar leaf cells rusty brown, shortly rectangular; marginal leaf cells rectangular. Seta reddish brown; capsule elongate.

Legend: 23-plant; 24-capsule; 25-leaf; 26-alar cells, 27-upper leaf cells.

Pilopogon africanus Broth. (fig. 3)

MSC 195

Altitude: 2,900 m

Plants terricolous, yellowish green above, brownish black below, forming extensive tufts on ground. Stems 7–8 cm long, tomentose. Leaves linear-lanceolate, relatively wide base tapering to long fine subula; margin entire. Capsule cylindrical.

Legend: 28-plant with sporophyte; 29-leaf; 30-capsule with calyptra.

Fissidentaceae*Fissidens* sp 1 (fig. 4)

BR 91/126a

Altitude: 3,000 m

Plants slender, bright green. Stems to 1.5 cm. Leaves two-ranked arrangement, lanceolate; margin entire, border absent; nerve ceasing below apex. Cells rounded hexagonal.

Legend: 1-plant; 2-leaf; 3-leaf tip.

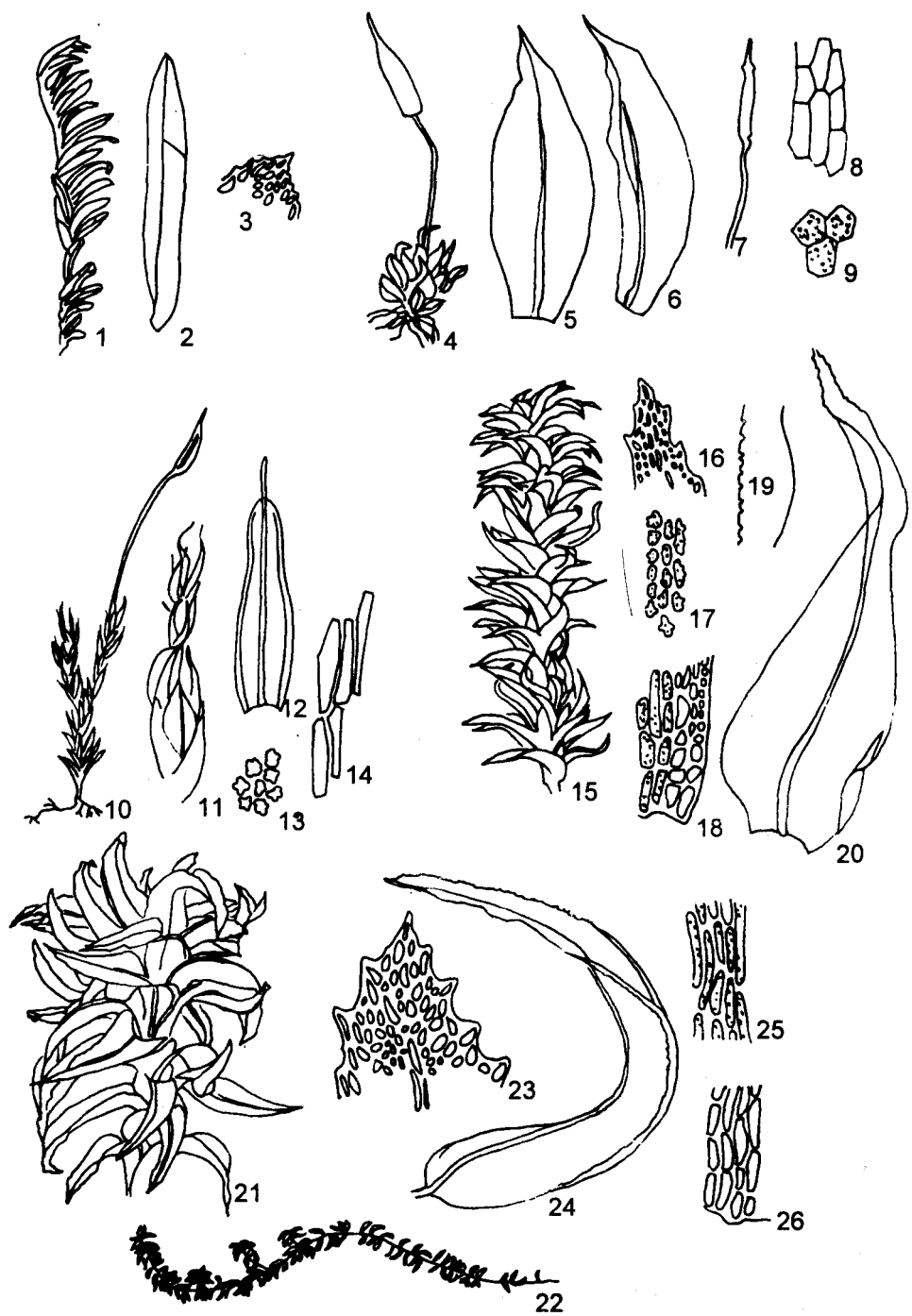


Figure 4. Legend see text

Encalyptaceae*Encalypta ciliata* Hedw. (fig. 4)

MSC 535, 536

Altitude: 4,250 m

Plants small, bright green, apical leaves in rosette, forming loose tufts. Stems to 1 cm long, unbranched. Leaves obtuse, tongue-shaped; nerve narrow, percurrent; basal cells oblong, hyaline; mid leaf cells shortly rectangular, chlorophyllose, papillose. Capsule cylindrical.

Legend: 4-plant with sporophyte; 5, 6-leaves; 7-young capsule; 8-basal leaf cells; 9-papillose mid leaf cells.

Pottiaceae*Tortula cavallii* Negri. (fig. 4)

MSC 149b, 172, 46b, 48, 54, 53, 139a, 40, 38, 221b, 183, 58, 129a, 191, 269b, 117a, 222a, 131a, 130, 128, 119, 181, 99c, 160a, 203

Altitude range: 3,000–4,600 m

Plants slender, reddish brown, forming tufts. Stems erect, orange-red up to 3 cm long. Leaves entire, oblong lanceolate; nerve stout, brownish, excurrent; basal cells rectangular to narrowly rectangular, shorter towards margin; cells towards apex incrassate, papillose. Seta dark red; capsule erect, narrowly ellipsoid, straight; peristome teeth filiform, spirally curved.

Legend: 10-plant with sporophyte; 11-shoot apex; 12-leaf; 13-cells near leaf apex; 14-basal leaf cells

Tortula fragilis Tayl. (fig. 4)

MSC 247a, 44c, 256, 274a, 209a, 96, 148b, 177b, 4

Altitude range: 3,550–4,490 m

Plants rupicolous and epiphytic, small, yellowish green, forming tufts. Stems erect, branched, to 2 cm long. Leaves tapering from expanded base to acute apex; margin irregularly denticulate near apex; nerve percurrent; basal cells narrowly rectangular, hyaline; upper leaf cells quadrate hexagonal, papillose, opaque.

Legend: 15-part of shoot; 16-apical leaf cells; 17-mid leaf cells; 18-basal leaf cells; 19-highly papillose back of nerve; 20-leaf.

Leptodontium luteum (Tayl.) Mitt. (fig. 4)

MSC 218

Altitude: 3,000 m

Plants yellowish green mats on damp rocks. Stems creeping to 8 cm long, shortly branched. Leaves linear lanceolate, crisped when dry; margin recurved, plane below, strongly dentate above. Nerve ending below apex. Basal leaf cells rectangular; cells above rectangular papillose.

Legend: 21-part of shoot; 22- plant; 23-apical leaf cells; 24-leaf; 25-mid leaf cells; 26-basal leaf cells.

GLOSSARY

acuminate = longly tapering narrow

acute = pointed, with angle at tip less than 90 degrees

alar cells = cells at basal angles of leaf

apiculate = bearing small abrupt projections (apiculus) at tip
appressed = of leaves, pressed against stem
auricle = enlarged or differentiated cells at basal angles of leaf forming distinctive groups of cells
calyptra = hood-like covering of capsule
capsule = spore bearing structure
cortex = outermost layer of stem cells
cushion = hemispherical colony formed by shoots radiating from central point
dehiscence = breaking up of a fruit for dispersal
dentate = toothed
distichous = in two ranks, one on either side of the stem
epiphytic = growing on trees or shrubs
excurrent = nerve projecting beyond leaf tip
fascicles = tuft of branches
flexuose = wavy
gametophyte = phase of life-cycle of mosses which has haploid nuclei, and during which sex-cells are produced
hexagonal = six-sided
hyaline = colourless and transparent
incrassate = of cells, with thick walls
julaceous = cylindrical and worm-like in appearance
lamellae = flat plate of cells
lanceolate = lance-shaped
ovate = egg shaped in outline
papillose = bearing solid projections (papilla) from cell surface
parenchyma = tissue consisting of living, thin walled cells
percurrent = nerve ending at leaf tip
peristome = the single or double ring of teeth at mouth of capsule revealed after dehiscence
quadrate = square
radicles = rusty-brown rhizoids that cover the lower part of the stems in many mosses
radiculose = possessing radicles
rhizoids = single or several-celled hair-like structure serving as a root
rupicolous = growing on rock surface
sessile = without a stalk
seta = stalk of capsule
sinuose = of margin, wavy outline
sporophyte = phase of life-cycle of mosses which has diploid nuclei, and during which spores are produced
subula = needle-like structure
terricolous = growing on ground
tomentum = dense felt of rhizoids
truncate = cut-off, ending abruptly

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