Key to the Moss Genera of North America North of Mexico

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This key to the genera of North American mosses is intended to complement, not replace, the keys to genera included with each family treatment in the *Flora*. It is a somewhat modified version of a key written earlier (D. H. Vitt and W. R. Buck 1992) to honor Howard A. Crum on his retirement from the University of Michigan.

Primary Key

1. Gametophytes seemingly absent (consisting only of protonemata); capsules asymmetric; setae papillose . . . . . 7–1. *Buxbaumia*, **v. 27, p. 118**
1. Gametophytes present (with obvious leaves); capsules and setae various.
   2. Laminal cells arranged in a network of narrow, green cells alternating with large hyaline cells; branches usually in clusters . . . . . 2–1. *Sphagnum*, **v. 27, p. 45**
   2. Laminal cells of one kind (green), or if two kinds, branches never in clusters.
      3. Leaves attached in 2 rows on opposite sides of stem (distichous).
         4. Leaves appearing split at base, consisting of 2 vaginant laminae clasping stem and base of leaf above (equitant) . . . . . 21–1. *Fissidens*, **v. 27, p. 331**
         4. Leaves with expanded bases, not clasping leaf above.
            5. Leaves ecostate; protonemata luminous . . . . . 28–1. *Schistostega*, **v. 27, p. 475**
            5. Leaves with single costa; protonemata not luminous.
               6. Vegetative leaves with smooth mucro; perichaetial leaves with smooth subula . . . . . 20–1. *Bryoxiphium*, **v. 27, p. 329**
               6. All leaves with papillose, linear subula . . . . . 25–2. *Distichium*, **v. 27, p. 448**
      3. Leaves attached all around stem (foliate stems sometimes flattened [complanate]).
         7. Leaves without lamellae or filaments on adaxial costal surface (but propagula sometimes present).
            8. Leaves deeply lobed, lobes linear-terete . . . . . 1–1. *Takakia*, **v. 27, p. 43**
            8. Leaves never lobed, flattened (sometimes concave with margins inrolled or recurved).
               9. Leaves ecostate, costa short and double, double or single to ⅓ leaf length, or single with 2 or 3 lateral spurs. . . . . Subkey A, **p. 641**
               9. Leaves with single costa to at least mid leaf. . . . . Subkey B, **p. 647**
         7. Leaves with lamellae or filaments on adaxial costal surface (excluding propagula).

[10. Shifted to left margin.—Ed.]
10. Leaves with filaments on adaxial costal surface.
    11. Leaf margins reflexed to revolute . . . . . 29–31. *Crossidium*, **v. 27, p. 611**
    11. Leaf margins broadly inrolled (mostly obscuring filaments) . . . . . 29–32. *Aloina*, **v. 27, p. 614**
10. Leaves with lamellae on adaxial costal surface.
    12. Leaves bordered with elongate marginal cells . . . . . 8–6. *Atrichum* (in part), **v. 27, p. 147**
    12. Leaves without elongate marginal cells.
        13. Leaves ciliate at distal part of hyaline sheath . . . . . 8–9. *Bartramiopsis*, **v. 27, p. 161**
        13. Leaves eciliate.
            14. Distal leaf margins 2-stratose with paired, multicellular teeth; leaf apices with slender, smooth, caducous awns . . . . . 8–8. *Lyellia*, **v. 27, p. 159**
            14. Distal leaf margins 1-stratose with single teeth or entire; leaf apices muticous or with serrate awns.
                15. Lamellae 2–4; leaves hyaline awned; plants small, less than 5 mm; peristome absent or rudimentary and fragile . . . . . 29–29. *Pterygoneurum*, **v. 27, p. 606**
                15. Lamellae 4–50; leaves mostly not awned; plants mostly larger; peristome of 32 or 64 persistent teeth.
                    16. Lamellae distinctly wavy.
                        17. Distal leaf margins not bordered . . . . . 8–4. *Oligotrichum* (in part), **v. 27, p. 142**
                        17. Distal leaf margins with border of hyaline, short-rhombic cells . . . . . 8–5. *Psilopilum*, **v. 27, p. 145**
                    16. Lamellae straight.
                        18. Calyptrae naked or with few hairs.
                            19. Distal abaxial leaf lamellae and teeth absent . . . . 8–3. *Meiotrichum*, **v. 27, p. 141**
                            19. Distal abaxial leaf lamellae and/or teeth present . . . . . 8–4. *Oligotrichum* (in part), **v. 27, p. 142**
                        18. Calyptrae densely hairy.
                            20. Capsules present.
                                21. Capsules sharply 4-angled . . . . . 8–2. *Polytrichum* (in part), **v. 27, p. 133**
                                21. Capsules cylindric or bluntly 2–4-angled.
                                    22. Capsules with stomata; lumina of apical cells of lamellae pyriform . . . . . 8–1. *Polytrichastrum* (in part), **v. 27, p. 124**
                                    22. Capsules without stomata; lumina of apical cells of lamellae not pyriform . . . . . 8–7. *Pogonatum* (in part), **v. 27, p. 155**
                            20. Capsules absent.
                                23. Apical cells of lamellae papillose.
                                    24. Apical cells elliptic-pyriform . . . . . 8–1. *Polytrichastrum* (in part), **v. 27, p. 124**
                                    24. Apical cells rounded, quadrate or oblate . . . . . 8–7. *Pogonatum* (in part), **v. 27, p. 155**
                                23. Apical cells of lamellae smooth or with faint cuticular ridges.
                                    25. Plants larger; leaves with or without awns. . . . . 8–2. *Polytrichum* (in part), **v. 27, p. 133**
                                    25. Plants small, less than 6 mm; leaves never awned . . . . . 8–7. *Pogonatum* (in part), **v. 27, p. 155**

Subkey A

1. Leaves appearing ecostate, but with costae single and occupying entire leaf area, thus lamina appearing multistratose.
    2. Leaves lanceolate; green cells 4-sided in transverse section . . . . . 24–1. *Leucobryum* (in part), **v. 27, p. 441**
    2. Leaves ligulate; green cells 3-sided in transverse section . . . . . 33–1. *Octoblepharum* (in part), **v. 27, p. 664**
1. Leaves ecostate, costae very short and single, or double; lamina always 1-stratose.

[3. Shifted to left margin.—Ed.]

3. Distal laminal cells papillose or prorulose.
   4. Leaf apices hyaline.
      5. Laminal cell papillae 1 or 2, forked; capsules immersed, smooth; perichaetial leaf margins ciliate; widespread . . . . . .38–1. *Hedwigia*, **v. 28, p. 84**
      5. Laminal cell papillae 1, simple; capsules exserted, ribbed; perichaetial leaf margins entire; restricted to w North America . . . . . 38–3. *Pseudobraunia*, **v. 28, p. 89**
   4. Leaf apices concolorous.
      6. Laminal cells multipapillose.
         7. Papillae arranged in rows over lumina; laminal cells more than 5:1 . . . . . .73–8. *Taxithelium*, **v. 28, p. 582**
         7. Papillae randomly arranged over lumina; laminal cells less than 4:1.
            8. Leaf apices obtuse; stems complanate-foliate . . . . . 27–1. *Erpodium* (in part)/27–2. *Solmsiella*, **v. 27, p. 471, 473**
            8. Leaf apices short-acuminate; stems symmetrically foliate . . . . . 38–2. *Braunia*, **v. 28, p. 88**
      6. Laminal cells 1-papillose or prorulose.
         9. Stems 2- or 3-pinnate, forming ascending series of flat, frondose tiers . . . . . .56–2. *Hylocomium*, **v. 28, p. 327**
         9. Stems simple or 1-pinnate, not forming ascending series of fronds.
            10. Leaves plicate.
               11. Costae extending beyond mid leaf; leaves spreading to squarrose . . . . 56–4. *Rhytidiadelphus* (in part), **v. 28, p. 330**
               11. Costae short; leaves falcate-secund . . . . . .72–5. *Ctenidium*, **v. 28, p. 522**
            10. Leaves not plicate.
               12. Plants reddish black, tightly attached to rock . . . . . .3–1. *Andreaea* (in part), **v. 27, p. 102**
               12. Plants green, on various substrates.
                  13. Plants minute, less than 2 mm, acrocarpous . . . . . .31–2. *Ephemerum* (in part), **v. 27, p. 650**
                  13. Plants large, more than 1 cm, pleurocarpous.
                     14. Costae extending to near leaf apex . . . . . .51–3. *Callicostella*, **v. 28, p. 257**
                     14. Costae ending below mid leaf.
                        15. Alar cells many, oblate to rounded, extending up margins; restricted to Pacific Northwest . . . . . .75–3. *Nogopterium*, **v. 28, p. 595**
                        15. Alar cells few, mostly quadrate, scarcely extending up margins; widespread.
                           16. Medial laminal cells less than 5:1.
                              17. Stem and branch leaves differentiated . . . . . 59–3. *Heterocladium*, **v. 28, p. 368**
                              17. Stem and branch leaves similar.
                                 18. Leaves broadly ovate, strongly concave; apices obtuse to obtuse-apiculate . . . . . 59–4. *Myurella*, **v. 28, p. 370**
                                 18. Leaves lanceolate to ovate-lanceolate, weakly concave or flat; apices acute to acuminate.
                                    19. Leaf apices acute; margins serrulate only distally; propagula often present in leaf axils; n North America. . . . . 59–2. *Pterigynandrum*, **v. 28, p. 367**
                                    19. Leaf apices acuminate; margins serrulate throughout; propagula absent; e United States . . . . . 64–2. *Schwetschkeopsis*, **v. 28, p. 475**
                           16. Medial laminal cells more than 5:1.
                              20. Basal row of laminal cells with large prorula at proximal end. . . . . .72–6. *Dacryophyllum*, **v. 28, p. 524**
                              20. Basal row of laminal cells smooth.

21. Apical laminal cells much shorter than medial cells . . . . . 72–18. *Taxiphyllum* (in part), **v. 28, p. 566**
21. Apical laminal cells scarcely differentiated.
22. Leaf apices acute; laminal cells prorulose only at distal ends . . . . 56–7. *Leptohymenium*, **v. 28, p. 336**
22. Leaf apices slenderly acuminate; laminal cells prorulose at both ends . . . . . 72–4. *Chryso-hypnum*, **v. 28, p. 520**

3. Distal laminal cells smooth (rarely with minute cuticular roughenings).
23. Leaf apices with hyaline awn.
24. Laminal cells 2:1 or less, oblate-hexagonal throughout; peristome absent . . . . . 27–1. *Erpodium* (in part), **v. 27, p. 471**
24. Laminal cells more than 3:1, basal cells quadrate, distal cells short-rhomboidal; peristome present . . . . . .27–3. *Venturiella*, **v. 27, p. 473**
23. Leaf apices concolorous.
25. Plants aquatic, submerged at least part of year; leaves keeled or flat. . . . 68–3. *Fontinalis*, **v. 28, p. 494**
25. Plants sometimes in wet habitats but never submerged; leaves never keeled.
26. Plants acrocarpous, usually less than 4 cm.
27. Plants on rock.
28. Plants reddish black; capsules valvate . . . . . .3–1. *Andreaea* (in part), **v. 27, p. 102**
28. Plants greenish brown; capsules with 4 peristome teeth. . . . . 5–2. *Tetrodontium*, **v. 27, p. 113**
27. Plants on bare soil.
29. Protonemata few; capsules globose; calyptrae very small, persistent . . . . . 31–1. *Micromitrium*, **v. 27, p. 647**
29. Protonemata many; capsules ovoid, apiculate; calyptrae campanulate-mitrate, deciduous. . . . . .31–2. *Ephemerum* (in part), **v. 27, p. 650**
26. Plants pleurocarpous, mostly larger.
30. Costae single, with 2 or more shorter, supplementary costae at base . . . . . .75–1. *Antitrichia* (in part), **v. 28, p. 591**
30. Costae double, or if single very short and without supplementary costae.
31. Costae double, extending to or beyond mid leaf.
32. Stem paraphyllia many.
33. Stem leaves plicate; bases decurrent . . . . . 56–1. *Hylocomiastrum* (in part), **v. 28, p. 326**
33. Stem leaves not plicate; bases not decurrent . . . . . 56–3. *Loeskeobryum*, **v. 28, p. 329**
32. Stem paraphyllia absent.
34. Laminal cells thin-walled, lax, abruptly bordered by elongate cells . . . . . .51–1. *Cyclodictyon*, **v. 28, p. 255**
34. Laminal cells firm-walled, not or only gradually bordered.
35. Plants in mats; leaves falcate-secund at least at branch apices; exostome teeth striate, furrowed. . . . . 51–2. *Trachyxiphium*, **v. 28, p. 256**
35. Plants tufted; leaves somewhat contorted when dry but not falcate; exostome teeth papillose, not furrowed . . . . . [*Lepidopilum*, see 49. Hookeriaceae, **v. 28, p. 248**]
31. Costae single or double, usually ending just beyond leaf base.
36. Leaf apices obtuse; plants small, rare, restricted to mountains of se United States.
37. Leaves symmetric, without basal lobe. . . . . .72–1. *Bryocrumia*, **v. 28, p. 517**
37. Leaves asymmetric, with basal lobe . . . . . 77–4. *Homaliadelphus*, **v. 28, p. 609**
36. Leaf apices acute to acuminate, at least apiculate; plants mostly larger, widespread.

[38. Shifted to left margin.—Ed.]

38. Laminal cells lax, hexagonal.
    39. Lateral and dorsal leaves with similar areolation; stems irregularly branched . . . . . 49–1. *Hookeria*, **v. 28, p. 249**
    39. Lateral and dorsal leaves differentiated in areolation; stems pinnate . . . . . 72–19. *Vesicularia*, **v. 28, p. 570**
38. Laminal cells firm- to thick-walled, rounded to linear.
    40. Leaf bases slenderly long-decurrent.
        41. Plants small to medium-sized, green; leaves not undulate; laminal cells smooth . . . . . 67–1. *Plagiothecium*, **v. 28, p. 484**
        41. Plants large, whitish; leaves strongly undulate; laminal cells with minute, granular, cuticular papillae . . . . . 72–2. *Buckiella*, **v. 28, p. 518**
    40. Leaf bases not at all decurrent to broadly auriculate.
        42. Leaves dimorphic, abaxial ones symmetric, cultriform; with large area of enlarged alar cells on one side of costa . . . . . 63–3. *Pilosium*, **v. 28, p. 472**
        42. Leaves monomorphic, symmetric; alar cells various.
            43. Plants slender, threadlike or in thin mats; leaves mostly less than 1 mm.
                44. Alar cells in 1 basal row, somewhat inflated, rounded . . . . . 73–3. *Hageniella*, **v. 28, p. 575**
                44. Alar cells few, quadrate.
                    45. Branch leaves more than 0.5 mm. . . . . 72–9. *Homomallium*, **v. 28, p. 529**
                    45. Branch leaves less than 0.5 mm.
                        46. Ecostate or costae very short and double; laminal cells rhombic . . . . . 54–4. *Platydictya*, **v. 28, p. 282**
                        46. Costae short and single; laminal cells rounded-elliptic . . . . . 58–9. *Pseudoleskeella* (in part), **v. 28, p. 361**
            43. Plants larger; leaves more than 1 mm.
                47. Leaves falcate-secund.
                    48. Distal laminal cells oblong-rhombic, ca. 3:1.
                        49. Alar cells few, oblong-quadrate, in 1 or 2 rows along insertion . . . . . 73–2. *Sematophyllum* (in part), **v. 28, p. 573**
                        49. Alar cells many, oblate, in many rows extending up margins . . . . . 75–2. *Leucodon* (in part), **v. 28, p. 593**
                    48. Distal laminal cells ± linear, more than 6:1.
                        50. Stems regularly and closely pinnate, featherlike, fronds flat, erect to ascending . . . . . 72–16. *Ptilium*, **v. 28, p. 562**
                        50. Stems irregularly pinnate to unbranched, not featherlike, prostrate to loosely ascending.
                            51. Mature branches erect, producing many conspicuous propagula in distal leaf axils. . . . . 72–14. *Platygyrium*, **v. 28, p. 557**
                            51. Branches not producing propagula in leaf axils.
                                52. Branches curved-secund when dry, erect when moist; alar cells small, quadrate. . . . . 72–17. *Pylaisia*, **v. 28, p. 563**
                                52. Branches little altered when dry; alar cells various.
                                    53. Alar cells when differentiated quadrate, sometimes enlarged but not inflated.
                                        54. Stem paraphyllia present. . . . . 56–6. *Rhytidiopsis*, **v. 28, p. 335**
                                        54. Stem paraphyllia absent.
                                            55. Plants very large (stem leaves 3.5–5 mm); stems ascending to erect; leaves plicate . . . . . 56–4. *Rhytidiadelphus* (in part), **v. 28, p. 330**
                                            55. Plants smaller (stem leaves less than 3.5 mm); stems prostrate to ascending; leaf plication various.

[56. Shifted to left margin.—Ed.]

56. Alar cells absent or very few; pale propagula often clustered in leaf axils . . . . . 72–11. *Isopterygiopsis* (in part), **v. 28, p. 549**

56. Alar cells distinctly differentiated; propagula absent, or if present, not clustered in leaf axils.

57. Plants on wet rock in mountain streams . . . . . 54–3. *Hygrohypnum* (in part), **v. 28, p. 269**

57. Plants in various habitats but not as above.

58. Costae to ⅓ leaf length with branches not meeting at base; Alaska, Yukon . . . . . 72–7. *Gollania*, **v. 28, p. 525**

58. Costae mostly shorter, branches meeting at base; widespread . . . . . 72–10. *Hypnum* (in part), **v. 28, p. 532**

[53. Shifted to left margin.—Ed.]

53. Alar cells quadrate to oblong, inflated.

59. Plants in calcareous fens or marl pools, dark reddish brown; leaf apices obtuse . . . . . 61–2. *Scorpidium* (in part), **v. 28, p. 387**

59. Plants in other habitats, golden to green; leaf apices acute to acuminate.

60. Plants on wet rock in mountain streams . . . . . 54–3. *Hygrohypnum* (in part), **v. 28, p. 269**

60. Plants in various habitats but not in streams.

61. Alar cells inflated in several rows, walls thick; leaf margins strongly serrate . . . . . 73–6. *Heterophyllium*, **v. 28, p. 579**

61. Alar cells inflated in 1 (or 2) rows, or if more, walls thin; leaf margins entire to serrulate.

62. Stems surrounded by enlarged, thin-walled, hyaline cortical cells (hyalodermis); alar regions large, subdecurrent . . . . . 72–10. *Hypnum* (in part), **v. 28, p. 532**

62. Stems surrounded by small, thick-walled, concolorous cells; alar regions in 1 (or 2) rows.

63. Plants very shiny; leaves 0.8–1.4 mm; distal margins densely serrulate; capsules inclined, asymmetric . . . . . 73–5. *Brotherella*, **v. 28, p. 577**

63. Plants slightly shiny; leaves 0.5–1.1 mm; distal margins distantly serrulate; capsules erect, symmetric . . . . . 73–7. *Pylaisiadelpha*, **v. 28, p. 580**

[47. Shifted to left margin.—Ed.]

47. Leaves straight.

64. Stem leaf apices abruptly contracted to long setaceous point.

65. Leaf apices hyaline; alar cells scarcely differentiated . . . . . 59–1. *Iwatsukiella*, **v. 28, p. 367**

65. Leaf apices yellow; alar cells inflated, hyaline . . . . . 73–9. *Wijkia*, **v. 28, p. 582**

64. Stem leaf apices acute, acuminate or apiculate.

66. Leaves squarrose-recurved when dry; apices channeled.

67. Stem leaves greater than 2.5 mm; alar cells oblong, somewhat inflated, intramarginal . . . . . 56–4. *Rhytidiadelphus* (in part), **v. 28, p. 330**

67. Stem leaves less than 2.5 mm; alar cells oblong to subquadrate, inflated or not, marginal.

68. Leaves greater than 1.6 mm . . . . . 54–7. *Campylium*, **v. 28, p. 287**

68. Leaves less than 1.7 mm . . . . . 54–18. *Campylophyllum*, **v. 28, p. 314**

66. Leaves erect to spreading, or if squarrose only when moist; apices mostly not channeled.

69. Plants on wet rock in mountain streams; leaves ovate, concave . . . . . 54–3. *Hygrohypnum* (in part), **v. 28, p. 269**

69. Plants in various habitats but not as above; leaves various.

70. Stems complanate-foliate.

71. Alar cells many, quadrate; capsules erect . . . . . 69–1. *Entodon* (in part), **v. 28, p. 503**

71. Alar cells few, variously shaped; capsules usually inclined.

72. Plants on vertical substrates, tree trunks or rock . . . . . 77–1. *Neckera* (in part), **v. 28, p. 603**
72. Plants on horizontal substrates, rarely on extreme base of trees.
73. Leaf margins serrulate throughout.
74. Apical laminal cells undifferentiated . . . . . 72–8. *Herzogiella* (in part), **v. 28, p. 527**
74. Apical laminal cells shorter than medial cells . . . . . 72–18. *Taxiphyllum* (in part), **v. 28, p. 566**
73. Leaf margins entire or serrulate only distally.
75. Rhizoids arising from leaf axils, papillose; leaf margins ± entire . . . . . 72–11. *Isopterygiopsis* (in part), **v. 28, p. 549**
75. Rhizoids arising from below leaf insertion, smooth; leaf margins serrulate distally.
76. Pseudoparaphyllia filamentous; annuli not differentiated; sexual condition mostly monoicous . . . . . 72–12. *Isopterygium* (in part), **v. 28, p. 552**
76. Pseudoparaphyllia absent; annuli differentiated; sexual condition mostly dioicous . . . . . 72–15. *Pseudotaxiphyllum*, **v. 28, p. 559**

[70. Shifted to left margin.—Ed.]

70. Stems symmetrically foliate.
77. Alar cells inflated.
78. Stems erect, hyalodermis present; alar cells hyaline, in auricles . . . . 54–16. *Calliergonella*, **v. 28, p. 312**
78. Stems prostrate, hyalodermis absent; alar cells yellowish, not in auricles.
79. Alar cells uniform, without enlarged basal row; stem apices flattened . . . . . 72–3. *Callicladium*, **v. 28, p. 519**
79. Alar cells with enlarged basal row; stem apices not flattened.
80. Alar regions rounded to insertion; exostome teeth furrowed . . . . . 73–1. *Acroporium*, **v. 28, p. 572**
80. Alar regions not rounded to insertion; exostome teeth not furrowed.
81. Exostome teeth striate; endostome with evident basal membrane and segments; e North America . . . . . 73–2. *Sematophyllum* (in part), **v. 28, p. 573**
81. Exostome teeth smooth or faintly papillose; endostome fugacious, appearing absent; restricted to c Florida in oak scrub . . . . . 73–4. *Donnellia*, **v. 28, p. 576**
77. Alar cells rectangular to quadrate, not inflated.
82. Alar cells many (more than 50), quadrate, regions extending up margins in 12+ rows.
83. Stem paraphyllia many . . . . . 79–3. *Alsia*, **v. 28, p. 627**
83. Stem paraphyllia absent.
84. Leaves less than 0.8 mm; laminal cells with obscure cuticular roughenings . . . . . 58–3. *Leptopterigynandrum*, **v. 28, p. 346**
84. Leaves more than 1 mm; laminal cells smooth.
85. Alar cells extending up margins more than ⅓ leaf length.
86. Secondary stems simple or with few branches . . . . . 75–2. *Leucodon* (in part), **v. 28, p. 593**
86. Secondary stems freely subpinnate . . . . . 79–1. *Forsstroemia* (in part), **v. 28, p. 624**
85. Alar cells extending up margins less than ⅙ leaf length.
87. Leaf apices mostly obtuse to acute, rarely acuminate; bases never decurrent; endostome cilia absent; widespread but not in coastal w North America . . . . . 69–1. *Entodon* (in part), **v. 28, p. 503**
87. Leaf apices acuminate; bases somewhat decurrent; endostome cilia present; restricted to coastal w North America, California to British Columbia . . . . . 78–3. *Tripterocladium*, **v. 28, p. 622**
82. Alar cells fewer (less than 25), quadrate to rectangular, regions extending up margins in less than 8 rows.

[88. Shifted to left margin.—Ed.]

88. Plants epiphytic; primary stems creeping, secondary stems erect.
  89. Secondary stems unbranched; leaves spreading with squarrose apices; propagula common . . . . . 76–1. *Jaegerina* (in part), **v. 28, p. 598**
  89. Secondary stems irregularly branched; leaves erect; propagula absent . . . 77–5. *Neomacounia*, **v. 28, p. 610**
88. Plants terrestrial or rarely on base of trees; primary and secondary stems not differentiated.
  90. Stem hyalodermis present; leaf margins serrulate to base . . . . . 72–8. *Herzogiella* (in part), **v. 28, p. 527**
  90. Stem hyalodermis absent; leaf margins entire or serrulate distally.
    91. Leaves plicate . . . . . 72–13. *Orthothecium* (in part), **v. 28, p. 554**
    91. Leaves not plicate.
      92. Leaf apices obtuse-apiculate.
        93. Plants in fens; stems green, sparsely branched . . . . . 54–10. *Pseudocalliergon* (in part), **v. 28, p. 297**
        93. Plants widespread in acidic habitats of boreal forests; stems reddish orange, pinnate . . . . . 56–5. *Pleurozium*, **v. 28, p. 334**
      92. Leaf apices acuminate.
        94. Laminal cells not porose except at insertion; pseudoparaphyllia filamentous; coastal e North America inland to Midwest. . . . . 72–12. *Isopterygium* (in part), **v. 28, p. 552**
        94. Laminal cells porose throughout; pseudoparaphyllia absent or foliose; boreal, arctic, and alpine habitats . . . . . 72–13. *Orthothecium* (in part), **v. 28, p. 554**

Subkey B

1. Stems erect, dendroid or frondose from stipe.
  2. Leaves bordered by elongate cells.
    3. Branch leaves dimorphic. . . . . 53–1. *Hypopterygium*, **v. 28, p. 261**
    3. Branch leaves monomorphic.
      4. Stems ± evenly branched, resembling small palm trees; stem leaves highly modified, triangular, hyaline or with hyaline apices; distal leaves ovate-triangular, flat . . . . . 46–3. *Leucolepis*, **v. 28, p. 222**
      4. Stems irregularly branched; proximal stem leaves similar to distal leaves, lingulate, undulate . . . . . 46–5. *Plagiomnium* (in part), **v. 28, p. 229**
  2. Leaves not bordered.
    5. Stem paraphyllia absent.
      6. Branch leaf apical laminal cells long-hexagonal; costae slender, tapering toward apex . . . . . 77–7. *Porotrichum*, **v. 28, p. 613**
      6. Branch leaf apical laminal cells rhombic; costae strong, not tapering toward apex . . . . . 77–8. *Thamnobryum*, **v. 28, p. 614**
    5. Stem paraphyllia or filamentous, paraphyllialike structures present.
      7. Plants epiphytic; stems pinnate, frondose, curled when dry, spreading when moist . . . . . 74–3. *Dendroalsia*, **v. 28, p. 588**
      7. Plants terrestrial (rarely on tree bases); stems dendroid, little altered when dry.
        8. Branch leaf bases cordate to auriculate, auricles not inflated; stem paraphyllia present; stem leaf margins serrate . . . . . 70–1. *Climacium* (in part), **v. 28, p. 509**
        8. Branch leaf bases long-decurrent, decurrencies of inflated, hyaline cells; stem lamellae present; stem leaf margins entire . . . . . 71–1. *Pleuroziopsis*, **v. 28, p. 513**
1. Stems prostrate to erect, simple to pinnate.
  9. Plants blackish, tightly attached to rock in arctic and montane areas; capsules valvate.
    10. Plants on acidic rock; capsules hygroscopic, elliptic when moist, tapering to point . . . . . 3–1. *Andreaea* (in part), **v. 27, p. 102**
    10. Plants on calcareous rock; capsules not hygroscopic, turbinate, obtuse-conic . . . . . 4–1. *Andreaeobryum*, **v. 27, p. 109**
  9. Plants greenish to blackish, on various substrates; capsules cleistocarpous or operculate, never valvate.
    11. Leaves strongly squarrose-recurved; in fens . . . . . 35–4. *Paludella*, **v. 28, p. 34**
    11. Leaves erect to squarrose; in various habitats.

[12. Shifted to left margin.—Ed.]

12. Stem paraphyllia present.
    13. Stems complanate-foliate; stem leaves undulate. . . . . .77–1. *Neckera* (in part), **v. 28, p. 603**
    13. Stems symmetrically foliate; stem leaves not undulate.
        14. Alar regions well differentiated, cells inflated.
            15. Stem leaves not plicate; paraphyllia foliose, few to many . . . . . 54–1. *Cratoneuron*, **v. 28, p. 266**
            15. Stem leaves deeply plicate; paraphyllia filamentous, many . . . . . 54–2. *Palustriella*, **v. 28, p. 267**
        14. Alar regions mostly not differentiated, if so, cells not inflated.
            16. Paraphyllia with cells elongate, more than 5:1, at least at apex.
                17. Leaf margins entire to serrulate . . . . . 55–1. *Elodium*, **v. 28, p. 321**
                17. Leaf margins strongly serrate distally.
                    18. Medial laminal cells short, oblong to quadrate, with 1 massive central papilla . . . . . 55–2. *Echinophyllum*, **v. 28, p. 324**
                    18. Medial laminal cells elongate or shortly oblong, smooth.
                        19. Distal laminal cells linear, more than 8:1; widespread. . . . . 56–1. *Hylocomiastrum* (in part), **v. 28, p. 326**
                        19. Distal laminal cells short, 2–5:1; se United States . . . . . .70–1. *Climacium* (in part), **v. 28, p. 509**
            16. Paraphyllia with cells short, 1–3:1.
                20. Paraphyllia with cells papillose.
                    21. Laminal cells 1-papillose.
                        22. Stems 1-pinnate; laminal cells papillose on both surfaces . . . . . .60–1. *Abietinella*, **v. 28, p. 374**
                        22. Stems 2- or 3-pinnate; laminal cells papillose only abaxially. . . . . 60–4. *Thuidium* (in part), **v. 28, p. 380**
                    21. Laminal cells multipapillose.
                        23. Plants large; sexual condition dioicous; laminal cells papillose only abaxially. . . . . 60–4. *Thuidium* (in part), **v. 28, p. 380**
                        23. Plants small; sexual condition autoicous; laminal cells papillose on both surfaces.
                            24. Stems 1- or 2-pinnate; leaves incurved when dry; laminal cells flat; setae smooth or papillose . . . . . .60–2. *Cyrto-hypnum*, **v. 28, p. 376**
                            24. Stems 1-pinnate; leaves not incurved when dry; laminal cells strongly bulging; setae smooth . . . . . .60–3. *Rauiella*, **v. 28, p. 378**
                20. Paraphyllia with cells smooth.
                    25. Laminal cell papillae large, forked or elongate and curved; leaves broadly ovate . . . . . 81–1. *Thelia*, **v. 28, p. 638**
                    25. Laminal cell papillae short, simple; leaves lanceolate to ovate-lanceolate.
                        26. Costae pellucid; leaf hair-points usually present . . . . 58–1. *Claopodium*, **v. 28, p. 342**
                        26. Costae opaque; leaf hair-points absent.
                            27. Stem and branch leaves differentiated. . . . . 58–2. *Haplocladium*, **v. 28, p. 345**
                            27. Stem and branch leaves similar.
                                28. Laminal cells elongate, oblong-rhombic to oblong-linear.
                                    29. Capsules erect, symmetric; endostome segments narrow, not keeled. . . . . 58–4. *Lescuraea* (in part), **v. 28, p. 348**
                                    29. Capsules inclined, asymmetric; endostome segments broader, keeled . . . . . .58–8. *Pseudoleskea* (in part), **v. 28, p. 355**
                                28. Laminal cells isodiametric or nearly so, hexagonal to short-rhombic.
                                    30. Capsules erect, symmetric; exostome teeth papillose; mostly e North America . . . . . .58–5. *Leskea*, **v. 28, p. 349**
                                    30. Capsules inclined, asymmetric; exostome teeth striate; mostly w North America. . . . . 58–8. *Pseudoleskea* (in part), **v. 28, p. 355**

12. Stem paraphyllia absent.
    31. Plants whitish; leaves composed mostly of costa, multistratose, with small green cells enclosed between 2 layers of hyaline cells on both surfaces.
        32. Green cells in transverse section 4-sided; terrestrial. . . . . 24–1. *Leucobryum* (in part), **v. 27, p. 441**
        32. Green cells in transverse section 3-sided; occasionally terrestrial. . . . . 33–1. *Octoblepharum* (in part), **v. 27, p. 664**
    31. Plants greenish to blackish, rarely whitish; leaves usually with conspicuous lamina, if not, green and hyaline cells of ca. equal size, with 1 layer of hyaline cells on either side of green cells.
        33. Leaf margins strongly incurved to involute, at least when dry.
            34. Leaf margins incurved when dry or moist.
                35. Laminal cells smooth; costal stereid band 1 . . . . . 15–5. *Indusiella*, **v. 27, p. 265**
                35. Laminal cells papillose; costal stereid bands 2 . . . . . 29–8. *Weissia*, **v. 27, p. 512**
            34. Leaf margins incurved when dry, plane when moist.
                36. Costal stereid band 1; peristome present . . . . . 29–24. *Plaubelia*, **v. 27, p. 581**
                36. Costal stereid bands 2; peristome absent . . . . . 29–25. *Hyophila*, **v. 27, p. 584**
        33. Leaf margins plane to recurved.
            37. Plants minute, on soil (or rarely rock), ephemeral, often with persistent protonemata; capsules immersed.
                38. Capsules operculate.
                    39. Exothecial cells collenchymatous. . . . . 12–1. *Aphanorrhegma*, **v. 27, p. 181**
                    39. Exothecial cells not collenchymatous. . . . . 12–5. *Physcomitrium* (in part), **v. 27, p. 196**
                38. Capsules cleistocarpous.
                    40. Spores few per capsule, more than 100 µm.
                        41. Leaves broadly ovate or elliptic; apices abruptly narrowed to awn; plants with slender, subterranean rhizomes . . . . . 14–1. *Lorentziella*, **v. 27, p. 202**
                        41. Leaves oblong to lanceolate; apices acute to subulate; plants not rhizomatous . . . . . 18–1. *Archidium*, **v. 27, p. 314**
                    40. Spores many per capsule, less than 60 µm.
                        42. Leaves ovate to broadly ovate; apices abruptly cuspidate to apiculate.
                            43. Distal laminal cells multipapillose.
                                44. Leaf margins plane. . . . . 29–9. *Aschisma*, **v. 27, p. 518**
                                44. Leaf margins revolute . . . . . 29–26. *Tortula* (in part), **v. 27, p. 586**
                            43. Distal laminal cells smooth or with 1 conic papilla or bottle-shaped protuberances.
                                45. Distal laminal cells bulging adaxially as bottle-shaped cells . . . . . 29–34. *Microbryum* (in part), **v. 27, p. 627**
                                45. Distal laminal cells smooth or occasionally with conic papillae . . . . . 29–38. *Acaulon*, **v. 27, p. 637**
                        42. Leaves narrowly lanceolate to oblong; costae subpercurrent to subulate.
                            46. Capsules pyriform, neck conspicuous . . . . . 23–1. *Bruchia* (in part), **v. 27, p. 434**
                            46. Capsules globose to broadly elliptic, neck not conspicuously differentiated.
                                47. Costae long-excurrent, at least on perichaetial leaves. . . . . 25–6. *Cleistocarpidium*/25–8. *Pleuridium*, **v. 27, p. 460, 463**
                                47. Costae subpercurrent.
                                    48. Leaf margins spinose-serrulate throughout . . . . . 31–2. *Ephemerum* (in part), **v. 27, p. 650**
                                    48. Leaf margins entire or serrulate distally.
                                        49. Leaves oblong-lanceolate to obovate. . . . . 12–4. *Physcomitrella*, **v. 27, p. 194**
                                        49. Leaves lanceolate . . . . . 25–9. *Pseudephemerum*, **v. 27, p. 467**
            37. Plants mostly larger, on various substrates, mostly not ephemeral, or if so, capsules exserted, protonemata not persistent or not present when mature.

[50. Shifted to left margin.—Ed.]

50. Capsule necks (hypophyses) as wide or wider than urns; on dung and animal remains.
    51. Capsules dumbbell shaped when mature; setae hyaline; restricted to the Arctic . . . . . 34–5. *Aplodon*, **v. 28, p. 28**
    51. Capsules (at least urn) cylindric; setae pigmented; widespread.
        52. Hypophyses narrowly pyriform, same color or darker than urn; peristome teeth joined in 4s, later in 2s, not chambered. . . . . .34–3. *Tetraplodon* (in part), **v. 28, p. 21**
        52. Hypophyses globose to turbinate, sometimes umbrelliform, color differentiated from urn; peristome teeth sometimes approximate or fused in pairs, chambered. . . . . .34–4. *Splachnum* (in part), **v. 28, p. 23**
50. Capsule necks considerably narrower than urns; on various substrates.
    53. Leaves dimorphic, lateral ones large, dorsal ones smaller.
        54. Leaves bordered; stems erect; along Pacific coast . . . . . 45–3. *Epipterygium*, **v. 28, p. 213**
        54. Leaves unbordered; stems prostrate; restricted to s Florida . . . . . .48–1. *Racopilum*, **v. 28, p. 246**
    53. Leaves monomorphic.
        55. Capsules cleistocarpous; plants rare.
            56. New Hampshire; on wet soil . . . . . 23–1. *Bruchia* (in part), **v. 27, p. 434**
            56. Arctic and alpine tundra; on animal-derived substrates.
                57. Capsules broadest proximally . . . . . 34–1. *Voitia*, **v. 28, p. 15**
                57. Capsules broadest distally . . . . . .34–3. *Tetraplodon* (in part), **v. 28, p. 21**
        55. Capsules operculate; plants rare to common.
            58. Laminal cell walls nodulose-wavy throughout leaf, sometimes most conspicuous toward leaf base when distal cells short.
                59. Laminal cells smooth or with raised ridges between lumina (pseudopapillae). . . . . 15–6. *Bucklandiella*, **v. 27, p. 267**
                59. Laminal cells papillose or hyaline leaf awns papillose, papillae over lumina.
                    60. Green laminal cells with tall, conic papillae over lumina . . . . . 15–7. *Niphotrichum*, **v. 27, p. 285**
                    60. Green laminal cells with flat papillae over longitudinal walls.
                        61. Hyaline apices present, strongly papillose, decurrent . . . . . .15–8. *Racomitrium*, **v. 27, p. 293**
                        61. Hyaline apices absent, or if present never papillose or decurrent . . . . . 15–9. *Codriophorus*, **v. 27, p. 295**
            58. Laminal cell walls not nodulose-wavy, or only near leaf insertion.
                62. Leaf hair-points absent, or if present not hyaline.
                    63. Costae narrower, or if broad then ending below leaf apex and not filling it; or if costae broad then plants pleurocarpous.
                        64. Plants pleurocarpous (sporophytes lateral); stems mostly prostrate with lateral branches, often mat-forming, or stems prostrate with erect branches bearing terminal sporophytes (cladocarpous). . . . . Subkey C, **p. 652**
                        64. Plants acrocarpous (sporophytes terminal); stems erect, not branched or occasionally branched below inflorescences . . . . . Subkey D, **p. 657**
                    63. Costae very broad, occupying ⅓–½ leaf base and filling subula; plants acrocarpous.
                        65. Alar cells well differentiated.
                            66. Costal guide cells and stereids absent, in transverse section with median layer of green cells enclosed dorsally and ventrally with hyaline cells . . . . . 22–15. *Paraleucobryum*, **v. 27, p. 425**
                            66. Costal guide cells and stereids usually present, without enclosed green cells.

67. Inner basal laminal cells not conspicuously differentiated along costa; capsules furrowed; annuli compound; calyptrae usually fringed . . . . . 22–5. *Campylopus* (in part), **v. 27, p. 366**
67. Inner basal laminal cells pale, enlarged, broadly rectangular, extending upward along costa; capsules smooth; annuli absent; calyptrae not fringed . . . . . 22–9. *Dicranodontium*, **v. 27, p. 393**

65. Alar cells poorly differentiated.
68. Capsule neck at least as long as urn; costa filling no more than ⅓ leaf base . . . . . .23–2. *Trematodon* (in part), **v. 27, p. 437**
68. Capsule neck short, inconspicuous; costa filling ½ or more of leaf base.
69. Leaves 3.5–5 mm; distal laminal cells elongate, 75–140 µm; brood leaves absent . . . . . .22–3. *Campylopodiella*, **v. 27, p. 363**
69. Leaves 2–3 mm; distal laminal cells rectangular, 25–55 µm; brood leaves usually present, often many. . . . . 22–4. *Brothera*, **v. 27, p. 365**

[62. Shifted to left margin.—Ed.]

62. Leaf hair-points present, hyaline.
70. Costa broad, filling ¼ or more of leaf base . . . . . 22–5. *Campylopus* (in part), **v. 27, p. 366**
70. Costa narrower than ¼ leaf base.
71. Distal laminal cells densely multipapillose, papillae C-shaped.
72. Basal laminal cell end walls thickened; calyptrae large, mitrate . . . . . 11–2. *Encalypta* (in part), **v. 27, p. 172**
72. Basal laminal cell end walls not thickened; calyptrae small, cucullate.
73. Abaxial costal surface cells thin-walled, differentiated from interior stereids; laminal reaction yellow in 2% KOH . . . . . 29–26. *Tortula* (in part), **v. 27, p. 586**
73. Abaxial costal surface cells thick-walled, not differentiated from interior stereids; laminal reaction red to orange in 2% KOH.
74. Leaf margins plane to revolute; marginal cells similar to laminal cells . . . . . 29–33. *Syntrichia*, **v. 27, p. 618**
74. Leaf margins strongly revolute; marginal cells chlorophyllose, walls thin . . . . . 29–35. *Hilpertia*, **v. 27, p. 631**

71. Distal laminal cells smooth or papillae low, indistinct.
75. Laminal cells smooth, lax, hexagonal to rhombic, walls thin.
76. Leaves not bordered. . . . . .29–27. *Stegonia* (in part), **v. 27, p. 603**
76. Leaves bordered.
77. Leaves ovate to broadly lanceolate; distal margins entire to serrulate . . . . . .42–7. *Leptostomopsis*, **v. 28, p. 147**
77. Leaves obovate to spathulate; distal margins serrate.
78. Distalmost laminal cells quadrate to short-rectangular, 1–2:1; capsules erect; peristome reduced . . . . . 42–2. *Brachymenium* (in part), **v. 28, p. 122**
78. Distalmost laminal cells rectangular, 2–4:1; capsules inclined to pendent; peristome well developed . . . . . .42–12. *Rosulabryum* (in part), **v. 28, p. 177**

75. Laminal cells obscurely papillose, rounded to quadrate, walls firm.
79. Plants on trees . . . . . 37–6. *Orthotrichum* (in part), **v. 28, p. 45**
79. Plants on rock and soil.
80. Perichaetial leaves differentiated from vegetative leaves in size and shape; capsules immersed . . . . . 15–1. *Schistidium* (in part), **v. 27, p. 207**
80. Perichaetial leaves similar to distal vegetative leaves; capsules immersed or exserted.
81. Calyptrae scarcely longer than operculum, cucullate or mitrate, smooth . . . . . 15–2. *Grimmia* (in part), **v. 27, p. 225**
81. Calyptrae large, covering capsule to middle or below, campanulate-mitrate, striate or plicate.
82. Leaves lanceolate; annuli absent; calyptrae plicate . . . . . .15–3. *Coscinodon*, **v. 27, p. 258**
82. Leaves ovate to obovate; annuli well developed; calyptrae striate . . . . . 15–4. *Jaffueliobryum*, **v. 27, p. 262**

Subkey C

1. Leaves bordered by elongate cells, sharply differentiated from shorter inner cells.
   2. Plants epiphytic; leaf borders 1-stratose . . . . . 50–1. *Daltonia*, **v. 28, p. 252**
   2. Plants aquatic; leaf borders 2–5-stratose.
      3. Leaf margins serrate almost to base; leaves ovate-oblong to ovate-lanceolate; apices acuminate; Oregon . . . . . 54–19. *Limbella*, **v. 28, p. 317**
      3. Leaf margins serrulate; leaves ovate, often broadly so; apices bluntly acute; e North America . . . . . 54–20. *Platylomella*, **v. 28, p. 319**
1. Leaves not bordered by elongate cells.
   4. Laminal cells papillose or prorulose.
      5. Leaves rugose, plicate . . . . . .57–1. *Rhytidium*, **v. 28, p. 339**
      5. Leaves not rugose, rarely plicate.
         6. Laminal cells multipapillose.
            7. Papillae randomly arranged over cells; laminal cells ± isodiametric.
               8. Leaves strongly inrolled when dry; marginal basal laminal cells elongate, smooth; sporophytes terminal on branches. . . .37–5. *Macromitrium*, **v. 28, p. 44**
               8. Leaves loosely erect to contorted when dry; marginal basal laminal cells rounded, papillose; sporophytes lateral . . . . . 80–1. *Anomodon*, **v. 28, p. 629**
            7. Papillae arranged in 1 row over lumina; laminal cells longer than 3:1.
               9. Plants stiff, dark green to blackish; leaves ovate, plicate; bases cordate . . . . . .66–1. *Papillaria*, **v. 28, p. 480**
               9. Plants soft, bright green; leaves lanceolate, not plicate; bases not cordate . . . . . .66–2. *Barbella*, **v. 28, p. 481**
         6. Laminal cells 1-papillose or prorulose.
            10. Laminal cells 1-papillose over lumina.
               11. Distal laminal cells linear-flexuose; specialized asexual reproduction by 1-seriate propagula in leaf axils . . . . . 76–3. *Henicodium*, **v. 28, p. 601**
               11. Distal laminal cells short, 1–3:1; specialized asexual reproduction absent or by branchlets.
                  12. Leaves ovate-lanceolate, squarrose when moist; apices narrowed to smooth, pale acumen . . . . . .58–7. *Lindbergia* (in part), **v. 28, p. 353**
                  12. Leaves oblong-ovate, loosely erect, ± complanate; apices bluntly acute . . . . . .63–1. *Stereophyllum*, **v. 28, p. 470**
            10. Laminal cells prorulose.
               13. Laminal cells 1–3:1.
                  14. Leaves little altered when moist; perichaetial leaves scarcely differentiated; capsules exserted . . . . . 58–4. *Lescuraea* (in part), **v. 28, p. 348**
                  14. Leaves appressed when dry, wide-spreading when moist; perichaetial leaves strongly differentiated; capsules immersed.
                     15. Perichaetia and capsules lateral; peristome double (single in *C. ravenelii*) . . . . . .74–1. *Cryphaea*, **v. 28, p. 585**
                     15. Perichaetia and capsules terminal; peristome single . . . . . 74–2. *Schoenobryum*, **v. 28, p. 586**
               13. Laminal cells more than 5:1.
                  16. Plants epiphytic; primary stems inconspicuous, creeping, secondary stems erect; costae subpercurrent . . . . . 76–2. *Pireella*, **v. 28, p. 599**
                  16. Plants terrestrial and epiphytic; primary and secondary stems not differentiated; costae ending well before apex.
                     17. Leaf bases decurrent; setae rough; capsules inclined; usually terrestrial . . . . . .62–3. *Bryhnia*, **v. 28, p. 428**
                     17. Leaf bases not decurrent; setae smooth; capsules erect; epiphytic or saxicolous . . . . . 78–2. *Isothecium*, **v. 28, p. 618**
   4. Laminal cells smooth.
      18. Leaf apices rounded-obtuse to truncate, apiculus absent.
         19. Leaf apices truncate . . . . . .77–2. *Neckeropsis*, **v. 28, p. 607**
         19. Leaf apices rounded-obtuse.

20. Distal laminal cells less than 3:1.
    21. Stems strongly complanate-foliate, little altered when moist; plants shiny . . . . . 77–3. *Homalia*, **v. 28, p. 608**
    21. Stems at best weakly complanate-foliate, strongly incurved when dry, erect when moist; plants dull . . . . . 79–2. *Leptodon*, **v. 28, p. 625**
20. Distal laminal cells more than 5:1.
    22. Alar cells inflated, or well differentiated from basal cells.
        23. Leaves loosely spreading, slightly concave; in fens . . . . . 61–3. *Calliergon* (in part), **v. 28, p. 390**
        23. Leaves strongly julaceous, concave; in peatlands or near streams.
            24. Leaves oblong; apices obtuse; plants yellowish, very shiny, in peatlands . . . . . 61–6. *Straminergon*, **v. 28, p. 398**
            24. Leaves ovate; apices obtuse to bluntly acute; plants brownish or green, dull or occasionally glossy, along streams and on rock . . . . . 62–18. *Scleropodium* (in part), **v. 28, p. 464**
    22. Alar cells not at all inflated, or if different from basal cells then smaller.
        25. Costal terminal spines present . . . . . 62–13. *Oxyrrhynchium*, **v. 28, p. 449**
        25. Costal terminal spines absent.
            26. Leaves plane to concave, spreading to loosely imbricate; laminal cells usually more than 7:1; on wet rock; widespread . . . . . 54–3. *Hygrohypnum* (in part), **v. 28, p. 269**
            26. Leaves deeply concave, tightly imbricate; laminal cells mostly less than 7:1; terrestrial; Alaska . . . . . 62–12. *Myuroclada* (in part), **v. 28, p. 448**

[18. Shifted to left margin.—Ed.]

18. Leaf apices acuminate to bluntly acute, or apiculus present, minute.
    27. Distal laminal cells 1–2:1.
        28. Sporophytes terminal on erect branches; distal laminal cells rounded.
            29. Basal marginal laminal cells short, rounded-quadrate.
                30. Distal laminal cells not bulging; leaves oblong-lanceolate; calyptrae naked, cucullate . . . . . 37–2. *Drummondia*, **v. 28, p. 40**
                30. Distal laminal cells strongly bulging; leaves lanceolate; calyptrae hairy, mitrate . . . . . 37–4. *Macrocoma*, **v. 28, p. 43**
            29. Basal marginal laminal cells elongate.
                31. Inner basal laminal cells subquadrate to rounded; calyptrae short, plicate . . . . . 37–3. *Groutiella*, **v. 28, p. 42**
                31. Inner basal laminal cells linear; calyptrae long, not plicate . . . . 37–7. *Schlotheimia*, **v. 28, p. 71**
        28. Sporophytes lateral; distal laminal cells rhombic to subquadrate.
            32. Costae strongly flexuose distally; leaf margins with multicellular teeth . . . . . 80–2. *Herpetineuron*, **v. 28, p. 635**
            32. Costae straight or faintly flexuose; leaf margins entire to serrulate.
                33. Costae ending in leaf apex.
                    34. Distal laminal cells short-oblong to rhombic, walls firm.
                        35. Costae less than 35 µm wide at base; terrestrial . . . . . 54–11. *Amblystegium* (in part), **v. 28, p. 301**
                        35. Costae mostly more than 50 µm wide at base; aquatic . . . . . 54–12. *Hygroamblystegium* (in part), **v. 28, p. 302**
                    34. Distal laminal cells rounded-quadrate to elliptic, walls thick.
                        36. Brood branchlets present, axillary . . . . . 58–6. *Leskeella*, **v. 28, p. 352**
                        36. Brood branchlets absent.
                            37. Alar cells extending to costa; inner basal laminal cells not differentiated; peristome white . . . . . 58–7. *Lindbergia* (in part), **v. 28, p. 353**
                            37. Alar cells in 5 or 6 rows along margins, not reaching costa; inner basal laminal cells long-rectangular; peristome yellow . . . . . 58–9. *Pseudoleskeella* (in part), **v. 28, p. 361**

33. Costae ending well before leaf apex.
38. Secondary stems erect, branched.
39. Leaf apices broadly acute; leaves less than 1 mm; w North America . . . . . 77–6. *Bryolawtonia*, **v. 28, p. 611**
39. Leaf apices short-acuminate; leaves more than 1 mm; e North America . . . . . 79–1. *Forsstroemia* (in part), **v. 28, p. 624**
38. Secondary stems not differentiated, prostrate.
40. Leaf apices acuminate; leaves often homomallous. . . . . 58–9. *Pseudoleskeella* (in part), **v. 28, p. 361**
40. Leaf apices bluntly acute; leaves erect to spreading.
41. Leaves symmetric; exostome teeth rudimentary; se North America . . . . . 62–6. *Clasmatodon*, **v. 28, p. 433**
41. Leaves obliquely asymmetric at apex; exostome teeth cross striate; boreal and arctic . . . . . 64–1. *Myrinia*, **v. 28, p. 475**

[27. Shifted to left margin.—Ed.]

27. Distal laminal cells more than 5:1.
42. Plants with long, deciduous, flagelliform branches . . . . . 52–1. *Pseudocryphaea*, **v. 28, p. 259**
42. Plants without flagelliform branches.
43. Primary stems inconspicuous, creeping, with reduced leaves, secondary stems erect, leafy.
44. Secondary stems mostly unbranched . . . . . 76–1. *Jaegerina* (in part), **v. 28, p. 598**
44. Secondary stems irregularly pinnate.
45. Secondary stem leaf costae toothed abaxially; branch leaf apices acute . . . . . 78–1. *Bestia*, **v. 28, p. 617**
45. Costae smooth abaxially; branch leaf apices acuminate.
46. Leaf margins revolute nearly throughout, serrate distally, teeth often reflexed; costae often with supplementary costae; w North America (disjunct in Newfoundland). . . . . 75–1. *Antitrichia* (in part), **v. 28, p. 591**
46. Leaf margins reflexed, entire to serrulate; costae without supplementary costae; e North America . . . . . 79–1. *Forsstroemia* (in part), **v. 28, p. 624**
43. Primary and secondary stems not differentiated.
47. Plants aquatic, coarse; costae broad, more than 100 µm wide at base, bluntly excurrent.
48. Costae ca. ¼ width of leaf base; lamina 1-stratose throughout . . . . . 54–12. *Hygroamblystegium* (in part), **v. 28, p. 302**
48. Costae ca. ⅓ width of leaf base; lamina with multistratose streaks . . . . . 62–7. *Donrichardsia*, **v. 28, p. 435**
47. Plants of various habitats; costae much narrower, ending before apex to excurrent, if excurrent then finely so.
49. One side of stems for entire length covered by reddish rhizoidal tomentum; leaves strongly plicate . . . . . 54–15. *Tomentypnum*, **v. 28, p. 310**
49. Tomentum, if present, restricted to extreme base of stems; leaves plicate or not.
50. Leaves falcate-secund.
51. Stem hyalodermis present.
52. Leaves strongly plicate; margins distinctly denticulate distally . . . . . 54–14. *Sanionia*, **v. 28, p. 306**
52. Leaves striolate to plane; margins entire to slightly denticulate.
53. Alar cells inflated; in streams . . . . 54–3. *Hygrohypnum* (in part), **v. 28, p. 269**
53. Alar cells poorly differentiated; in rich fens . . . . . 61–2. *Scorpidium* (in part), **v. 28, p. 387**
51. Stem hyalodermis absent.

[54. Shifted to left margin.—Ed.]

54. Plants of upland habitats; leaves plicate . . . . . 62–1. *Brachytheciastrum* (in part)/62–2. *Brachythecium* (in part)/62–17. *Sciuro-hypnum* complex (in part), **v. 28, p. 408, 414, 455**

54. Plants of wet habitats; leaves not plicate.

55. Leaves keeled, distinctly to obscurely 3-ranked; endostome segments connate at apices . . . . . .68–2. *Dichelyma*, **v. 28, p. 491**

55. Leaves not keeled or 3-ranked; endostome segments free.

56. Costae excurrent.

57. Alar cells poorly differentiated . . . . . 54–9. *Drepanocladus* (in part), **v. 28, p. 292**

57. Alar cells abruptly inflated.

58. Leaf margins entire . . . . . 54–9. *Drepanocladus* (in part), **v. 28, p. 292**

58. Leaf margins finely denticulate. . . . . 61–5. *Warnstorfia* (in part), **v. 28, p. 396**

56. Costae subpercurrent.

59. Leaf margins finely denticulate at apex.

60. Plants greenish; leaf apices acuminate . . . . . 61–5. *Warnstorfia* (in part), **v. 28, p. 396**

60. Plants reddish; leaf apices acute, acuminate, or rounded-apiculate. . . . . 61–7. *Sarmentypnum* (in part), **v. 28, p. 399**

59. Leaf margins entire throughout.

61. Plants on rock in mountain streams. . . . . .54–3. *Hygrohypnum* (in part), **v. 28, p. 269**

61. Plants in fens and seeps, not on rock.

62. Proximal laminal cells porose; Arctic areas . . . . . .54–10. *Pseudocalliergon* (in part)/61–4. *Loeskypnum* (in part), **v. 28, p. 297, 394**

62. Laminal cells porose only at extreme insertion; widespread.

63. Stems with central strand present . . . . . 54–9. *Drepanocladus* (in part), **v. 28, p. 292**

63. Stems with central strand absent. . . . . 61–1. *Hamatocaulis*, **v. 28, p. 386**

[50. Shifted to left margin.—Ed.]

50. Leaves straight or recurved.

64. Leaves 3-ranked, conduplicate . . . . . .68–1. *Brachelyma*, **v. 28, p. 490**

64. Leaves not 3-ranked or conduplicate.

65. Plants pendulous from branches; stem leaf apices with capillary points; branch leaves strongly recurved; restricted to s Florida. . . . . 62–19. *Zelometeorium*, **v. 28, p. 468**

65. Plants terrestrial to epiphytic, never pendulous; stem leaf apices with shorter points; branch leaves mostly not strongly recurved; mostly n North America.

66. Laminal cells long-hexagonal, less than 8:1.

67. Leaves broadly ovate, deeply concave; Alaska . . . . .62–12. *Myuroclada* (in part), **v. 28, p. 448**

67. Leaves lanceolate to ovate, not or only slightly concave; widespread.

68. Plants epiphytic.

69. Leaf margins entire; apices gradually acuminate; peristome double, reflexed. . . . . 54–5. *Anacamptodon*, **v. 28, p. 285**

69. Leaf margins mostly toothed; apices piliferous; peristome single to absent. . . . . 65–1. *Fabronia* (in part), **v. 28, p. 477**

68. Plants terrestrial and saxicolous.

70. Leaf apices piliferous . . . . . 65–1. *Fabronia* (in part), **v. 28, p. 477**

70. Leaf apices acute to acuminate.

71. Distal laminal cell walls thick, ends rounded; capsules erect . . . . . 58–9. *Pseudoleskeella* (in part), **v. 28, p. 361**

71. Distal laminal cell walls firm, ends pointed; capsules inclined.

72. Plants on soil in dry habitats, especially prairies . . . . . .62–1. *Brachytheciastrum* (in part), **v. 28, p. 408**

72. Plants on logs and soil in mesic to wet habitats.

73. Leaves greater than 1 mm . . . 54–8. *Leptodictyum* (in part), **v. 28, p. 289**

73. Leaves less than 1 mm. . . . . 54–11. *Amblystegium* (in part), **v. 28, p. 301**

66. Laminal cells linear, more than 10:1.

74. Plants attached to rock in fast flowing streams and beside waterfalls. . . . . 62–16. *Rhynchostegium* (in part), **v. 28, p. 453**

74. Plants in various habitats but not on rock in fast flowing water.

[75. Shifted to left margin.—Ed.]

75. Plants terrestrial, large, coarse; stems erect, pinnate.
    76. Stem leaves ovate-lanceolate, acuminate to filiform, plicate; on litter in coniferous forests . . . . . .62–10. *Homalothecium* (in part), **v. 28, p. 439**
    76. Stem leaves ovate-oblong, abruptly apiculate, not plicate; in lawns and gardens . . . . . 62–15. *Pseudoscleropodium*, **v. 28, p. 452**
75. Plants various; stems variously branched, prostrate to ascending, if erect then in wetlands.
    77. Leaves plicate.
        78. Branches curved-ascending when dry . . . . . .62–10. *Homalothecium* (in part), **v. 28, p. 439**
        78. Branches prostrate.
            79. Leaf margins entire to serrulate at apex; distal laminal cell walls firm; alar cells mostly differentiated, short-rectangular; plants soft . . . . . .62–1. *Brachytheciastrum* (in part)/62–2. *Brachythecium* (in part)/62–17. *Sciuro-hypnum* complex (in part), **v. 28, p. 408, 414, 455**
            79. Leaf margins coarsely serrate at apex; distal laminal cell walls thick; alar cells well differentiated, quadrate; plants rigid . . . . . 62–14. *Palamocladium*, **v. 28, p. 451**
    77. Leaves not plicate.
        80. Plants on tree trunks; calyptrae sparsely hairy; setae rough; e United States . . . . . 62–9. *Homalotheciella*, **v. 28, p. 438**
        80. Plants not on tree trunks except rarely at base; calyptrae naked; setae usually smooth, rarely rough; w North America.
            81. Stems terete-foliate, at least at apex; leaves broadly oblong to ovate, concave to cucullate.
                82. Leaf apices abruptly acuminate.
                    83. Costae with 1+ terminal spines; w North America . . . . . 62–18. *Scleropodium* (in part), **v. 28, p. 464**
                    83. Costae without terminal spines; widespread.
                        84. Leaf apices broader, twisted . . . . . .62–4. *Bryoandersonia*, **v. 28, p. 431**
                        84. Leaf apices filiform, flat . . . . . 62–5. *Cirriphyllum*, **v. 28, p. 432**
                82. Leaf apices broadly acute to obtuse, sometimes with minute apiculus.
                    85. Leaf apices with minute apiculus.
                        86. Plants reddish; alar cells strongly inflated, walls thin . . . . . 61–7. *Sarmentypnum* (in part), **v. 28, p. 399**
                        86. Plants green to brownish; alar cells slightly inflated, walls thick.
                            87. Leaves imbricate or slightly falcate-apiculate in Arctic species . . . . . 54–10. *Pseudocalliergon* (in part), **v. 28, p. 297**
                            87. Leaves falcate . . . . . 61–4. *Loeskypnum* (in part), **v. 28, p. 394**
                    85. Leaf apices not apiculate.
                        88. Leaf apices broadly acute; on moist rock and soil; Pacific coast . . . . . 62–18. *Scleropodium* (in part), **v. 28, p. 464**
                        88. Leaf apices obtuse; in fens and swamps; widespread.
                            89. Plants slender, wormlike, unbranched; leaves tightly imbricate . . . . . 54–10. *Pseudocalliergon* (in part), **v. 28, p. 297**
                            89. Plants robust, branched; leaves loosely imbricate at least proximally . . . . . 61–3. *Calliergon* (in part), **v. 28, p. 390**
            81. Stems with spreading leaves; leaves lanceolate, not or scarcely concave.
                90. Branch leaf apical laminal cells ½ length of medial cells . . . . . .62–8. *Eurhynchiastrum*, **v. 28, p. 436**
                90. Branch leaf apical laminal cells scarcely shorter than medial cells.
                    91. Leaf apices twisted; stems often complanate-foliate . . . . . 62–16. *Rhynchostegium* (in part), **v. 28, p. 453**
                    91. Leaf apices flat; stems rarely complanate-foliate.
                        92. Leaf apices channeled; bases concave, insertions narrow.
                            93. Leaves more than 1.6 mm, falcate to straight . . . . . 54–9. *Drepanocladus* (in part), **v. 28, p. 292**
                            93. Leaves less than 1.7 mm, recurved to squarrose.

94. Largest alar cells 10–19 µm wide; sexual condition dioicous . . . . . .54–6. *Campyliadelphus*, **v. 28, p. 286**
94. Largest alar cells 18–25 µm wide; sexual condition autoicous . . . . . 54–13. *Pseudocampylium*, **v. 28, p. 305**

[92. Shifted to left margin.—Ed.]

92. Leaf apices not channeled; bases not concave, insertions not narrow.
95. Alar cells many, quadrate, with more on one side of costa than the other, collenchymatous; s Florida . . . . . .63–2. *Entodontopsis*, **v. 28, p. 471**
95. Alar cells few, quadrate to rectangular, symmetrically arranged, not collenchymatous; widespread.
96. Stem and branch leaves strongly differentiated; opercula long-rostrate . . . . . 62–11. *Kindbergia*, **v. 28, p. 446**
96. Stem and branch leaves scarcely differentiated; opercula conic to apiculate.
97. Costae ending well below leaf apex.
98. Leaves wide-spreading; margins entire; stems complanate-foliate; in wet habitats . . . . . 54–8. *Leptodictyum* (in part), **v. 28, p. 289**
98. Leaves erect to spreading; margins serrulate, rarely entire; stems not complanate-foliate; in various habitats . . . . . .62–1. *Brachytheciastrum* (in part)/62–2. *Brachythecium* (in part)/*62–17. Sciuro-hypnum complex (in part),* **v. 28, p. 408, 414, 455**
97. Costae percurrent or nearly so.
99. Costae indistinct at mid leaf, not toothed; setae smooth; propagula 1-seriate, often on distal abaxial costa . . . . . .54–17. *Conardia*, **v. 28, p. 313**
99. Costae distinct throughout, toothed on distal abaxial surface; setae rough; propagula absent . . . . . .62–1. *Brachytheciastrum* (in part), **v. 28, p. 408**

Subkey D

1. Capsules large, sessile, asymmetric. . . . . .9–1. *Diphyscium* (in part), **v. 27, p. 163**
1. Capsules smaller, usually exserted, symmetric.
2. Costae with abaxial surface ridged.
3. Laminal cells rounded-oblate, less than 3:1. . . . . 15–2. *Grimmia* (in part), **v. 27, p. 225**
3. Laminal cells long-rectangular, more than 5:1. . . . . 22–11. *Dicranum* (in part), **v. 27, p. 397**
2. Costae with abaxial surface smooth or toothed, not ridged.
4. Rhizoids in conspicuous clusters, obscuring stem.
5. Laminal cells strongly 1-papillose on both surfaces . . . . 39–1. *Aulacomnium* (in part), **v. 28, p. 92**
5. Laminal cells smooth or prorulose.
6. Leaves narrowly lanceolate from ovate base . . . . . 40–3. *Anacolia*, **v. 28, p. 99**
6. Leaves ovate to broadly elliptic.
7. Rhizoidal (macronematal) initials in longitudinal rows; endostome segments fused into dome . . . . . .46–1. *Cinclidium* (in part), **v. 28, p. 217**
7. Rhizoidal initials not in longitudinal rows; endostome segments free . . . . . 46–7. *Rhizomnium* (in part), **v. 28, p. 236**
4. Rhizoids inconspicuous or if conspicuous, never obscuring stem.
8. Plants blackish, on wet rock usually near streams or sea; propagula absent.
9. Leaf bases with submarginal band of elongate cells . . . . . 17–1. *Scouleria*, **v. 27, p. 312**
9. Leaf bases without differentiated submarginal cells.
10. Leaf margins plane to recurved . . . . . 15–1. *Schistidium* (in part), **v. 27, p. 207**
10. Leaf margins incurved . . . . . 15–2. *Grimmia* (in part), **v. 27, p. 225**
8. Plants greenish, in various habitats, rarely on wet rock by streams; propagula present or absent.
11. Hyaline basal cells extending up margins farther than at costa, forming V-shaped region.
12. Distal laminal cells bulging but not papillose. . . . . 29–40. *Luisierella*, **v. 27, p. 641**
12. Distal laminal cells multipapillose.

13. Leaves squarrose-recurved from erect base when moist; leaf margins serrulate distally; sporophytes lateral . . . . . 29–6. *Pleurochaete*, **v. 27, p. 496**
13. Leaves erect-spreading to spreading from erect base when moist; leaf margins entire to notched; sporophytes terminal. . . . . 29–26. *Tortella* (in part), **v. 27, p. 586**

[11. Shifted to left margin.—Ed.]

11. Hyaline basal cells if present extending ± equally up margins and costa, or farther up costa.
14. Plants glaucous, bluish green; leaves narrowly lanceolate . . . . . .25–4. *Saelania*, **v. 27, p. 458**
14. Plants usually not glaucous or bluish, if so then leaves not lanceolate.
15. Leaves unbordered, or if bordered then by only 1 row (or several poorly defined rows) of somewhat elongate cells, or by short cells.
16. Leaf margins with single teeth or entire.
17. Laminal cells smooth or papillose, not bulging, or if bulging then papillose . . . . . Subkey E, **p. 660**
17. Laminal cells strongly bulging on one or both surfaces, not papillose.
18. Leaf laminae 2-stratose . . . . . 29–1. *Timmiella*, **v. 27, p. 481**
18. Leaf laminae 1-stratose.
19. Leaf bases sheathing . . . . . 10–1. *Timmia* (in part), **v. 27, p. 165**
19. Leaf bases not sheathing.
20. Distal laminal cells bulging on both surfaces; calyptrae mitrate; Arctic and n North America . . . . . .11-1. *Bryobrittonia*, **v. 27, p. 171**
20. Distal laminal cells bulging only on adaxial surface; calyptrae cucullate; temperate distribution . . . . . .29–13. *Hyophiladelphus*, **v. 27, p. 527**
16. Leaf margins with paired teeth.
21. Leaf bases with abruptly differentiated unpigmented cells (cancellinae); propagula on distal costa . . . . . 32–1. *Syrrhopodon* (in part), **v. 27, p. 655**
21. Leaf bases without cancellinae; propagula absent.
22. Laminal cells smooth.
23. Leaves elliptic to ovate-elliptic . . . . . 46–4. *Mnium* (in part), **v. 28, p. 223**
23. Leaves linear-lanceolate . . . . . .47–1. *Pyrrhobryum*, **v. 28, p. 245**
22. Laminal cells prorulose or with fine cuticular ridges.
24. Distal laminal cells with cuticular ridges; stems triangular in transverse section . . . . . 40–2. *Plagiopus*, **v. 28, p. 99**
24. Distal laminal cells prorulose; stems round in transverse section.
25. Leaves crispate when dry . . . . . 40–4. *Bartramia* (in part), **v. 28, p. 101**
25. Leaves straight when dry . . . . . 40–5. *Philonotis* (in part), **v. 28, p. 106**
15. Leaves bordered by 2+ rows of elongate cells.
26. Leaf margins entire.
27. Laminal cells 1–2:1.
28. Rhizoidal (macronematal) initials in longitudinal rows; endostome segments fused into dome . . . . . .46–1. *Cinclidium* (in part), **v. 28, p. 217**
28. Rhizoidal initials not in longitudinal rows; endostome segments free.
29. Leaves ovate or broadly elliptic; border 1-stratose; stems blackish; stomata superficial . . . . . 46–2. *Cyrtomnium*, **v. 28, p. 219**
29. Leaves obovate or elliptic, occasionally orbicular; border thickness various; stems usually reddish; stomata immersed . . . . . 46–7. *Rhizomnium* (in part), **v. 28, p. 236**
27. Most laminal cells longer than 3:1.
30. Laminal cells in oblique rows; leaf apices rounded-obtuse, usually apiculate . . . . . 46–6. *Pseudobryum* (in part), **v. 28, p. 235**
30. Laminal cells not in obvious rows; leaf apices various.
31. Distal laminal cells 3–6:1, longer than proximal cells; leaves imbricate, not contorted or twisted when dry; border cells 1-stratose.
32. Plants mostly less than 1 cm; leaves less than 2.5 mm . . . . . .42–4. *Gemmabryum* (in part), **v. 28, p. 129**
32. Plants mostly 1–3 cm; leaves 1–3.5 mm . . . . . .42–6. *Imbribryum* (in part), **v. 28, p. 142**

31. Distal laminal cells 2–4:1, similar in length to proximal cells; leaves twisted to contorted when dry; border cells 1- or 2-stratose.
    33. Leaves ovate-lanceolate to ovate; border cells 1- or 2-stratose . . . . . 42–10. *Ptychostomum* (in part), **v. 28, p. 155**
    33. Leaves ovate to obovate; border cells 1-stratose . . . . . 42–12. *Rosulabryum* (in part), **v. 28, p. 177**

[26. Shifted to left margin.—Ed.]

26. Leaf margins toothed, sometimes obscurely so.
    34. Leaf bases expanded, with many abruptly hyaline cells . . . . . 32–1. *Syrrhopodon* (in part), **v. 27, p. 655**
    34. Leaf bases not expanded, without hyaline cells.
        35. Leaf marginal teeth paired.
            36. Laminal cells mammillose . . . . . 46–8. *Trachycystis*, **v. 28, p. 242**
            36. Laminal cells not mammillose.
                37. Some leaves with low, inconspicuous lamellae; costal stereid bands 2; exostome teeth 32, attached at apices to tympanum . . . . 8–6. *Atrichum* (in part), **v. 27, p. 147**
                37. Lamellae absent; costal stereid band 1 or absent; exostome teeth 16, free . . . . . 46–4. *Mnium* (in part), **v. 28, p. 223**
        35. Leaf marginal teeth single.
            38. Leaves rugose when dry or moist; restricted to Pacific Northwest . . . . . 43–1. *Roellobryon*, **v. 28, p. 187**
            38. Leaves usually flat when moist, contorted but not rugose when dry; widespread.
                39. Laminal cells shorter than 2:1 . . . . . 46–5. *Plagiomnium* (in part), **v. 28, p. 229**
                39. Laminal cells 3+:1.
                    40. Stems rosulate-foliate, erect from horizontal underground stem; sporophytes often clustered . . . . . 42–11. *Rhodobryum*, **v. 28, p. 176**
                    40. Stems foliate throughout, without rhizomelike connections between erect stems; sporophytes not clustered.
                        41. Laminal cells in oblique rows; leaf apices rounded-obtuse, usually apiculate . . . . . 46–6. *Pseudobryum* (in part), **v. 28, p. 235**
                        41. Laminal cells not in obvious rows; leaf apices broadly acute to acuminate.
                            42. Plants roselike with distinctive head of terminal leaves.
                                43. Capsules erect, symmetric; endostome basal membrane high, segments absent or rudimentary, cilia absent . . . . . 42–2. *Brachymenium* (in part), **v. 28, p. 122**
                                43. Capsules inclined, asymmetric; endostome basal membrane keeled, segments keeled, perforate, cilia usually present . . . . . 42–12. *Rosulabryum* (in part), **v. 28, p. 177**
                            42. Plants with leaves evenly arranged along stem or bulbiform.
                                44. Distal laminal cells 3–6:1, longer than proximal cells; leaves imbricate, not contorted or twisted when dry; border cells 1-stratose.
                                    45. Plants mostly less than 1 cm; leaves less than 2.5 mm . . . . . 42–4. *Gemmabryum* (in part), **v. 28, p. 129**
                                    45. Plants mostly 1–3 cm; leaves 1–3.5 mm. . . . . 42–6. *Imbribryum* (in part), **v. 28, p. 142**
                                44. Distal laminal cells 2–4:1, similar in length to proximal cells; leaves twisted to contorted when dry; border cells 1- or 2-stratose.
                                    46. Leaves ovate-lanceolate to ovate; border cells 1- or 2-stratose. . . . . 42–10. *Ptychostomum* (in part), **v. 28, p. 155**
                                    46. Leaves ovate to obovate; border cells 1-stratose . . . . . 42–12. *Rosulabryum* (in part), **v. 28, p. 177**

Subkey E

1. Leaf bases abruptly expanded, sheathing.
   2. Laminal cells papillose (at least on sheath) or prorulose.
      3. Laminal cells papillose over lumina . . . . . 10–1. *Timmia* (in part), **v. 27, p. 165**
      3. Laminal cells prorulose . . . . . 40–4. *Bartramia* (in part), **v. 28, p. 101**
   2. Laminal cells smooth.
      4. Distal laminal cells quadrate.
         5. Capsules inclined, asymmetric, strumose; widespread . . . . . 22–13. *Oncophorus* (in part), **v. 27, p. 423**
         5. Capsules erect, symmetric, not strumose; restricted to sw United States . . . . . 22–17. *Symblepharis*, **v. 27, p. 430**
      4. Distal laminal cells short-rectangular.
         6. Leaf awns roughened throughout by projecting cell ends . . . . . 25–5. *Trichodon*, **v. 27, p. 459**
         6. Leaf awns smooth or only rough at apex.
            7. Capsule neck as long as or longer than urn . . . . . 23–2. *Trematodon* (in part), **v. 27, p. 437**
            7. Capsule neck much shorter than urn.
               8. Capsules inclined, oblong, smooth or furrowed, if erect then furrowed; peristome teeth flat, split mid tooth, vertically pitted . . . . . 22–8. *Dicranella* (in part), **v. 27, p. 386**
               8. Capsules erect, cylindric, smooth; peristome teeth irregularly perforate or deeply cleft into terete, sometimes filiform divisions . . . . . 25–3. *Ditrichum* (in part), **v. 27, p. 450**

1. Leaf bases not or gradually expanded, rarely sheathing.
   9. Alar cells enlarged, pigmented, or inflated.
      10. Distal and medial laminal cells with coarse, irregular cuticular ridges, resembling papillae in transverse section; capsules cylindric, smooth, erect.
         11. Leaves with clusters of spheric propagula at apex; leaf margins 2-stratose . . . . . 15–2. *Grimmia* (in part), **v. 27, p. 225**
         11. Leaves without propagula; leaf margins 1-stratose . . . 22–10. *Dicranoweisia* (in part), **v. 27, p. 395**
      10. Laminal cells without cuticular ridges; capsules various.
         12. Costal stereid bands 2 . . . . . 22–11. *Dicranum* (in part), **v. 27, p. 397**
         12. Costal stereid bands absent.
            13. Capsules curved, strumose; on alpine rock . . . . . 22–12. *Kiaeria*, **v. 27, p. 420**
            13. Capsules straight, not strumose; widespread.
               14. Capsules cylindric; usually terrestrial or on tree trunks, rarely on rock . . . . . 22–11. *Dicranum* (in part), **v. 27, p. 397**
               14. Capsules short, obovoid to pyriform; on rock.
                  15. Capsules smooth when dry; peristome papillose . . . . . 19–2. *Blindia*, **v. 27, p. 327**
                  15. Capsules ribbed when dry; peristome vertically pitted-striolate proximally . . . . . 22–2. *Arctoa*, **v. 27, p. 362**
   9. Alar cells scarcely differentiated.
      16. Laminal cells smooth.
         17. Asexual propagula borne on leaf surfaces . . . . . 26–1. *Rhachithecium*, **v. 27, p. 468**
         17. Asexual propagula absent, axillary, or on leaf apices or specialized structures.
            18. Leaves ovate to obovate; apices broadly obtuse; costae ending before apex.
               19. Leaf apices cucullate . . . . . 29–28. *Globulinella*, **v. 27, p. 605**
               19. Leaf apices not cucullate.
                  20. Propagula large, multicellular, in leaf axils; leaves obovate; margins ciliate basally . . . . . 6–1. *Oedipodium*, **v. 27, p. 117**
                  20. Axillary propagula absent; leaves ovate to spatulate; margins eciliate.
                     21. Plants small, bulbiform, on dry soil; leaves concave, imbricate . . . . . 29–27. *Stegonia* (in part), **v. 27, p. 603**
                     21. Plants small to medium-sized, never bulbiform, on moist soil; leaves flat to concave, mostly not imbricate.

22. Laminal cells short-rectangular, lax, walls thin; capsules erect.
    23. Apical marginal laminal cells short-rhombic, oblong-hexagonal internally; capsule neck not distinct; s United States . . . . . 30–1. *Splachnobryum*, **v. 27, p. 644**
    23. Apical marginal laminal cells laxly rectangular, similar to internal ones; capsule neck well differentiated; n North America . . . . . 34–2. *Tayloria* (in part), **v. 28, p. 17**
22. Laminal cells long-hexagonal, walls firm; capsules inclined to horizontal.
    24. Plants whitish; stems terete-foliate; distal laminal cells 7–9:1 . . . . . 42–1. *Anomobryum* (in part), **v. 28, p. 120**
    24. Plants reddish or green; stems not terete-foliate; distal laminal cells 2–6:1 . . . . . 42–3. *Bryum*, **v. 28, p. 124**

[18. Shifted to left margin.—Ed.]

18. Leaves linear, ovate-lanceolate, ligulate to ovate; apices acuminate to acute or awned; costae ending below apex to excurrent.
    25. Leaves lanceolate to linear.
        26. Leaves conspicuously 4-ranked . . . . . 40–1. *Conostomum* (in part), **v. 28, p. 98**
        26. Leaves not conspicuously ranked (if 3-ranked see 35–3. *Meesia* (in part), **v. 28, p. 32**) . . . Subkey F, **p. 666**
    25. Leaves oblong, lingulate to ovate.
        27. Laminal cells rounded to quadrate, ± isodiametric.
            28. Leaf bases with abruptly differentiated, hyaline cells (cancellinae); apices often with propagula . . . . . 32–2. *Calymperes* (in part), **v. 27, p. 659**
            28. Leaf bases without cancellinae although sometimes gradually hyaline; apices without propagula.
                29. Costae subpercurrent; apices broadly acute or obtuse to rarely mucronate.
                    30. Peristome teeth 4; propagula cups borne on apices of sterile shoots . . . . . 5–1. *Tetraphis*, **v. 27, p. 111**
                    30. Peristome teeth 16; propagula cups absent.
                        31. Leaves homomallous, broadly oblong to oblong-ovate; apices subacute to obtuse . . . . . 39–2. *Arrhenopterum*, **v. 28, p. 95**
                        31. Leaves not homomallous, oblong to lanceolate; apices mucronate to acuminate.
                            32. Leaves broadly to narrowly lanceolate; peristome double. . . . . 35–3 *Meesia* (in part), **v. 28, p. 32**
                            32. Leaves broadly oblong to spatulate; peristome single.
                                33. Costal stereid band 1 . . . . . 29–2. *Scopelophila*, **v. 27, p. 483**
                                33. Costal stereid bands 2 . . . . . 29–14. *Barbula* (in part), **v. 27, p. 528**
                29. Costae excurrent to ending in cusp; apices cuspidate to piliferous.
                    34. Leaf apices piliferous . . . . . 29–26. *Tortula* (in part), **v. 27, p. 586**
                    34. Leaf apices cuspidate, apiculate, or acuminate.
                        35. Leaves obovate to elliptic; apices apiculate (of 1(–3) thick-walled cells); rhizoidal tubers present . . . . . 29–36. *Chenia*, **v. 27, p. 633**
                        35. Leaves ovate to spathulate; apices acute, mucronate, or acuminate; rhizoidal tubers absent.
                            36. Distal marginal laminal cells differentiated from inner cells . . . . . 29–34. *Microbryum* (in part), **v. 27, p. 627**
                            36. Distal marginal laminal cells similar to inner cells.
                                37. Distal leaf margins dentate; marginal cells smaller, walls thicker than inner cells . . . . . 29–37. *Hennediella*, **v. 27, p. 635**
                                37. Distal leaf margins entire; marginal cells larger, walls thinner than inner cells . . . . . 29–39. *Crumia* (in part), **v. 27, p. 639**

[27. Shifted to left margin.—Ed.]

27. Laminal cells short-rectangular to linear.
    38. Plants filiform; stems julaceous (if costa not excurrent see also 42–1. *Anomobryum*, (in part), **v. 28, p. 120**) . . . . . 22–1. *Aongstroemia*, **v. 27, p. 360**
    38. Plants coarser; stems not julaceous.
        39. Laminal cells (5–)7+:1; leaves generally lanceolate . . . . . 45–2. *Pohlia* (in part), **v. 28, p. 193**
        39. Laminal cells (3–)4:1 or shorter; leaves generally ovate-lanceolate.
            40. Capsules horizontal to pendulous.
                41. Capsules curved, asymmetric, pendulous.
                    42. Exostome teeth longer than and opposite to endostome segments . . . . . 12–3. *Funaria* (in part), **v. 27, p. 188**
                    42. Exostome teeth either reduced or alternate to endostome segments . . . . . 42–9. *Plagiobryum*, **v. 28, p. 152**
                41. Capsules straight, symmetric, inclined to horizontal.
                    43. Gametophores much reduced; stems to 0.2 mm; leaves less than 1 mm; costae nearly absent; capsules subspheric to globose, less than 1 mm; stomata absent; endostome fused to exostome, cilia absent . . . . . 13–1. *Discelium*, **v. 27, p. 200**
                    43. Gametophores not reduced; stems and leaves larger; costae present; capsules cylindric to ovate, usually greater than 1 mm; stomata present; endostome free of exostome, cilia or endostome segments mostly present.
                        44. Capsules short-pyriform to ovate, neck short; sporophytes lateral; peristome with endostome only . . . . . 42–5. *Haplodontium* (in part), **v. 28, p. 140**
                        44. Capsules pyriform, neck long; sporophytes terminal; peristome with endostome and exostome.
                            45. Rhizoidal tubers small, pyriform, brown, 40–60 µm; laminal cells less than 15 µm wide; alar cells quadrate . . . . . 42–4. *Gemmabryum* (in part), **v. 28, p. 129**
                            45. Rhizoidal tubers large, spheric, red, often greater than 200 µm, or absent; laminal cells typically greater than 20 µm wide; alar cells not quadrate . . . . . 42–8. *Plagiobryoides*, **v. 28, p. 148**
            40. Capsules erect.
                46. Peristome absent.
                    47. Calyptrae 4-angled, sheathing entire capsule until after dehiscence . . . . . 12–6. *Pyramidula*, **v. 27, p. 199**
                    47. Calyptrae not angled, not sheathing or persistent.
                        48. Capsules subcylindric or narrowly pyriform; annuli absent; exothecial cells oblong to oblong-linear; calyptrae inflated-cucullate . . . . . 12–2. *Entosthodon* (in part), **v. 27, p. 182**
                        48. Capsules urceolate to broadly pyriform; annuli present; exothecial cells irregularly hexagonal; calyptrae inflated-mitrate . . . . . 12–5. *Physcomitrium* (in part), **v. 27, p. 196**
                46. Peristome present.
                    49. Peristome of endostome only, without center line on external surface.
                        50. Leaf margins entire . . . . . 42–5. *Haplodontium* (in part), **v. 28, p. 140**
                        50. Leaf margins denticulate . . . . . 45–1. *Mielichhoferia* (in part), **v. 28, p. 191**
                    49. Peristome double or of exostome only, with center line on external surface.
                        51. Capsule neck scarcely differentiated.
                            52. Plants of British Columbia (50° N) and south . . . . . 12–2. *Entosthodon* (in part), **v. 27, p. 182**
                            52. Plants of arctic tundra . . . . . 12–3. *Funaria* (in part), **v. 27, p. 188**
                        51. Capsule neck well differentiated.

53. Capsule urns black, hypophyses sometimes yellow. . . . . .34–3. *Tetraplodon* (in part), **v. 28, p. 21**
53. Capsule urns and hypophyses green to brown.
54. Setae brownish, stout to slender; costae ending below apex; w, n North America . . . . . .34–2. *Tayloria* (in part), **v. 28, p. 17**
54. Setae pale greenish white, slender; costae filling acumen; e North America . . . . . .34–4. *Splachnum* (in part), **v. 28, p. 23**

[16. Shifted to left margin.—Ed.]

16. Laminal cells papillose or prorulose.
55. Leaves 2-stratose throughout, ligulate to oblong; apices obtuse; perichaetial leaves long-awned . . . . . .9–1. *Diphyscium* (in part), **v. 27, p. 163**
55. Leaves 1-stratose, or if 2-stratose then not ligulate to oblong; apices acuminate, acute, or obtuse; perichaetial leaves not so differentiated.
56. Laminal cells rectangular, prorulose; capsules globose, rugulose to furrowed when dry.
57. Leaves strongly ranked. . . . . .40–1. *Conostomum* (in part), **v. 28, p. 98**
57. Leaves not conspicuously ranked.
58. Capsules erect, or if pendent then from curvature of seta, symmetric, rugulose when dry; peristome reduced to low membrane. . . . . 40–5. *Philonotis* (in part), **v. 28, p. 106**
58. Capsules strongly inclined, asymmetric, furrowed; peristome more developed.
59. Leaves 2-stratose at least at margins; on banks and cliffs in mesic habitats; innovative branches absent . . . . . 40–4. *Bartramia* (in part), **v. 28, p. 101**
59. Leaves 1-stratose; on soil and rock in at least periodically wet habitats; innovative branches often present beneath inflorescences . . . . . 40–5. *Philonotis* (in part), **v. 28, p. 106**
56. Laminal cells rounded-quadrate, 1–multipapillose; capsules ovate to cylindric, smooth or furrowed.
60. Laminal cells appearing papillose from slightly thickened walls between cells (not prorulose).
61. Leaves erect, straight to curved; capsules immersed to short-exserted, ovate-cylindric; on rock . . . . . 15–2. *Grimmia* (in part), **v. 27, p. 225**
61. Leaves crispate when dry; capsules long-exserted, cylindric; usually on logs . . . . . 22–10. *Dicranoweisia* (in part), **v. 27, p. 395**
60. Laminal cells papillose over lumina.

[62. Shifted to left margin.—Ed.]

62. Laminal cells collenchymatous, stellate.
63. Laminal cells multipapillose; leaves recurved. . . . . .29–16. *Didymodon* (in part), **v. 27, p. 539**
63. Laminal cells 1-papillose; leaves not recurved . . . . . 39–1. *Aulacomnium* (in part), **v. 28, p. 92**
62. Laminal cells not collenchymatous, or if so, not stellate.
64. Leaves with abruptly differentiated hyaline cells occupying most of base (cancellinae), and with intramarginal border of elongate cells (teniolae), at least in proximal part of leaf; propagula usually present on leaf apex . . . . . 32–2. *Calymperes* (in part), **v. 27, p. 659**
64. Leaves without cancellinae, or if present then never with teniolae; propagula never on leaf apices but sometimes elsewhere on leaves or in axils.
65. Plants with propagula borne terminally on specialized stalks from stem apices. . . . . 39–1. *Aulacomnium* (in part), **v. 28, p. 92**
65. Plants with or without various means of asexual reproduction but these never borne on stalks from stem apices.
66. Plants on tree trunks or bare rock; capsules immersed to short-exserted, often ribbed.
67. Calyptrae cucullate, not plicate, naked; on wet rock . . . . . .37–1. *Amphidium* (in part), **v. 28, p. 38**
67. Calyptrae mitrate, plicate, usually hairy; on tree trunks and dry rock.

68. Leaves usually little altered when dry; basal marginal laminal cells not differentiated; stomata immersed or superficial; capsules immersed to short-exserted . . . . . 37–6. *Orthotrichum* (in part), **v. 28, p. 45**
68. Leaves usually crispate to contorted when dry; basal marginal laminal cells with thickened transverse walls; stomata superficial; capsules short-exserted . . . . . 37–8. *Ulota* (in part), **v. 28, p. 72**

[66. Shifted to left margin.—Ed.]

66. Plants usually on soil, if on rock or trees then capsules long-exserted and mostly unribbed (or plants sterile).
69. Costal stereid bands not differentiated.
70. Laminal cell papillae C-shaped; leaves broadly spatulate . . . . . 29–3. *Gymnostomiella*, **v. 27, p. 609**
70. Laminal cell papillae simple, conic; leaves not broadly spatulate.
71. Distal laminal cell papillae 4–7, conic . . . . . 37–9. *Zygodon* (in part), **v. 28, p. 78**
71. Distal laminal cell papillae 3 or fewer, simple to branched.
72. Leaves less than 0.6 mm, ligulate; apices rounded-obtuse; annuli of 2 or 3 rows of well-differentiated cells . . . . . 29–11. *Gyroweisia*, **v. 27, p. 523**
72. Leaves more than (0.7–)1.5 mm, lanceolate to ovate; apices acuminate to obtuse; annuli poorly differentiated.
73. Leaves usually little altered when dry; basal marginal laminal cells not differentiated; capsules immersed to short-exserted; calyptrae naked (species with contorted leaves) to hairy (species with unaltered leaves) . . . . . 37–6. *Orthotrichum* (in part), **v. 28, p. 45**
73. Leaves typically crispate to contorted when dry; basal marginal laminal cells with thickened transverse walls; capsules short-exserted; calyptrae hairy . . . . . 37–8. *Ulota* (in part), **v. 28, p. 72**
69. Costal stereid bands differentiated.
74. Costal stereid bands single, dorsal.
75. Calyptrae campanulate-mitrate, covering entire capsule, often lobed at base; basal laminal cells with thickened transverse walls. . . . . 11–2. *Encalypta* (in part), **v. 27, p. 172**
75. Calyptrae cucullate, covering only operculum and capsule apex, unlobed at base; basal laminal cells usually without thickened transverse walls.
76. Leaves broadly lanceolate (from revolute leaf margins), lingulate or oblong-ovate; apices sometimes with hair-points; margins recurved to strongly revolute; laminal cell papillae stellate from stipitate base to C-shaped.
77. Leaves with intramarginal band of enlarged, smooth, often orange cells . . . . . 29–39. *Crumia* (in part), **v. 27, p. 639**
77. Leaves without differentiated intramarginal cells but sometimes with smooth, not enlarged marginal cells.
78. Leaves narrowly lanceolate; margins erect, 2-stratose . . . . . 29–16. *Didymodon* (in part), **v. 27, p. 539**
78. Leaves oblong, lingulate to ovate; margins plane to revolute, 1-stratose, or if 2-stratose then always revolute.
79. Distal leaf margins broadly revolute to spirally revolute; marginal cells often more strongly chlorophyllose than medial cells . . . . . 29–19. *Pseudocrossidium*, **v. 27, p. 569**
79. Distal leaf margins plane to revolute; marginal cells undifferentiated or paler than medial cells.
80. Leaves often bordered by smooth cells; peristome present . . . . . 29–26. *Tortula* (in part), **v. 27, p. 586**
80. Leaves unbordered; peristome absent or rudimentary . . . . . 29–34. *Microbryum* (in part), **v. 27, p. 627**

76. Leaves linear-lanceolate to lanceolate; apices never with hair-points; margins recurved to plane; laminal cell papillae conic, clavate, or branched, rarely C-shaped.
81. Laminal cell papillae 4–7, widely spaced, small, conic; elliptic propagula present in leaf axils; peristome double; usually on trees, rarely on rock . . . . . 37–9. *Zygodon* (in part), **v. 28, p. 78**
81. Laminal cell papillae 1–3(–4), closely set, simple to branched; propagula absent; peristome single or absent; on soil and rock.
82. Leaf margins serrulate distally; capsules erect to inclined, often furrowed and strumose; peristome vertically pitted-striolate . . . . . 22–6. *Cynodontium* (in part), **v. 27, p. 376**
82. Leaf margins entire; capsules erect, never furrowed or strumose; peristome, when present, papillose.
83. Basal laminal cells lax, hyaline; distal leaf margins 2-stratose throughout; peristome present . . . . . 29–16. *Didymodon* (in part), **v. 27, p. 539**
83. Basal laminal cells firm-walled, pale but not hyaline; distal leaf margins 1-stratose or irregularly 2-stratose; peristome absent.
84. Stems monopodial; archegonia on short, lateral branches; stems in transverse section rounded-triangular . . . . . 29–10. *Anoectangium*, **v. 27, p. 520**
84. Stems sympodial; archegonia terminal on main stem; stems in transverse section round . . . 29–15. *Gymnostomum* (in part), **v. 27, p. 534**

[74. Shifted to left margin.—Ed.]

74. Costal stereid bands both dorsal and ventral.
85. Leaf margins abruptly serrate at shoulders . . . . . 29–3. *Eucladium*, **v. 27, p. 486**
85. Leaf margins entire at shoulders.
86. Laminal cell papillae many (more than 7), minute, elliptic, over walls and lumina . . . . . 37–1. *Amphidium* (in part), **v. 28, p. 38**
86. Laminal cell papillae fewer than 7, larger, round, only over lumina.
87. Leaf margins toothed distally.
88. Laminae 2-stratose; margins 1-stratose . . . . . 29–20. *Rhexophyllum*, **v. 27, p. 572**
88. Laminae 1-stratose; margins 1- or 2-stratose.
89. Laminal cells bulging, mammillose to 1-papillose . . . . . 22-7. *Dichodontium* (in part), **v. 27, p. 382**
89. Laminal cells not bulging, multipapillose.
90. Stems with central strand present . . . . . 29–18. *Bryoerythrophyllum*, **v. 27, p. 565**
90. Stems with central strand absent.
91. Stems with hyalodermis present; costal adaxial surface with enlarged, papillose cells . . . . . 29–4. *Trichostomum* (in part), **v. 27, p. 488**
91. Stems with hyalodermis absent; costal adaxial surface with small, smooth cells . . . . . 29–21. *Leptodontium*, **v. 27, p. 574**
87. Leaf margins entire or roughened with projecting papillae.
92. Leaf margins at extreme apex with large, curved, projecting papillae . . . . . 22–7. *Dichodontium* (in part), **v. 27, p. 382**
92. Leaf margins at extreme apex entire or papillose-crenulate.
93. Stems triquetrous, especially when moist; laminal cells 1-papillose, papillae sometimes branched; California . . . . . 29–23. *Triquetrella*, **v. 27, p. 580**
93. Stems without ranked leaves; laminal cells multipapillose; widespread.
94. Leaf margins recurved to revolute, at least near mid leaf or below.
95. Peristome absent; leaves recurved only on one side. . . . . 29–22. *Hymenostylium*, **v. 27, p. 577**
95. Peristome usually present; leaves recurved on both sides.

96. Axillary hairs with all cells hyaline; laminal cells obscure in surface view; leaves usually ovate to oblong; costal abaxial surface cells oblong to elongate; basal laminal cells usually strongly differentiated, hyaline, elongate . . . . . 29–14. *Barbula* (in part), **v. 27, p. 528**

96. Axillary hairs with brown basal cell; laminal cells well defined in surface view; leaves usually lanceolate; costal abaxial surface cells quadrate to short-oblong, rarely elongate; basal laminal cells usually little differentiated, green, short-rectangular . . . . . 29–16. *Didymodon* (in part), **v. 27, p. 539**

[94. Shifted to left margin.—Ed.]

94. Leaf margins plane to erect.
97. Costae sinuous distally . . . . . 29–12. *Bellibarbula*, **v. 27, p. 525**
97. Costae straight distally.
98. Stems with hyalodermis present . . . . . 29–4. *Trichostomum* (in part), **v. 27, p. 488**
98. Stems with hyalodermis absent, epidermal cells small.
99. Leaf apices subtubulose; distal laminal cell papillae 1 or 2, large, centered, multifid . . . . . 29–5. *Tuerckheimia*, **v. 27, p. 494**
99. Leaf apices flat; distal laminal cell papillae 3–6, small, scattered, simple, blunt.
100. Perichaetia and sporophytes terminal; leaves less than 2 mm; axillary hairs of 8–10 cells . . . . . 29–15. *Gymnostomum* (in part), **v. 27, p. 534**
100. Perichaetia and sporophytes lateral; leaves 2.2–3 mm; axillary hairs of 15–20 cells . . . . . 29–17. *Molendoa*, **v. 27, p. 561**

Subkey F

1. Laminal cells (3–)4+:1, rectangular to long-hexagonal.
2. Leaf apices acute to acuminate.
3. Costae occupying ½ or more of leaf base; capsules curved, asymmetric, elongate-pyriform, neck as long as urn . . . . . 35–2. *Amblyodon*, **v. 28, p. 31**
3. Costae occupying less than ¼ leaf base; capsules straight, symmetric, shape variable but not elongate-pyriform, neck inconspicuous.
4. Plants small, less than 2 mm, gregarious, on calcareous rock; capsules ovate . . . . . 19–1. *Seligeria* (in part), **v. 27, p. 320**
4. Plants larger, mostly more than 5 mm, in tufts, on various substrates; capsules cylindric.
5. Leaves flexuose-twisted when dry; capsules erect; s Appalachian Mountains, California . . . . . 41–1. *Orthodontium*, **v. 28, p. 114**
5. Leaves erect, little altered when dry; capsules erect or inclined; widespread.
6. Capsules appearing lateral, erect; peristome single; leaves less than 1 mm; propagula absent . . . . . 45–1. *Mielichhoferia* (in part), **v. 28, p. 191**
6. Capsules terminal, inclined to pendent; peristome double; leaves usually more than 1 mm; axillary propagula sometimes present . . . . . 45–2. *Pohlia* (in part), **v. 28, p. 193**
2. Leaf apices subulate.
7. Capsules curved, asymmetric . . . . . 22–8. *Dicranella* (in part), **v. 27, p. 386**
7. Capsules straight, symmetric (sometimes inclined to pendulous).
8. Setae flexuose-curved to cygneous.
9. Setae more than 1 cm; plants more than 5 mm; leaves more than 4 mm; capsules pyriform. . . . . 35–1. *Leptobryum*, **v. 28, p. 31**
9. Setae less than 0.5 cm; plants less than 3 mm; leaves less than 2 mm; capsules hemispheric.
10. Plants perennial, on rock, not in Florida; setae slender, twisted; peristome present . . . . . 19–1. *Seligeria* (in part), **v. 27, p. 320**
10. Plants ephemeral, on soil in Florida; setae stout, curved at apex, not twisted; peristome absent . . . . . 25–7. *Eccremidium*, **v. 27, p. 461**

8. Setae straight but sometimes spirally twisted.
11. Peristome double; Arctic areas . . . . . 44–1. *Pseudoditrichum*, **v. 28, p. 188**
11. Peristome single; widespread.
12. Capsules ovoid; on calcareous rock . . . . . 19–1. *Seligeria* (in part), **v. 27, p. 320**
12. Capsules oblong to cylindric; generally on soil.
13. Capsules short-cylindric; peristome teeth divided ½ their length, flat, vertically pitted-striolate . . . . . 22–8. *Dicranella* (in part), **v. 27, p. 386**
13. Capsules long-cylindric; peristome teeth divided to base, terete, papillose . . . . . 25–3. *Ditrichum* (in part), **v. 27, p. 450**

1. Laminal cells 1(–2):1, rounded to quadrate.
14. Perichaetial leaves strongly differentiated, awns as long as lamina; leaves 2-stratose . . . . . 9–1. *Diphyscium* (in part), **v. 27, p. 163**
14. Perichaetial leaves slightly or not differentiated, never long-awned; leaves 1–multistratose.
15. Distal laminal cells in ascending oblique rows; cylindric brood bodies present on leaves; tomentum common . . . . . 37–9. *Zygodon* (in part), **v. 28, p. 78**
15. Distal laminal cells not in oblique rows; brood bodies present or absent; tomentum absent or sparse.
16. Capsules distinctly 8- or 16-ribbed and furrowed.
17. Calyptrae mitrate.
18. Calyptrae hairy . . . . . 37–8. *Ulota* (in part), **v. 28, p. 72**
18. Calyptrae naked.
19. Annuli compound; calyptrae not plicate . . . . . 19–3. *Brachydontium*, **v. 27, p. 327**
19. Annuli absent; calyptrae plicate . . . . . 37–6. *Orthotrichum* (in part), **v. 28, p. 45**
17. Calyptrae cucullate.
20. Setae cygneous; plants rare, in tight cushions on alpine slopes. . . . . 22-14. *Oreas*, **v. 27, p. 425**
20. Setae erect (sometimes twisted); plants various but not on alpine slopes.
21. Capsules abruptly bent at seta-capsule junction and horizontal, often purple-red when mature. . . . . 25–1. *Ceratodon*, **v. 27, p. 445**
21. Capsules erect to suberect, brown when mature.
22. Peristome teeth divided to ½ their length; capsules cylindric to ovate-cylindric, 2 mm; Pacific Northwest . . . . . 22–6. *Cynodontium* (in part), **v. 27, p. 376**
22. Peristome teeth undivided; capsules ovoid, less than 1 mm; e, Midwestern United States, maritime Canada . . . . . 22-16. *Rhabdoweisia*, **v. 27, p. 428**
16. Capsules smooth, or indistinctly furrowed when dry but without distinct ribs.
23. Capsule neck elongate, well defined; peristome double . . . . 35–3. *Meesia* (in part), **v. 28, p. 32**
23. Capsule neck short, inconspicuous; peristome single.
24. Capsules inclined.
25. Capsules 1.5–2 mm, pale, strumose; leaf margins 2-stratose; on moist soil, rock, and logs . . . . . 36–1. *Oncophorus* (in part), **v. 27, p. 423**
25. Capsules less than 1 mm, black, not strumose; leaf margins 1-stratose; in rich fens . . . . . 35–3. *Catoscopium*, **v. 28, p. 35**
24. Capsules erect.
26. Capsules immersed to short-exserted . . . . . 15–2. *Grimmia* (in part), **v. 27, p. 225**
26. Capsules long-exserted.
27. Calyptrae mitrate.
28. Calyptrae not plicate; setae cygneous . . . 16–1. *Campylostelium*, **v. 27, p. 307**
28. Calyptrae plicate; setae straight . . . . . 16–2. *Ptychomitrium*, **v. 27, p. 307**
27. Calyptrae cucullate.
29. Leaves oblong . . . . . 29–14. *Barbula* (in part), **v. 27, p. 528**
29. Leaves lanceolate from somewhat expanded base . . . . . 29–16. *Didymodon* (in part), **v. 27, p. 539**