# 4. ANDREAEOBRYACEAE Steere

Patricia M. Eckel

**Plants** clear green to olive green to dark red-brown to dull black, moderate in size, pulvinate to mat-forming. **Stems** erect, irregularly branched; rhizoids present; central strand absent. **Leaves** dimorphic, falcate-secund and ovate-lanceolate, occasionally minute, ecostate, imbricate, squamiform on flagelliform shoots or proximally on main stem; costa single, broad, indistinct, excurrent, forming a broad, obtuse subula, lamellae absent, in section at midleaf with substereid cells centrally, adaxially and abaxially of more or less uniform thick-walled cells; margins plane to weakly tubulose, never recurved; laminal cells rounded-quadrate to short-rectangular, 1-stratose at base, becoming 2-stratose distally, multistratose in four layers when filling the fleshy subula. **Specialized asexual reproduction** absent. **Perichaetial leaves** scarcely differentiated from stem leaves, not convolute-sheathing. **Pseudopodium** as an elongate gametophytic stalk not developed. **Sporophytes** terminal on a short and broad seta. **Capsule** erect, rounded angular-ovate (trullate), broadest toward the base, opening irregularly during period of dehiscence by 4–8 lateral longitudinal valves connected at the apex; stomata, annulus, operculum, and peristome absent. **Calyptra** large, enveloping the whole capsule, mitrate, becoming cucullate on dehiscence, persistent. **Spores** chlorophyllose or aborted, the former spheric to ovoid, relatively large, (50–)90–100(–120) µm, papillose or reticulate-papillose.

Genus 1, species 1: nw North America in arctic and subarctic areas.

Unlike the case with the similar Andreaeaceae, in Andreaeobryaceae the elevating stalk supporting the capsule is derived from sporophytic (diploid) rather than gametophytic (haploid) tissue. The foot of the seta is embedded in the vaginula at the stem apex, as generally occurs in mosses of the Bryales. Sporogenous tissue and the columella are derived from the endothecium, uniting the family with that of the Andreaeaceae in this respect, and not with the Sphagnaceae, where the spore sac derives from the amphithecium. The capsule is also unlike that of the Andreaeaceae, which is clearly elliptic, not angular-ovate. The family is also similar to *Andreaea* in the presence of thallose protonematal appendages. The axillary hairs at the base of the leaves have terminal cells that are beaked, as in the genus *Takakia*. The leaves are not particularly fragile, but fragmentation may prove a factor in asexual reproduction for the species. The following is a modification of B. M. Murray's (1987) treatment.

## 1. ANDREAEOBRYUM Steere & B. M. Murray, Phytologia 33: 407. 1976 • [Genus *Andreaea* and Greek *bryon*, moss, alluding to anomalous resemblance] E

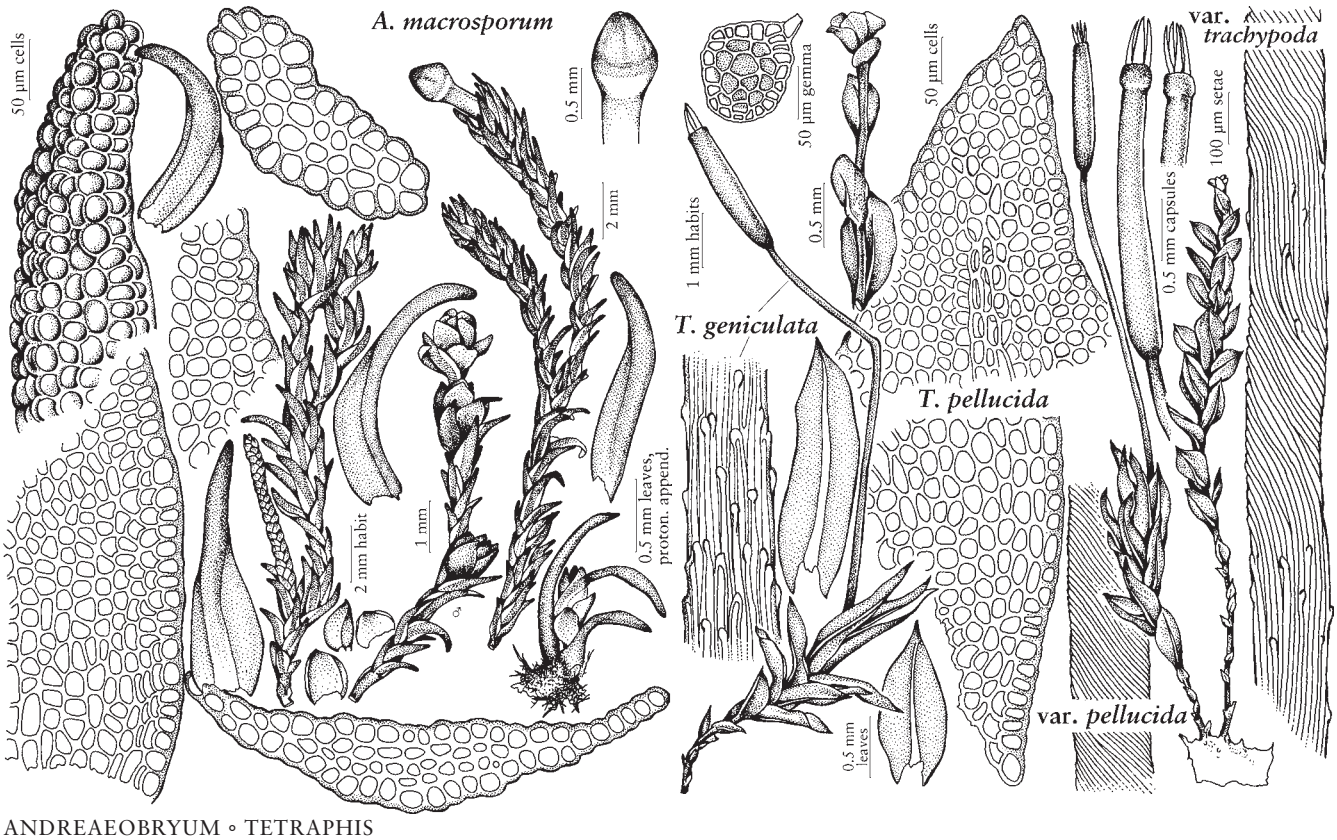
**Stems** with axillary hairs having brown to hyaline cells at the base, cells elongate distally but abruptly terminated by broadly rounded cells with a terminal beak, mucilage apparently extruded apically. **Leaves** not particularly brittle, ending in a mammillose, multistratose, obtuse subula without differentiated apical cells; costa poorly differentiated from the leaf lamina, strong from leaf insertion to apex; laminal cells with evenly thickened transverse and longitudinal walls, rounded, not pitted or sinuose. **Capsule** 0.6–1.5(–2) mm.

Species 1: nw North America in arctic and subarctic areas.

*Andreaeobryum* is especially distinctive in its substrate: unlike the speciose genus *Andreaea,* which is characteristic of granitic or other acidic substrates, the single species of *Andreaeobryum* grows exclusively on limestone or other strongly calcareous rock. The plants are often whitened with calcareous incrustations proximally. Although the genus may strongly resemble species of *Andreaea* in the field in the blackened appearance, absent hyaline hair-points, and the capsule (where common in the northern part of its range) opening by longitudinal valves, the occurrence of *Andreaeobryum* on stony calcareous substrates, on wet vertical cliffs where "the large black mats are visible for miles on the white limestone cliffs that predominate in the Brooks Range of Alaska" (B. M. Murray 1987) set it apart from species of *Andreaea*. *Andreaeobryum* is distinguished from ecostate species of *Andreaea* by its robust costa, smooth, non-papillose cells, and undifferentiated (not convolute-sheathing) perichaetial leaves. Spore sizes in species of *Andreaea* rarely approach 90 µm (exceptionally to 110 µm in *A. megistospora*), whereas those of *Andreaeobryum* are the largest for any member of the Andreaeales. The dimorphic leaves also are diagnostic, with proximal and medial areas of the main stem and side shoots julaceously cloaked with appressed, imbricate, scale-like leaves broader than wide. In addition, species of *Andreaea* are mostly autoicous.

**1. Andreaeobryum macrosporum** Steere & B. M. Murray, Phytologia 33: 407. 1976 E F

**Protonemata** massive, globose, multicellular, giving rise to a branched and thallose protonema, and protonematal appendages that are persistent, cylindrical and multiseriate, to 2 mm. **Stems** 2–4(–6) cm, hyalodermis absent, sclerodermis of 3–4 thicker-walled cells, central strand absent, sparse, red-brown, 1-seriate rhizoids at base. **Leaves** little changed on drying, erect-spreading, falcate-secund when moist, near stem base 0.3–0.4 mm, gradually larger toward stem apices, to 1–1.7 mm, clustered in the stem apices as a fist-like coma, base scarcely differentiated to ovate or elliptic, somewhat decurrent, lamina gradually to abruptly ending in the subula in the distal 1/5 or less, lamina plane to gently concave, margins plane to slightly incurved proximally, smooth to weakly sinuose in the subula; basal cells gradually differentiated, occasionally hyaline near insertion, short-rectangular, 2(–3):1, all cells distal to the base rounded-quadrate, occasionally slightly oblate, 12–20(–25) µm, all cells firm, thick-walled, more thickened at the cell angles, thickenings not irregular, not trigonous, cell walls smooth, convex to bulging-mammillose, especially in the subula. **Sexual condition** dioicous; perigonia gemmate, terminal and lateral, perigonial leaves broadly ovate, short apiculate, interior perigonial leaves 1-stratose, ecostate, wider than long, antheridia usually 4–6, on 2-seriate stalks; perichaetia terminal or lateral, 1–4 per stem, interior leaves little




ANDREAEOBRYUM ◦ TETRAPHIS

different from the cauline, minute, multistratose, innermost leaf little longer than the archegonium. **Seta** red-brown, concolorous with capsule base, massive, not twisted, 0.6–1.2(–2) × 0.2–0.4 mm, foot long-tapering, not swollen. **Capsule** red-brown to shining black with age, the broad base paler and the narrower, conic distal portion darker and developing 4–8 hygroscopic, longitudinal, dehiscent slits for spore dispersal.

Capsules mature late summer. Calcareous rock in Arctic and subarctic areas; low to high elevations; B.C., N.W.T., Yukon; Alaska.

*Andreaeobryum macrosporum* is rare or occasional within its range, though locally abundant. *Didymodon subandreaeoides* (Pottiaceae), also of limestone substrates and found in the same areas, likewise has dimorphic leaves that are cochleariform on fragile branchlets or portions of some stems; it has a stem central strand. Both that species and the similar *D. nigrescens* have 1-stratose leaves.