

ANDREAEOBRYUM MACROSPORUM, A NEW GENUS AND

SPECIES OF MUSCI FROM

NORTHERN ALASKA AND CANADA

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In the course of field work in Arctic Alaska, both authors have independently discovered an anomalous moss that differs strikingly from any known family, genus or species of Musci, although it falls within the general relationships of the Andreaeales. Also, two collections from northern Canada have been identified.

Andreaeobryum macrosporum Steere et B. Murray, gen. et sp. nov. Plantae habitu toto Andreieis similes, subsimplices saepissime rigidulae adscendenti-erectae caespitosae fusco-olivaceae mox rufo-nigricantes vel nigrae. Caulis + elongatus, imo basi aphyllus, simplex vel bifurcatus. Folia conferta e basi ovato concavo lineari-lanceolata et subulata, secunda et falcato-secunda, solida costata laevia aterrima, cellulis minutis pachydermis seriatim dispositis, areolis superne anguloso-punctiformibus, basi rectangulos efformantibus. Flores dioici, utriusque sexus terminales: masculi gemmiformes, antheridiis 5-8 ovato-oblongis, pedicello longo suffultis, paraphysibus numerosis elongatis articulatis subclavatis; feminei solitarii, foliis perichaetialibus indistinctis, intimis minutissimis, archegoniis paucis.

Fructus terminalis solitarius seta + elongata elevatus, pede decrescenti nec inflato. Capsula ovato-conica fuscescens, maturitate praeterita in valvulas 4, 6, vel 8 nigricantes fragiles apice demum liberas subclavatas dehiscens. Sporae majusculae. Calyptra ampla.

Andreaeobryum macrosporum Steere et B. Murray, gen. et sp. nov. Plants relatively small, stiff, scattered among other mosses, mostly caespitose or growing closely together; clear green when young, becoming dark reddish brown and then jet black with age, not glossy, often with a conspicuous calcareous incrustation below. Stems thin, to 2--3 cm in length, without

central strand, thickly foliose above, but denuded of leaves below, often for the greater length of the stem, branching occasional, by innovations.

Leaves falcate-secund, usually conspicuously so; 1.0--1.7 mm long, 0.20--0.25 mm wide at base, narrowly lanceolate, tapering from a broadened base to a narrowed, obtuse and thickened subula; largest in upper part of stem, becoming progressively smaller downward, the lowest leaves ecostate, as wide as long, abruptly acuminate, ca. 0.3--0.4 mm long. Leaf base concave, yellowish, cells unistratose at very base, soon becoming bistratose upward, rounded quadrate to short rectangular, thick walled, 12--18 (28) μ in diameter, not papillose; in more or less opaque upper half of leaf the cells multistratose, in four layers in cross section, somewhat smaller, quadrate or sometimes transversely elongated, 7--15 (18) μ in diameter; in cross section of the upper leaf, the inner two of the four layers thicker walled, longer, and apparently representing the costa. Costa up to 50--80 (100) μ wide at leaf base, up to 1/4 or 1/3 the width of leaf base, on the ventral side flat and not sharply demarcated from the lamina at its edges, although the superficial costal cells are longer, rectangular to elongate rectangular but becoming shorter and similar to the laminal cells above, filling the narrower upper half of the leaf; on the dorsal side convex, its superficial cells similar to laminal cells. Leaf margin plane, entire, although occasionally appearing somewhat crenulate from the convexity of marginal cells; leaf apex entire, narrowly obtuse.

Dioicous. Perichaetial leaves scarcely differentiated morphologically from the vegetative leaves but much smaller, multistratose, not visible without dissection of the terminal bud; innermost perichaetial leaf hardly longer than the archegonium. Male plants somewhat smaller and more delicate than the female ones, otherwise identical; antheridia produced at the apex of the stem in a gemmiform bud that is oval, brownish yellow, easily visible, and consisting of numerous perigonial leaves; all perigonial leaves short, broadly ovate, apiculate, inner perigonial leaves unistratose, ecostate, but with 3--4 rows of central unistratose cells that are longer and narrower than the others, otherwise similar; innermost perigonial leaf wider than long, very concave and clasping the antheridia within it; margins strongly crenulate, apiculus short and abrupt, acute or obtuse, leaf unistratose except for the extreme apex, whose cells may be bistratose. Antheridia ellipsoidal, bright green even when apparently mature, 200--400 μ long, becoming reddish brown when empty, widest at the middle, stalked as in *Andraea*, stalk 75--100 μ long, 25--35 μ in diameter, continuing to grow in diameter as the antheridium matures; body of antheridium easily detached from apex of stalk even before maturity; stalk in superficial view consisting of two rows of narrow, transversely

elongated cells.

Sporophytes produced rather abundantly. Young capsule elongated-oval, tapering both to the apex and to the seta, completely invested by the massive calyptra, intensely chlorophyllose, spores produced around a large dome-shaped columella which shrivels with age; spores apparently produced when capsule is still small, little-expanded and green, at a much earlier developmental stage than in the Bryales. Capsule becoming much broader as it matures, with a chestnut-brown to shining black upper conical part resting on a broad and paler base, which is suddenly contracted below to the apex of the massive seta, 0.6--1.0 (1.5) mm in length and 0.6--0.7 (1.0) mm in diameter. Upper part of mature capsule at first smooth and then developing 4--8 ridges alternating with fluted depressions in which the slits for spore dispersal develop; the number of ridges thus determines the number of valves and of the longitudinally dehiscent slits between them; spore dispersal controlled simply by the hygroscopic opening and closing of the slits by swelling of the tissue of the valve when moist and its contraction as it dries; there is no shortening of the whole capsule when dry and elongation when wet, as in Andreaea. Dehiscent slits for dissemination of spores occur on conic upper half of capsule only, and extend nearly to the blunt apex. Cells of thickened capsule wall arranged in a zigzag fashion in cross section. Tissue of capsule much thickened, indurated and fragile, often cracking and breaking at capsule apex simply by structural failure of the apical tissue, thus freeing the upper end of each of the 4--8 segments or valves, which remain at their base to the rim of the bowl-shaped capsule bottom, thus sometimes forming a sort of corona of "teeth." Valves strongly hygroscopic and fragile after separation from each other, and sooner or later falling off, leaving behind only the persistent cyathiform capsule base and seta. Seta much thickened, massive, indurated, 0.2--0.4 mm. in diameter, clearly flattened when dry, approximately 1.2--1.5 (2.0) mm long; tapering bryoid foot not swollen, inserted up to 1.0 mm into the leafy apex of stem which is larger in diameter than the stem immediately below insertion.

Spores very large, (52) 60--100 (122) μ in diameter, by far the largest yet known for any member of the Andreaeales; rather variable in size, chlorophyllose, spherical to ovoid, with granular or warty patches on surface, somewhat fragile. Calyptra large, 0.9--1.5 mm long, covering the whole capsule and often persisting to its full maturity, light yellowish brown, campanulate, becoming cucullate as it splits because of the widening of the capsule within it, its tissue thick and brittle; lacerate at base.

The generic name was selected to reflect the bryoid relationships of an anomalous andreaeoid moss, and the specific epithet refers to the unusually large spores.

Type collection: U.S.A., ALASKA. Brooks Range, Franklin Mountains, Arctic National Wildlife Range; Lake Peters, just NW of Mt. Chamberlain; valley at NE end of lake (Mt. Michelson Quadrangle, 69°20' N Lat., 145° W Long.). 1129 m altitude. On wet, overhanging cliff of Lisburne limestone, within and immediately adjacent to irrigated seepage area; forming almost pure cushions. 7 August 1974, Barbara M. Murray 6713 (NY, holotype; isotype at ALA). Also known from 15 further collections from rather widely separated collections in the Brooks Range (Batten; Jordal; Murray; Steere) and from single collections made in both the Yukon Territory, Canada (Vitt 6390), and the Northwest Territories, Canada (Scotter 22245).

Andreaobryum macrosporum agrees with the Andreaeaceae and the Andreaeales in several respects, especially in the dehiscence of the capsule by longitudinal slits, the dome-shaped archesporium around the columella, and the stalked antheridia. However, it also differs so drastically in several unique characteristics, notably the presence of a well developed seta with a bryoid foot and the very large spores and persistent calyptrae, as well as the ecological preference for limestone, that a new family has to be established for it, and the classical definition of the order has to be emended for it.

Andreaeobryaceae Steere, fam. nov., habitu plantarum gametophytarum cum Andreaealibus optime congruentes, sed characteribus sporophytarum absimiles; capsula seta basi in pedem bryoideum decrescenti elevata, parte supre basin firmum persistentem conica, primum valvatim 4--8-partita demum decidua; calyptra magna indurata brunneo-luteola capsulam totam induenti, primum campanulata demum capsula accrescenti cucullata.

Andreaeales Milde (1869, Ordo 14, as Andreaeaceae) emend. Steere Capsula ut in Sphagno parva, perichaetio immersa, aut in vaginula brevi primum exacte sessilis postea receptaculo in pseudopodium molle prolongato exserta, aut seta crassa solida elevata, pede tunc more bryoideo sensim decrescenti.

Further details, as well as illustrations, will be published later, covering the geographical distribution, special ecology, and phytogeographic and evolutionary significance of Andreaobryum macrosporum, a "missing link" or unexpected transitional form between the widely differing orders, Bryales and Andreaeales.

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