

Studies on Colombian cryptogams. XVITaxonomy and ecology of *Kingiobryum paramicola* (Dicranaceae, Musci)by Richard H. Zander¹ and Antoine M. Cleef²¹ *Buffalo Museum of Science, Buffalo, NY 14211, U.S.A.*² *Institute of Systematic Botany, University of Utrecht, Heidelberglaan 2, 3584 CS Utrecht, the Netherlands*

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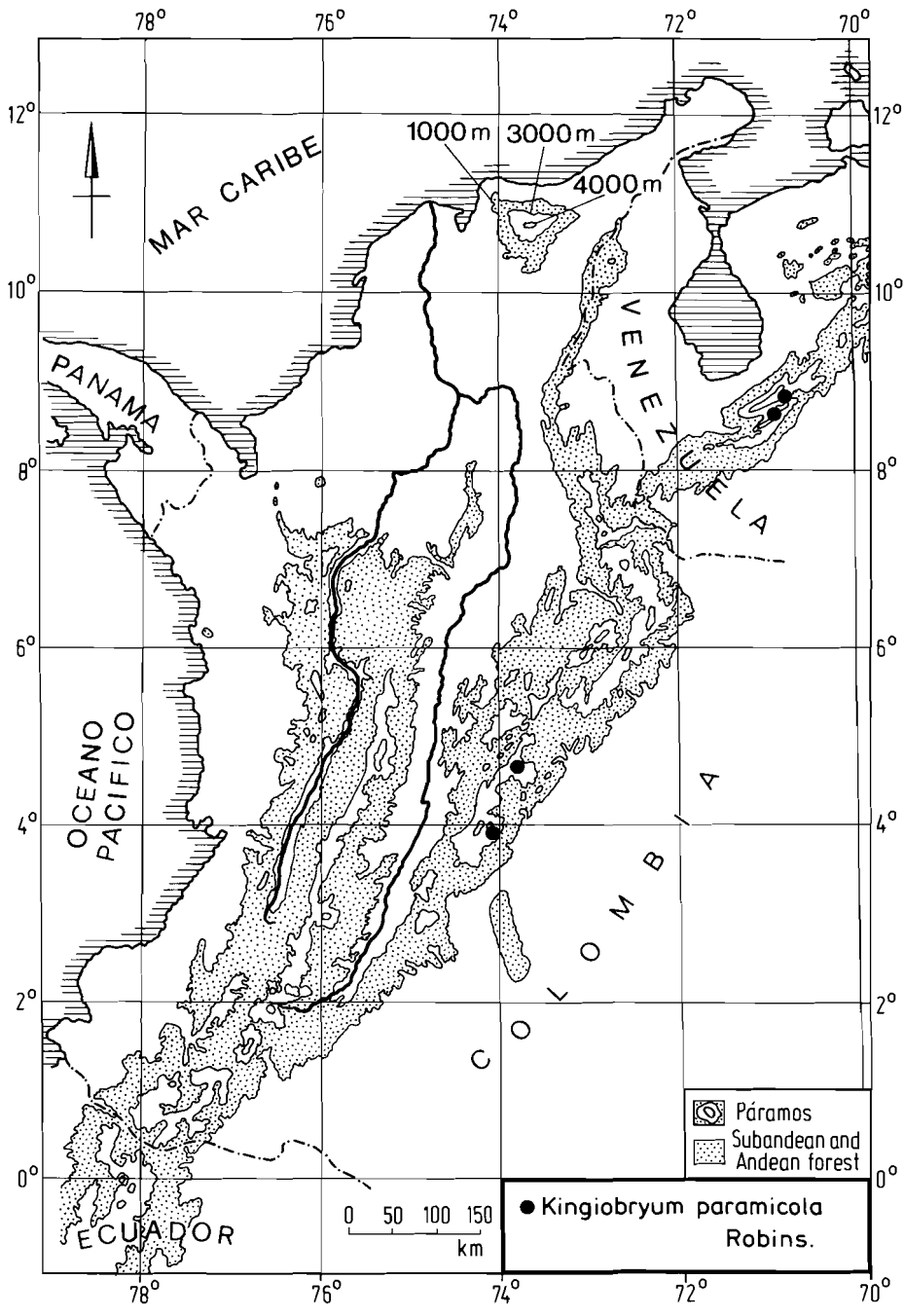
ABSTRACT

Kingiobryum paramicola, a rare species of a monotypic endemic genus of Dicranaceae (Musci), has been collected several times in páramos of Colombia and Venezuela. It was previously reported from only a single specimen. *Kingiobryum paramicola* is redescribed, including details of the newly discovered sporophyte and discussion of the perforate and fissured walls of the inner basal cells. The ecology of *K. paramicola* is delineated and phytosociological data are supplied.

RESUMEN

Kingiobryum es un género monotípico y endémico de las Dicranaceae (Musci). *Kingiobryum paramicola*, una especie descrita anteriormente a base de la única colección conocida, fue coleccionada recientemente varias veces en los páramos de Colombia y Venezuela. La especie es descrita aquí nuevamente, incluyendo detalles del esporófito encontrado por primera vez y una discusión sobre las paredes perforadas y fisuradas de las células interiores basales. Se suministra datos sobre la ecología de *Kingiobryum paramicola* y su presencia en comunidades vegetales.

Kingiobryum paramicola Robins. was originally described (Robinson 1967) as a new genus and species from a single collection of gametophytic material collected at high elevations in the Andes by R.M. King. It has not been reported since; however, the second author made three additional collections of this species, one with sporophytes, during a study of Colombian páramo vegetation, and was able to make detailed ecological and phytosociological observations. Two additional Venezuelan collections were located at FLAS and NY. The original description and illustrations of this taxon were sketchy; a



Map 1. Distribution of *Kingiobryum paramicola* Robins.

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Fig. 1-9.

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more complete description, including details of the sporophyte, and additional illustrations are presented here.

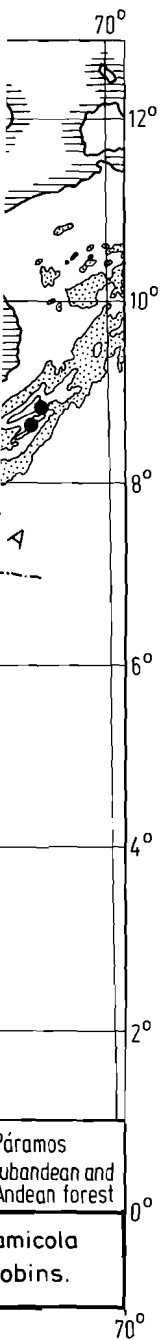
Kingiobryum paramicola Robins., Bryologist 70: 9. 1967.

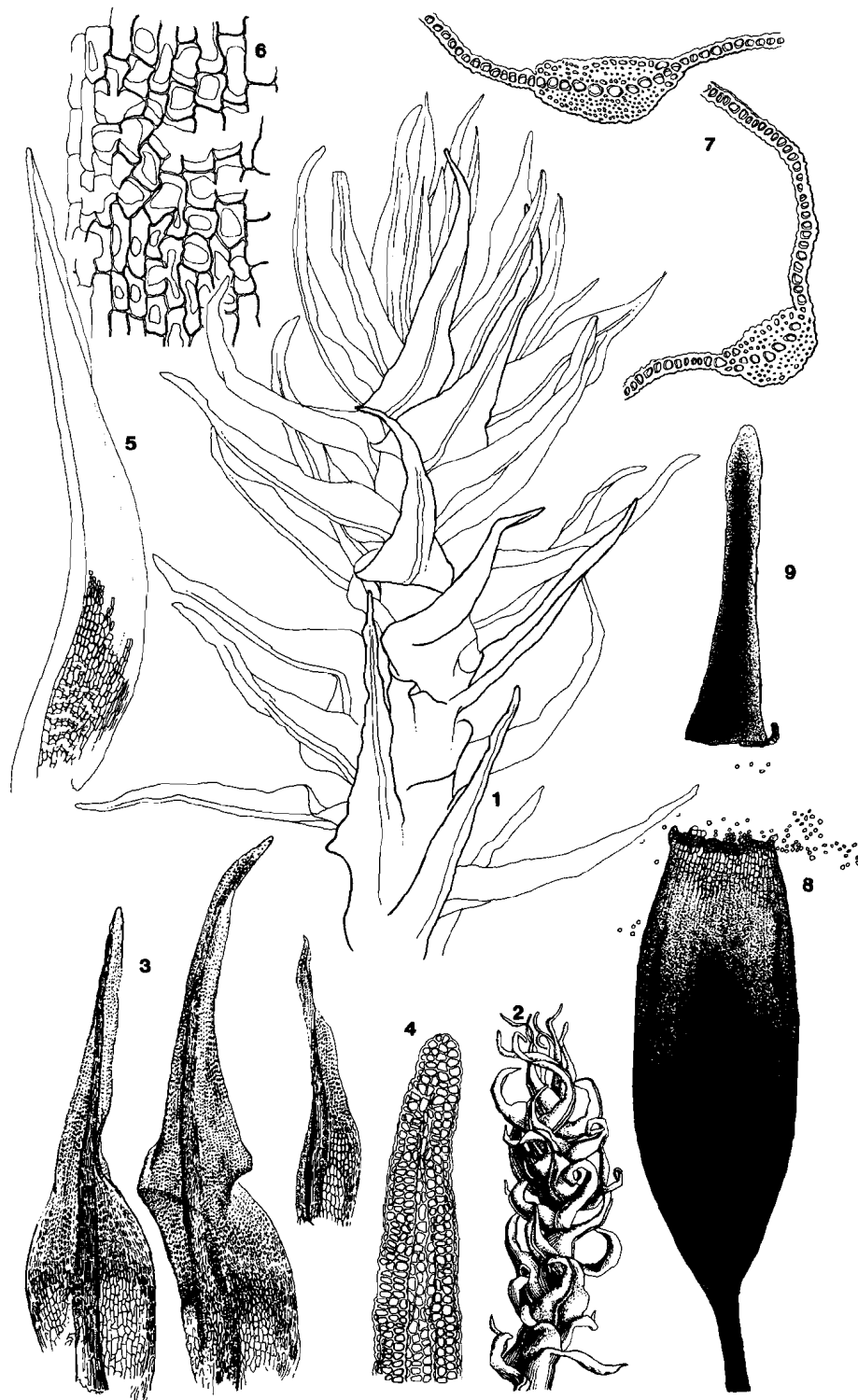
Fig. 1-9.

Plants green above and red-brown below, in cushions; stems irregularly branching, fragile, weakly radiculose, light brown, to 3.5 cm long, in cross section pentagonal, central strand distinct, cortex of 3-4 layers of small, thick-walled cells, *hyalodermis present*, of bulging, rectangular cells; axillary hairs several per axil, of 5-7 hyaline, uniseriate cells, basal 1-2 cells brownish; *leaves appressed-incurved to widely incurved to catenulate above a sheathing base when dry, widely spreading to squarrose when wet, lanceolate, 2.8-3.8 mm long, broadly channeled on the adaxial surface; leaf margins narrowly recurved above the sheathing base, entire, narrowly bistratose above midleaf; leaf apex acute, ending in a blunt cone of several rhomboid to subquadrate cells, or occasionally in a conical cell; leaf base sheathing the stem, oblong, highly differentiated; costa percurrent, adaxial surficial cells quadrate to short-rectangular, weakly papillose, abaxial surficial cells rectangular, smooth to weakly papillose, transverse section of costa semicircular to elliptical, adaxial surface plane to convex, adaxial and abaxial stereid bands strong, adaxial epidermis weakly differentiated, abaxial epidermis slightly differentiated or not distinguishable, guide cells 8 in one layer; upper laminal cells subquadrate to rhomboidal, heterogeneous in shape, 8-10 μm wide, 1(-3): 1, walls evenly thickened, weakly surficially bulging, arranged in longitudinal rows; upper laminal papillae often nearly absent or very low in mature leaves, in young leaves bifid and massive, 1-2 per lumen but centered over the transverse cell walls; basal laminal cells differentiated medially, rectangular, bulging, 20-23 μm wide, 2-4: 1, cell walls thin to irregularly thickened and resorbed on lateral and surficial longitudinal walls, tearing transversely in older leaves across the leaf at the shoulder of the sheathing leaf base. Apparently dioicous, perigoniate stems not seen. Perichaetia terminal, inner leaves long-oval, to 2.0 mm long, sheathing the seta, prosenchymatous cells reaching leaf apex.*

Seta one per perichaetium, to 2.0 cm long, dark red-brown, twisted clockwise, also forming a narrow clockwise helix; theca 1.8-2.0 mm long, dark red-brown, smooth when dry, elliptical, neck weakly differentiated, exothecial cells rectangular, 20-30 μm wide, 3-4: 1, walls moderately thickened, stomates present at base of theca, phaneropore, annulus of 2-3 rows of vesiculose cells, deciduous in pieces; *peristome absent*; operculum long-rostrate, 1.1-1.3 mm long, cells not twisted; spores brown, weakly papillose, 14-16 μm in diameter. Calyptra not seen. Chemical reactions of gametophyte laminae: Cl (conc. HCl): medium orange to yellow-orange; K (10% KOH): deep red-brown to red-orange; N (conc. HNO₃): light brown; SE (H₂SO₄-ethanol, 2: 1): deep red-orange.

Robinson (1967) assigned *Kingiobryum paramicola* to the Dicranaceae





Figures 1-9. *Kingiobryum paramicola* Robins. 1. Habit, moist plant, $\times 15$. 2. Habit, dry plant, $\times 11$. 3. Leaves, $\times 15$. 4. Leaf apex, $\times 232$. 5. Leaf showing tattered base, $\times 15$. 6. Cells of inner leaf base showing areas of wall resorption, $\times 232$. 7. Transverse sections of costa, $\times 232$. 8. Capsule, $\times 17$. 9. Operculum, $\times 17$.

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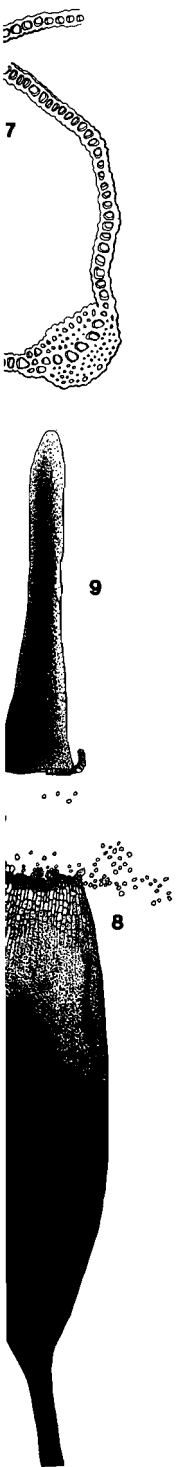
Table 1. Relev
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without discussion of his reasons for doing so, and distinguished *Kingiobryum* from other genera of Dicranaceae by the surficially and laterally perforate basal laminal cells, which were known previously only for the Calymperaceae and Leucobryaceae. However, *Kingiobryum* has papillose upper leaf cells, and, although these are found in some members of the Dicranaceae, their presence is a major character of the Pottiaceae. The perforate basal laminal cells, too, have recently been noted for some Pottiaceae species (Proctor 1979; Richards & Edwards 1972), and are present in the Encalyptaceae. With the discovery of the sporophyte, it was hoped that family placement might be made more surely on the basis of peristome morphology, but, alas, the capsule is aperistomate. Both the Pottiaceae and the Dicranaceae include taxa that are similar to *Kingiobryum* in the lanceolate leaves with sheathing leaf bases, e.g. *Leptodontium*, *Erythrophyllopsis*, *Rhexophyllum*, and *Symblepharis*, *Holomitrium* and *Onchophorus*, respectively. The acid-base color reactions (Zander 1980) of *Kingiobryum* are similar to those of *Erythrophyllopsis*, but, because of the lack of an overview of generic color reactions, these cannot at present be considered helpful in determining the systematic position of the genus *Kingiobryum*. The following gametophytic character states, in combination, indicate the *Kingiobryum* should be retained in the Dicranaceae: stem hyalodermis of enlarged rectangular cells; perichaetial leaves smaller than the cauline leaves,

Table 1. Relevé Cleef 284. Colombia, Meta: Nevado de Sumapaz, NW slope, 25° inclination; limestone, soil depth 5 cm, soil pH 6.0. Cover %: vegetation 20, herbs 15, mosses 8, liverworts <1+, lichens 1. Size 5 m × 5 m. January 19, 1973.

vascular species:	cover %	mosses:	cover %
<i>Valeriana plantaginea</i>	8	<i>Racomitrium crispulum</i>	3
<i>Senecio niveo-aureus</i>	2	<i>Kingiobryum paramicola</i>	2
<i>Senecio summus</i>	2	<i>Breutelia intergrifolia</i>	2
<i>Erigeron chionophilus</i>	1	pottiaceous ross	1
<i>Polystichum polyphyllum</i>	1	<i>Hymenostylium recurvirostrum</i>	<1
<i>Draba</i> sp. (white petals)	1	<i>Bryum argenteum</i>	<1
<i>Hypochoeris sessiliflora</i>	<1+	<i>Blindia acuta</i>	<1+
		<i>Campylopus pittieri</i>	<1
lichens:		<i>Distichium capillaceum</i>	<1
<i>Peltigera</i> sp. (Cleef 8083)	1	<i>Bartramia</i> sp.	<1
<i>Stereocaulon glareosum</i>	<1	<i>Cheilothela chilensis</i>	<1
<i>Cetraria islandica</i>		<i>Bryum</i> cf. <i>alpinum</i>	<1
ssp. <i>crispiformis</i>	<1	acrocarpous moss (Cleef 8087)	<1
		<i>Encalypta ciliata</i>	<1
liverworts:		<i>Erythrophyllopsis andina</i>	<1
<i>Plagiochila</i> sp. (Cleef 8075)	<1		
<i>Plagiochila</i> aff. <i>jaramilloi</i>	<1		
<i>Plagiochila</i> sp. (Cleef 8082)	<1		
<i>Anastrophyllum auritum</i>	<1		

Other companion species observed outside the quadrat, but in the same vegetation type include *Cerastium imbricatum*, *Montia meridensis*, *Senecio canescens*, *Lycopodium crassum*, *Lucilia pusilla*, *Oreomyrrhis andicola*, and *Veronica serpyllifolia*.

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Figure 10. *Valeriana plantaginea* - *Racomitrium crispulum* vegetation on a stoney (calcareous) slope in the humid lower superpáramo at 4200 m on the Nevado de Sumapaz (Colombia, dept. of Meta). Commonly associated are *Senecio niveo-aureus* (whitish rosettes), *Draba* spp., *Kingiobryum paramicola*, *Erythrohyloopsis andina* and *Plagiochila* spp. (Photogr. Cleef 14-6).

oval, prostrate, moderately branched, papillae bilobed, with eight

Kingiobryum Andes (Meta Depto. Cundinamarca de Palacios Depto. Meta Cleef 7691) U--det. P. Aguilera, Esmeraldas (NY), Sierra húmeda, 31

Ecology: paramicoland northern Andes (lower superpáramo and on soil

At 3700 m rockshelter: *bryum* and *Kingiobryum* (7690), *Anacamptis ehrenbergiana canescens*, *Kingiobryum mexicanum*

In the upper superpáramo are most common communities general description Cleef (1981) compact cushions, leaved species on rocky slopes *plantaginea* phytosociology

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Figure 10. *Valeriana plantaginea* - *Racomitrium crispulum* vegetation on a stoney (calcareous) slope in the humid lower superpáramo at 4200 m on the Nevado de Sumapaz (Colombia, dept. of Meta). Commonly associated are *Senecio niveo-aureus* (whitish rosettes), *Draba* spp., *Kingiobryum paramicola*, *Erythrophyllopsis andina* and *Plagiochila* spp. (Photogr. Cleef 14-6).

oval, prosenchymatous throughout; cauline leaves with upper leaf cells moderately and evenly thickened, heterogeneous in shape; upper laminal papillae bifid and centered over the transverse walls; and costa in cross section with eight guide cells in one layer.

Kingiobryum is apparently restricted to páramo regions of the northern Andes (Map 1) and is presently known from the following stations: Colombia, Depto. Cundinamarca: Municipality of la Calera, Hacienda la Siberia, Páramo de Palacio, elev. 3490 m, *King C-1015* (US--holotype; COL, U--isotypes); Depto. Meta, Páramo de Sumapaz, Cerro Nevado de Sumapaz, elev. 3700 m, *Cleef 7691* (BUF, COL, U), 4200 m, *Cleef 8073* (BUF, COL, U), *8086* (COL, U--det. P.A. Florschütz). Venezuela, Est. Mérida: region of Mucubají and El Aguila, *Espeletia* zone, wet páramo, 3750 m, *Steiermark & Cronquist 106301* (NY), Sierra Nevada de Mérida, cerca de la Laguna de los Anteojos, en suelo húmedo, 3800 m, *Griffin, López & Ruiz-Terán 472* (FLAS).

Ecology: Though only a few collections have been made, *Kingiobryum paramicola* seems locally common in the atmospherically humid páramos of the northern Andes between about 3500 m (subpáramo, grass-páramo) and 4200 m (lower superpáramo). This species generally grows in small cushions on rocks and on soil.

At 3700 m, *Kingiobryum* was found on humid limestone outcroppings and rockshelters on the SW side of the Nevado de Sumapaz. Clumps of *Kingiobryum* and *Philonotis* cf. *sphaerocarpa* grow together with *Breutelia* sp. (*Cleef 7690*), *Anoetangium aestivum*, *Erythrophyllopsis andinum* and *Morinia ehrenbergiana*. Associated vascular plants are *Muhlenbeckia vulcanica*, *Galium canescens*, *Parietaria debilis*, *Bromus unioloides*, *B. lanatus*, and *Brachypodium mexicanum*.

In the upper reaches of the Nevado de Sumapaz, cushions of *Kingiobryum* are most conspicuous on moist, thin brownish clayey-stoney soil in zonal communities of *Valeriana plantaginea* and *Racomitrium crispulum* (Fig. 10). A general description of this zonal lower superpáramo community was given by Cleef (1981). Robust, fruiting *Kingiobryum* grows here in about 5 cm thick, compact cushions. Common associates are *Breutelia integrifolia* and an entire leaved species of *Plagiochila* (*Cleef 8082*). Relevé 284 (Table 1) taken here on a rocky slope at 4200 m elevation provides a good example of such *Valeriana plantaginea-Racomitrium* vegetation containing *Kingiobryum*. Methods of phytosociological survey are discussed by Cleef (1981).

The Venezuelan collection Griffin et al. 472 was, according to Dr. D. Griffin (in litt.), found on humid soil and was mixed with *Anoetangium aestivum* and *Aloinella venezuelana*. The plants in this collection are less robust than in the Colombian type material; this might be explained by the wet habitat on soil.

ACKNOWLEDGEMENTS

P.M. Eckel provided the illustrations of *Kingiobryum*. We thank the curators of FLAS and NY for loan of specimens and the Netherlands Foundation for Tropical Research (WOTRO) for financial fieldwork support to the second author.

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