

## The phytogeography and ecology of *Macrocoma* (Orthotrichaceae, Musci) in Africa

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### ABSTRACT

Of the 11 species presently recognized in the genus *Macrocoma* (Orthotrichaceae, Musci), four occur in Africa. These species are xeromorphic and occur in savannas, woodlands, and forests, roughly corresponding to the Afromontane Phytogeographic Region. *Macrocoma tenue* (Hook. & Grev.) Vitt subsp. *tenue* is widespread in southern Africa, north to Ethiopia and also occurs in Australasia. Three species are endemic, with *M. pulchella* (Hornsch.) Vitt found only in the Cape area; *M. abyssinica* (C. Müll.) Vitt occurring in eastern Africa, and *M. lycopodioides* (Schwaegr.) Vitt distributed sporadically in eastern and southern South Africa.

### RÉSUMÉ

#### LA PHYTOGÉOGRAPHIE ET L'ÉCOLOGIE DU MACROCOMA (ORTHOTRICHACEAE, MUSCI) EN AFRIQUE

Des 11 espèces actuellement reconnues dans le genre *Macrocoma* (Orthotrichaceae, Musci) quatre se trouvent en Afrique. Ces espèces sont xeromorphiques et surviennent dans les savanes, les terrains boisés et les forêts correspondant grosso-modo à la Région Phytogéographique Afromontane. *Macrocoma tenue* (Hook. & Grev.) Vitt sous-esp. *tenue* est répandue en Afrique australe, le nord le l'Éthiopie et survient aussi en Australasie. Trois espèces sont endémiques, avec *M. pulchella* (Hornsch.) Vitt survenant seulement dans la région du Cap; *M. abyssinica* (C. Müll.) Vitt survenant en Afrique orientale et *M. lycopodioides* (Schwaegr.) Vitt distribuée sporadiquement dans l'Est et dans le Sud de l'Afrique du Sud.

The moss genus *Macrocoma* (Hornsch. ex C. Müll.) Grout is a member of the family Orthotrichaceae, subfamily Macromitrioideae. Within this subfamily there are about eight genera, of which *Macromitrium* with approximately 250 species is the largest. *Macrocoma* was first recognized as a section by C. Müller in 1845, and later Brotherus (1901-1909) considered it a subgenus of *Macromitrium*. Grout (1944) was the first author to recognize this taxon at the generic level, and most authors have accepted it since that time as a distinct genus.

Briefly, the genus can be characterized by creeping, slender stems and branches with imbricate, closely set leaves, and by the uniformly rounded to elliptic leaf cells. The basal cells, particularly at the margins are more or less similar in shape to the upper ones. The calyptrae are large, plicate and cover the entire capsule. From *Macromitrium* and *Groutiella*, the macroscopic appearance of species of *Macrocoma* is quite different since in the former two genera, the leaves are always twisted, contorted, or incurved giving the individual plants a 'bushy' appearance. Keys to all species are presented in Vitt (1980a) and the taxonomy and nomenclature are discussed by Vitt (1973, 1980a, 1980b). Presently eleven species, one with two subspecies, can be recognized in the genus. Within the subgenus *Trachyphylum* (Broth.) Vitt there are two species [*M. gracillima* (Besch.) Vitt and *M. papillosa* (Thér. in Herz.) Vitt], both restricted in distribution to southern South America. The subgenus *Macrocoma* is widespread in both Southern and Northern Hemispheres, with two species widespread in distribution. *Macrocoma orthotrichoides* (Raddi) Wijk & Marg. and *M. tenue* (Hook. & Grev.) Vitt occur in both the Old and New World (Fig. 1), *M. frigida* (C. Müll.) Vitt, *M.*

*gastonyi* Vitt, and *M. brasiliensis* (Mitt.) Vitt are endemic to South and Central America (+ Mexico), whereas *M. iwatsukii* Vitt has been collected only in the Himalayan Mountains.

Three species occur only in southern and eastern Africa, (Fig. 1) and, along with *M. tenue* subsp. *tenue* comprise the African members of this genus. These species occur on the branches and trunks of angiospermous or rarely coniferous trees and occasionally on rocks and boulders. Sim (1926) stated that species of the *M. tenue* complex 'are common and are present in every bush and on nearly every soft moist stone in South Africa'. The African species of *Macrocoma* are xeromorphic and occur in savannas, woodlands and forests, roughly corresponding to the Afromontane Phytogeographic Region (cf. Werger, 1978). The species are frequently encountered along the afromontane 'archipelago' that extends from coastal areas of the Cape Province, northward along the mountainous regions of eastern Africa, to Ethiopia. This part of the Afromontane Region is mostly surrounded by the Zambezian Domain of the Sudano-Zambezian Phytogeographic Region, where typical vegetation types are dry woodlands, savannas or grasslands. The absence of *Macrocoma* from lowland rainforests, typical of the Guinea-Congolian Phytogeographic Region of central and western Africa, probably explains the conspicuous absence of the species from west African outliers of the Afromontane vegetation in the Cameroon and Guinea-Ivory Coast areas.

Ecologically the species are highly adapted to such habitats with high light intensities and low annual precipitation as the African savannas and woodlands. Specimens are, however, frequently collected in dense, moist, montane or kloof forests, indicating a rather wide acceptance of habitats throughout the Afromontane Region.

The maps illustrating the distributions of African species of *Macrocoma* (Figs 2-5) were computer

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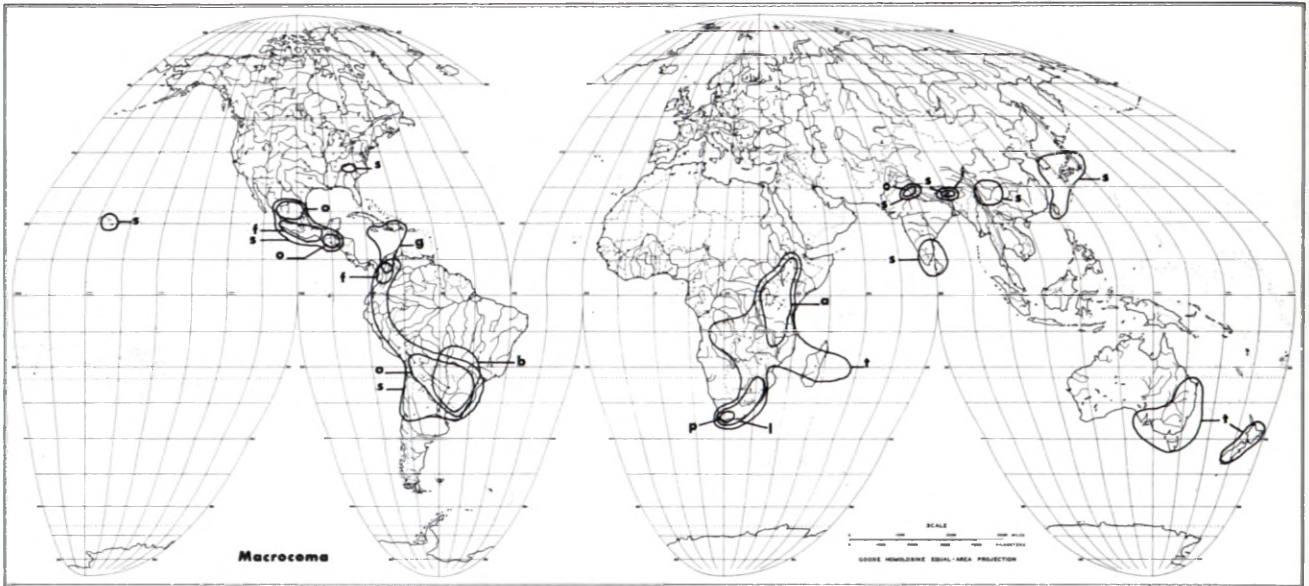


FIG. 1.—Approximate world distribution of the nine species in *Macrocoma* subgenus *Macrocoma*. Northern South American patterns are not well known and here hypothetical as are the western Australian and Chinese distributional limits. The Indian populations are probably more widespread than indicated. Data taken only from specimens examined (see Vitt, 1980a for herbaria consulted). Abbreviations: a = *abyssinica*, b = *brasiliensis*, f = *frigida*, g = *gastonyi*, i = *iwatsukii*, l = *lycopodioides*, o = *orthotrichoides*, p = *pulchella*, s = *tenue* subsp. *sullivantii*, and t = *tenue* subsp. *tenue*.

plotted. In connection with research on the Flora of Southern Africa, the Data Section of the Botanical Research Institute, has written programs that plot distributions for taxa in southern Africa (Figs 3, 5, & 6) or part of Africa and Madagascar as seen in Figs 2 & 4. Distributional data are entered for each taxon using the Quarter-Degree Square Reference System (Edwards & Leistner, 1971; Edwards, 1981). The mapping program compares entries in the distribution data file of the taxon to be mapped and plots a quarter-degree square only once. Therefore, a dot on the map indicates presence of the taxon in the quarter-degree square and may represent single or multiple entries in the data file.

(1) *Macrocoma abyssinica* (C. Müll.) Vitt — Ethiopia, Kenya, Malawi, Rwanda, Tanzania, Uganda, Zaire. This species is most closely related to *M. tenue* and appears to be endemic to the Afromontane flora of eastern Africa. Restricted in distribution, *M. abyssinica* is most frequently collected in the Usambara and Ruwenzori Mountain areas. A few collections have come from the Uluguru-Mlanje Mountains to the south and the type represents the only collection seen from the Ethiopian Mountain system to the north (Fig. 2).

(2) *Macrocoma tenue* (Hook. & Grev.) Vitt subsp. *tenue* — Angola, Ethiopia, Kenya, Réunion, Lesotho, Madagascas, Malawi, Rwanda, South Africa, Swaziland, Tanzania, Transkei, Zaire, Zambia, Zimbabwe. Also known from eastern Australia and New Zealand. The most widely distributed of the African species, *M. tenue* is often collected on trees and occasionally on rocks and boulders. The species is frequently encountered in Afromontane forest remnants within the Fynbos Biome of the southern and south-western Cape Province. Extending to the northeast, it becomes more common in the high forests and grasslands of the Drakensberg and escarpment of the eastern Transvaal (Fig. 3). The species has been collected only occasionally in the Chimanimani Mountains of Zimbabwe and the Uluguru-Mlanje Mountains of Malawi and Tanzania,

but occurs frequently in the Ruwenzori and Usambara Mountains of eastern Africa. Only a single specimen is presently known from the mountains of southern Ethiopia, marking the northernmost extension of its range.

Outside its major north-south distribution axis, *M. tenue* is found in the montane vegetation of Madagascar and Réunion, and in isolated western outliers

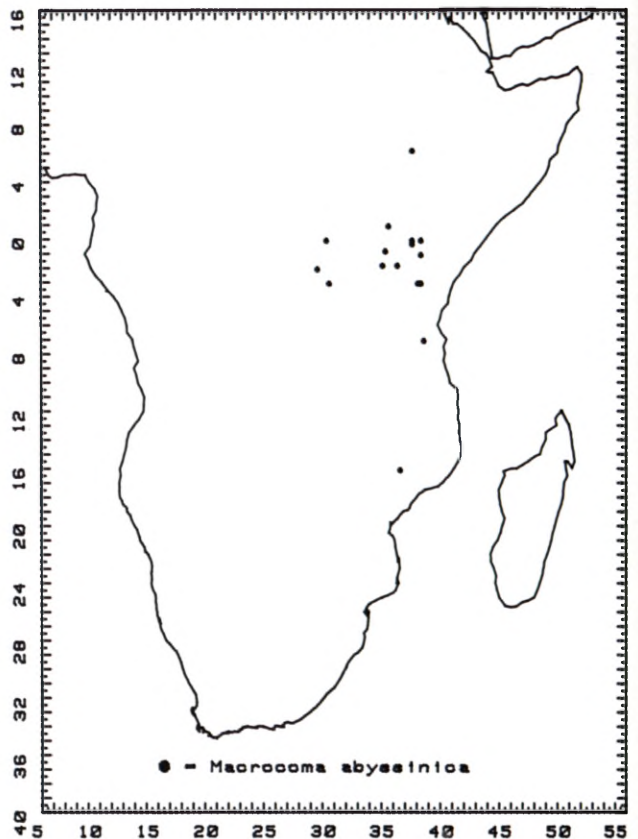


FIG. 2.—African distribution of the endemic *Macrocoma abyssinica*.



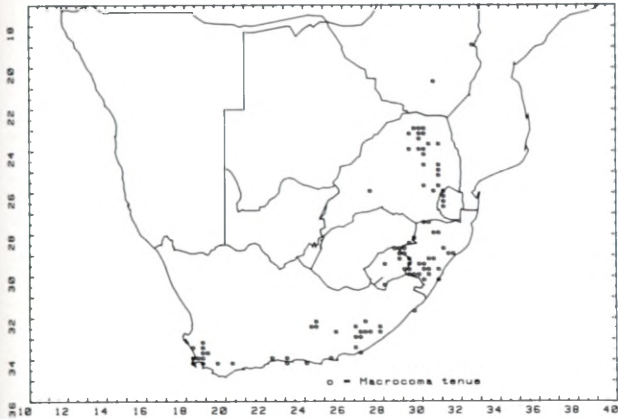


FIG. 3.—Southern African distribution of *Macrocoma tenue* subsp. *tenue*.

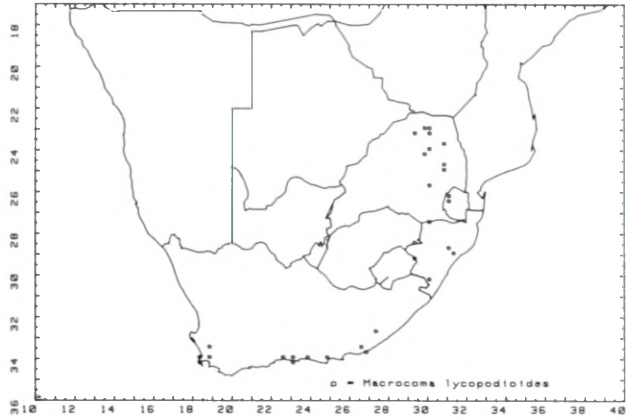


FIG. 5.—African distribution of the endemic *Macrocoma lycopodioides*.

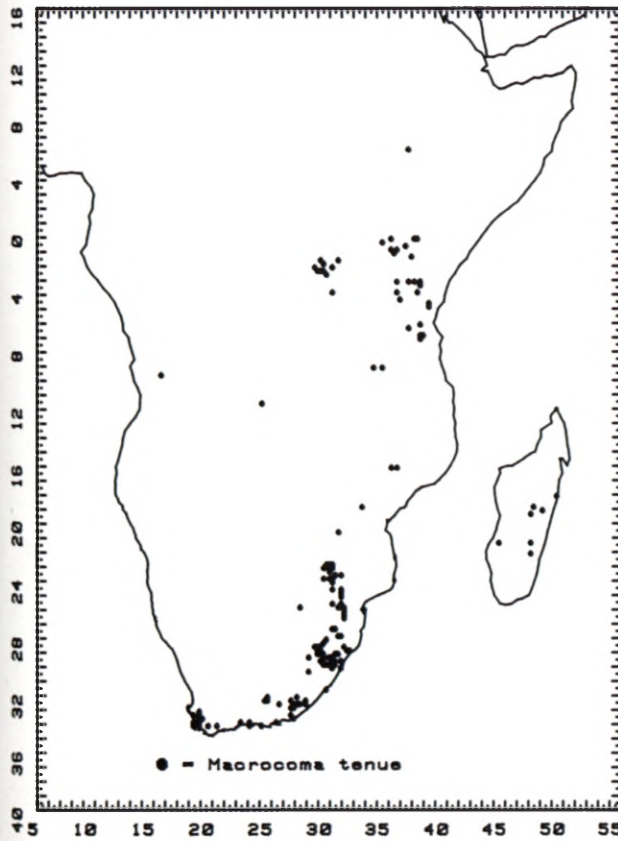


FIG. 4.—African distribution of *Macrocoma tenue* subsp. *tenue*.

of the Afromontane vegetation and surrounding Zambezan woodlands of central Zaire and Angola (Fig. 4).

(3) *Macrocoma lycopodioides* (Schwaegr.) Vitt — South Africa, Swaziland, Transkei. Presently known only from eastern and southern parts of southern Africa, *M. lycopodioides* is less common than *M. tenue*. The two species are practically sympatric in southern Africa and are often intermixed. *Macrocoma lycopodioides* is easily differentiated from its closest relative, *M. tenue*, by having fragile leaf apices. Specimens of *M. lycopodioides* are occasionally collected in relic montane forest within the Fynbos Biome of the southern and south-western Cape, as well as forests and woodlands of the eastern Cape, Transkei and Natal. Extending northward into

the savannas or forests of the Orange Free State, Swaziland and the escarpment of the eastern Transvaal, the species reaches the northernmost part of its range in the woodlands of the Soutpansberg in the northern Transvaal (Fig. 5).

(4) *Macrocoma pulchella* (Hornsch.) Vitt — South Africa. Endemic to South Africa, this species is known from only a few collection sites in the south-western Cape Province. Very little is known about its distribution or ecology, but it also appears to be restricted to areas of relic montane forest within the Fynbos Biome. It is interesting that the areas where *M. pulchella* has been collected (Table Mountain, Devil's Peak and Jonkershoek) receive some of the highest precipitation in southern Africa. The species is probably most closely related to *M. tenue*, however, the fused, 2-layered, well-developed peristome and unique gametophytic features (see Vitt, 1980b) make this a very distinctive species (Fig. 6).

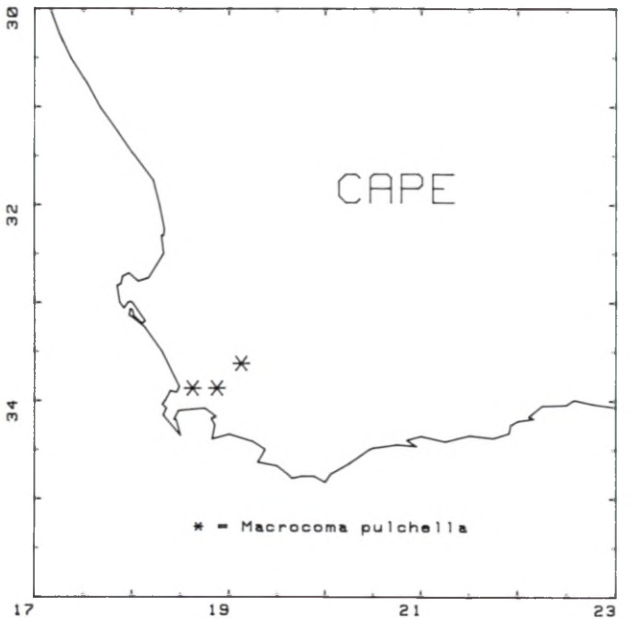


FIG. 6.—African distribution of the endemic *Macrocoma pulchella*.

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of this research. African distributions are mapped based on specimens in BOL, BM, BR, C, COLO, DUKE, EGR, H, L, MO, NAM, PRE, & Herb. Townsend (KEW), and we wish to thank the curators of these herbaria for loan of specimens. We also wish to thank the Data Section (BRI) and especially Dr H. F. Glen for access to the computer programs.

#### UITTREKSEL

*Van die 11 spesies wat tans in die genus Macrocoma (Orthotrichaceae, Musci) erken word, kom vier in Afrika voor. Hierdie spesies is xeromorfies en word in savannas, bosse en woude aangetref, min of meer ooreenkomstig die Afromontane Plantgeografiese Stree. Macrocoma tenue (Hook. & Grev.) Vitt subsp. tenue is wydverspreid in suidelike Afrika, noordwaarts tot in Ethiopië, en word ook in Australasië aangetref. Drie spesies is endemies, waarvan M. pulchella (Hornsch.) Vitt slegs in die Kaapse gebied voorkom; M. abyssinnica (C. Müll.) Vitt in oostelike Afrika aangetref word, en M. lycopodioides*

*(Schwaegr.) Vitt sporadies versprei is in die ooste en suide van Suid-Afrika.*

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