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THE GENUS *DANTHONIA* IN AFRICA

HANS JOACHIM CONERT

It is generally assumed that the grass genus *Danthonia* is distributed all over the globe. It is represented in Europe and North America by a few species but its centre of distribution lies in the southern hemisphere: it occurs in Australia, New Zealand, Indonesia, South America and Africa. Based on the two European taxa *Danthonia decumbens* and *Danthonia provincialis* the genus was founded by DE CANDOLLE in 1805. On nomenclatural grounds neither of these species, however, can be considered as the type which as a matter of fact, is *Danthonia spicata*. *Danthonia provincialis* — its correct name is *Danthonia alpina* — is closely related to *Danthonia decumbens*. They agree to a large extent in their habit as well as in morphological characters. They possess many-nerved glumes and though lemmas; the latter are only short pilose along the margins. *Danthonia decumbens* differs only in having the central awn of the lemma completely reduced. This difference cannot be considered sufficient for establishing the separate genus *Sieglingia*. This view is clearly supported by the fact that the sterile hybrid between these two species is intermediate in all aspects (CONERT 1969).

In Europe *Danthonia decumbens* is widely distributed, ranging from Iceland to the African coast of the Mediterranean. In contrast *Danthonia alpina* is more or less confined to southern Europe. About 20 years ago its occurrence in southern Germany, in the so-called Garchinger Heide, a remarkable remnant of the original grass steppe, was recorded by SUESSENGUTH and MERXMÜLLER. Since then the plant has become established there.

The two European species are closely related to the North American members of the genus. In both groups there are axillary cleistogamous spikelets within the lowermost leaf-sheaths. These spikelets, which are enveloped by an often deeply split prophyllum, possess greatly reduced glumes and completely simplified lemmas and paleas. Their fully developed caryopsis is released at maturity when the culms break off above the nodes.

Danthonia is widely distributed in North America and a few species extend their range into Greenland and the Far East on one hand and into South America on the other. One should draw special attention to the presence of *Danthonia intermedia* in Kamtchatka, of *Danthonia spicata* in Greenland and of *Danthonia californica* in Chile. A fair number of South American species also belong to this group, since they have not only lemmas with marginal hairs but also cleistogamous spikelets in their inflorescence as

well within their lowermost leaf-sheaths. Besides these characters another can be observed in South American species, namely tufts of hairs in a transverse line across the back of the lemma just beneath the insertion of the central awn. Species, which exhibit this character, are, however, not confined to South America but occur also in the Easter-Island, in New Zealand, Australia, Tasmania, Indonesia and in the Himalayas. ZOTOV has based his genus *Notodanthonia* on species from New Zealand. It remains to be decided whether or not this genus should be retained. Only the study of the South American species can elucidate this problem.

None of the groups mentioned so far occurs in southern Africa. Nonetheless, not fewer than 121 *Danthonia* species have been described from there. It goes without saying that many of these names are synonyms. Moreover, over the years, quite a number of these species have been separated into different genera which have been recognized by most students of African Gramineae. These include well-known generic names such as *Pentameris*, *Pentaschistis*, *Streblochaete*, *Chaetobromus*, *Alloeochaete* as well as *Phaenanthoecium*. But, even so, 36 species remain in *Danthonia* as can be seen in C. E. HUBBARD's treatment of this group in the Flora of Tropical Africa and in MISS CHIPPINDALL's cursory guide to South African grasses.

In the following account these remaining species of *Danthonia* will be considered: The first 4 taxa described as *Danthonia* can be distinguished from typical *Danthonia* at a first glance by having a long pungent callus at the base of each floret. Besides this, there are other characters, anatomical as well as morphological, which justify the establishment of a separate genus, *Asthenatherum*, best known through its type-species, *Asthenatherum forskaalii*, which is distributed throughout North-Africa and Arabia and as far as Central Asia. It is less known that this species also occurs in the mountains of the Sahara and in Angola. In Angola it was collected first by WELWITSCH and later by PEARSON. Whereas two more species of this genus are endemic to Angola (*Asthenatherum mossamedense*) and South West Africa and South Africa (*Asthenatherum glaucum*), the fourth is to be found in North Africa and Arabia. *Asthenatherum* is centred in South Africa, extending along the west coast of the continent towards the North contrary to the traditional opinion that it is originated in North Africa and spread eastward into Central Asia.

An even more marked distributional pattern is exhibited by the genus *Schismus*. Although only one of its 5 species was originally described as a *Danthonia*, this genus should be considered within the framework of this paper. The type-species, *Schismus barbatus*, occurs in Southern Africa as well as in the Mediterranean region, ranging from the Canary Islands, southern France and Morocco to the delta of the Nile in the south and from Arabia as far as the Caucasus in the north. The closely related *Schismus arabicus* ranges from the Himalayas to Greece in one direction and from Pakistan to the delta of the Nile in the other. The areas of *Schismus barbatus* and *Schismus arabicus* overlap greatly in a broad zone stretching from Egypt

to the Caucasus, and within this area one will encounter forms which are not typical of either species. There are two annual species, well known in the Mediterranean, which represent, however, only a small section of the genus *Schismus*. Three more species, all perennials, are endemic to South Africa. These are adapted to extreme environmental conditions and, unfortunately, are not well represented in the European herbaria. Only the annual *Schismus barbatus* was able to occupy a wide area in South Africa and migrate from there along the western coast to the north of the continent. *Schismus* is of special importance in connection with some related taxa which were originally housed in *Danthonia* namely species on which I, in co-operation with Miss A. M. TÜRPE, have based the genus *Karroochloa*. This new genus consists of 4 species, 2 being perennials and 2 annuals. The perennials, *K. curva* and *K. purpurea* are adapted to peculiar environments. The first grows on the lower levels of the South African mountains, never exceeding 600 metres above sealevel; the other occurs in mountainous habitats at altitudes of between 2000 and 2300 metres. In contrast, the two annual species



Map I: Localities of the annual species of *Schismus*.



Map II: Localities of the perennial species of *Schismus* (above) and of the closely related genus *Karroochloa*.

are widely distributed; one will find them in sandy plains or in the sandy beds of dried-up rivers. *Schismus* and *Karroochloa* are closely related genera as can be deduced from the similar structure of their lowermost leaf-sheaths. These are thinly chartaceous and have 2 prominent keels which terminate in two stiffly pilose awns. Whereas the two genera agree to a large extent in habit and leaf-anatomy, their spikelet-structure is clearly different. The spikelets of *Schismus* fall off entire at maturity; their lemmas are awnless. In *Karroochloa* the spikelets break up at maturity and have lemmas, which are always awned, the awn being geniculate and twisted below the bend. *Schismus pleuropogon*, which is known only from two gatherings, occupies an intermediate position. The *Schismus-Karroochloa* complex is undoubtedly centred on South Africa, but it extends its range into the Mediterranean region with two annual species.

Of the remaining 23 species, 4 belong to 2 highly specialized genera. To the first of these genera (*Dregeochloa*) is attributed the taxon which has been known for so long as *Danthonia pumila*. This species has certain peculiar characteristics in both spikelet-morphology and leaf-anatomy. The most important clue, however, I found when a plant, apparently of this affinity, yielded a mature caryopsis. This had a loose yellowish pericarp and the shape of its hilum as well as its embryo, distinguished it clearly from the caryopsis of all the other species of *Danthonia*. The type-species, *Dregeochloa pumila*, is confined to a small area of South West Africa; a second species, *D. calviniensis*, has been found only around Calvinia.

A similarly isolated position occupy two other species known as *Danthonia macrantha* and *Danthonia brachyphylla*. In having 2-flowered spikelets over 40 mm long they differ conspicuously from all the other species. They certainly do not belong to *Danthonia*; but they also differ strikingly from *Pentameris*, a genus to which they were attributed by some authorities. I have united them in the new genus *Pseudopentameris*. This genus can easily be separated from both *Danthonia* and *Pentameris* by the many-nerved glumes and the structure of the caryopsis, as well as by their leaf-anatomy. There is no obvious relationship between *Pseudopentameris* and any other genus known to me. The type species is confined to the Cape of Good Hope and the other species occurs around Swellendam.

***Pseudopentameris* CONERT, genus novum**

Spiculae conspicue magnae, 35—55 mm longae, pallidae, lanceolatae, lateraliter compressae, biflorae (rarissime triflorae), rhachilla ultra florem superiorem producta, gluma rudimento terminata, in paniculis paucifloris, ramis brevibus, contractis aggregatae. Flosculi uniformi, ambitu oblongi. Flores hermaphroditi; lodiculae 2, cuneatae, nervosae, 1—1,5 mm longae, glabrae; stamina 3, antherae 5—7 mm longae; ovarium glabrum, stilis 2 brevissimis terminalibus, stigmatibus 3—5 mm longis, plumosis. Caryopsis libera, glabra, 4—5 mm longa, 1 mm lata, teretiuscula, anguste-caniculata, brunnea, apice tantum straminea, hilo lineari totam fructus fere longo, embryoni elliptici,

1 mm longi. Rhachilla supra glumas et inter flosculos disarticulans; pars superior cum callo 3—4 mm longo, angusto, basi acuto-pungente, acie dense et 1—2 mm longe barbato connata; pars inferior ad flosculum inferiore persistens, 1,2—1,5 mm longa, glabra.

Glumae 2, spiculam longe superantes, membranaceae, lanceolatae, acuminatae, aequales, gluma superior tantum paulo angustior, glabrae, margines et ad apicem asperae, 3—5 (—7) —nerviae, nervis prominentibus, ternis mediis percurrentibus, lateralibus in parte infima glumarum evanescentibus, omnibus anastomosantibus. Lemmae dorso convexae, 9-nerviae, nervis ternis mediis infra aristam concurrentibus, ternis lateralibus utrinque in laciniam excurrentibus. Lemmae oblongae, apice bilobatae et inter lobos aristatae, coriaceae, dorso vel parte superior tantum pilis 2—3 mm longis villosae. Laciniae anguste-triangulares, 3—4 mm longae, bifidae; lacinula interiore in setam 8—15 mm longam excurrens, exteriore hyalina, 1—2 mm longa, acuta, ciliata. Arista media inter lacinias oriente, geniculata, in parte inferiore 8—15 mm longa, spiraliter torta, acie ciliata, parte superiore 12—20 mm longa, acuta, scabra. Paleae anguste-lanceolatae, apice emarginatae, bicarinatae, nervis prominentibus glabris, inter carinas glabrae vel villosae, marginibus inflexis, angustis, glabris. Gramina perennia. Culmi erecti, parce ramosi vel simplices, inferne polyphylli, dense vaginati, foliis angustis demum convolutis, supra scabris subtus vaginisque glabris, his margine nudis. Ligula corona pilorum albidorum formata.

Typus generis: *Pseudopentameris macrantha*.

Species duae, Africam australem inhabitantes.

***Pseudopentameris macrantha* (SCHRADER) CONERT, comb. nov.**

Danthonia macrantha SCHRADER in SCHULTES, Mant. pl. 2:385 (1824).

Pentameris macrantha NEES in Linnaea 7:312 (1832).

Type: South Africa, Cape of Good Hope, HESSE, s. n.

***Pseudopentameris brachyphylla* (STAPF) CONERT, comb. nov.**

Danthonia brachyphylla STAPF in Fl. Cap. 7:520 (1899).

Type: from South Africa, ZEYHER 1826 δ .

Of the 19 remaining species 17 belong to *Merxmüllera* and form the largest and most interesting group amongst the species previously lumped in *Danthonia*. Most species of *Merxmüllera* are tall, densely tufted perennials with persistent tough leaf-sheaths. The leaf-laminae are narrow, involute, subulate, and striate only on the upper surface. The spikelets are large, many-flowered, often gold-yellow in colour, with rather thin glumes and lemmas. Despite their considerable length the glumes are only 1-nerved or rarely have a few additional lateral nerves. The lemmas are either irregularly pilose or with hairs arranged in individual tufts or even only near the margins. The rather slender lateral lobes are often united with the lowermost part of the awn.

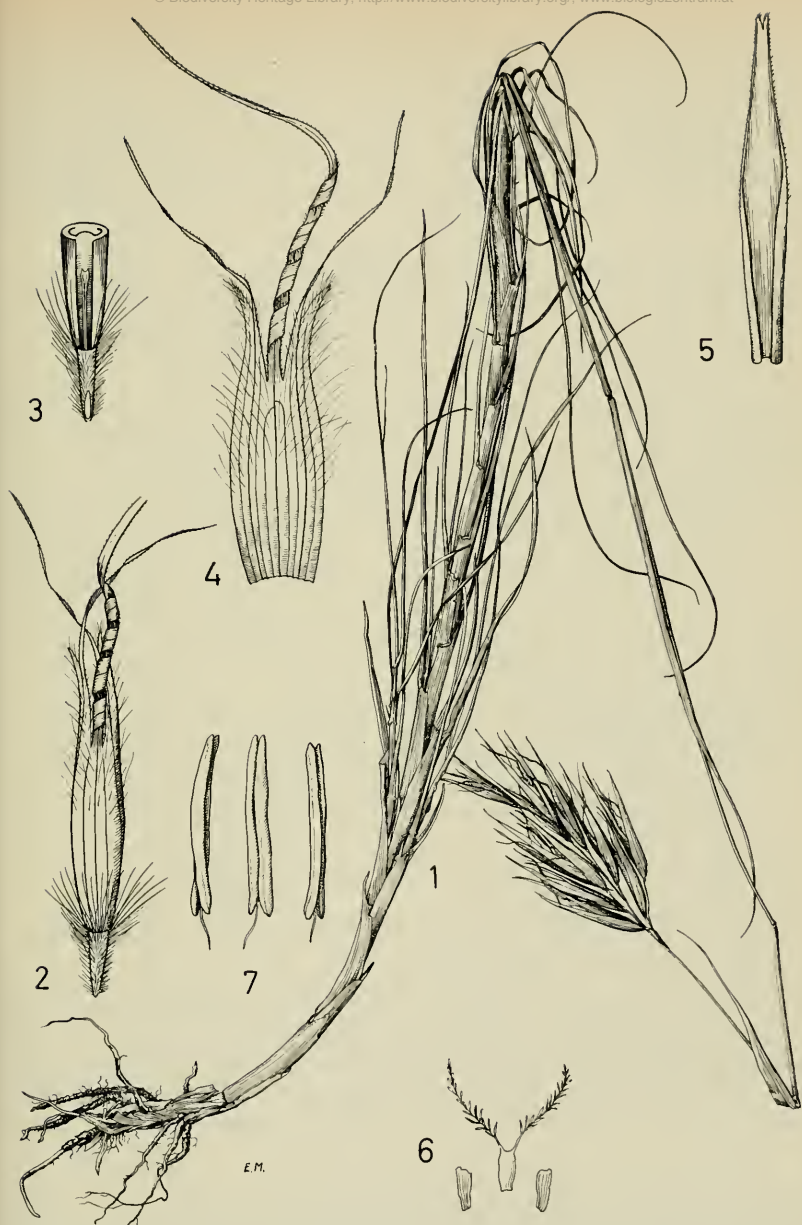


Plate 1: *Pseudopentameris macrantha*. 1) habit (x 0,4); 2) floret (x 4); 3) callus and rhachilla-extension (x 4); 4) lemma (x 4); 5) palea (x 4); 6) ovary and lodicules (x 4); 7) stamens (x 4). Drawing by Mrs. E. Michels.

These characters show convincingly that *Merxmuellera* is distinct from *Danthonia*. As a matter of fact it is not even related to it. Similar patterns of hairiness are merely due to convergence. *Merxmuellera* is to be found in South Africa, and 2 species are recorded from the mountains of Madagascar.

Besides the 14 species, which were mentioned in connection with the description of the genus the following taxa have to be referred to *Merxmuellera*:

***Merxmuellera decora* (NEES) CONERT, comb. nov.**

Danthonia decora NEES, Fl. Afr. Austr.: 332 (1841).

Danthonia zeyheriana STEUDEL, Syn. Pl. Glum. 1:244 (1854).

Danthonia zeyheriana STEUDEL var. *trichostachya* STAFF
in Fl. Cap. 7:522 (1899).

Type: South Africa, Cape of Good Hope, DRÈGE, s. n.

***Merxmuellera lupulina* (THUNBERG) CONERT, comb. nov.**

Avena lupulina THUNBERG, Prod. Pl. Cap.: 23 (1794).

Danthonia lupulina (THUNBERG) BEAUVOIS ex ROEMER et SCHULTES, Syst.
Veg. 2:690 (1817).

Danthonia coronata TRINIUS in Mem. Acad. Imp. Sc. St. Petersburg.
Ser. 6, 1:70 (1831).

Type: South Africa, Cape of Good Hope, THUNBERG, s. n.

***Merxmuellera rufa* (NEES) CONERT, comb. nov.**

Danthonia rufa NEES, Fl. Afr. Austr.: 330 (1841).

Avena lanata SCHRADER in Gött. gel. Anzeigen 3:2075 (1821),
non KOELER (1802) nec CAVANILLES (1802).¹

Danthonia lanata (SCHRADER) SCHRADER in SCHULTES, Mant. Pl.
2:386 (1824).

Danthonia lanata (SCHRADER) SCHRADER var. *major* NEES, Fl. Afr.
Austr.: 329 (1841).

Danthonia macrocephala STAFF in Fl. Cap. 7:522 (1899).

Type: South Africa, Cedar Mts. DRÈGE, 2559.

There is no genus of African grasses to which *Merxmuellera* shows any relationship; but strangely enough, in their habit, the peculiar formation of the leaf-sheaths and their tendency to unite the lateral lobes of the lemma with the lowermost part of the awn they agree more or less with the snow-grasses of New Zealand and the pampas-grasses of South America. The genus *Chionochloa* is represented in New Zealand by more than 10 species and

¹ *Avena lanata* SCHRADER is a younger homonym to both *Avena lanata* (LINNAEUS) KOELER (1802) and *Avena lanata* (LINNAEUS) CAVANILLES (1802), thus it has to be rejected. The new combination is based on *Danthonia rufa* NEES (1841) which is the oldest name available.



Map III: Distribution of the related genera *Merxmuellera* (Africa and Madagascar), *Chionochloa* (New Zealand) and *Cortaderia* (South America; 1 species in New Zealand).



Map IV: Distribution of *Danthonia grandiflora* and *D. subulata* (in Ethiopia) as well as of the closely related *D. schneideri* stretching from Afghanistan to western China.

is also known from the Auckland Islands and Campbell Island. As in *Merxmuellera*, in this genus the spikelets are hermaphrodite, but the hairiness of the lemma does not exhibit the same diversity. The lemma of *Chionochloa*, however, shows all intermediate stages from a bi-lobed to a completely undivided apex.

The genus *Cortaderia* is represented in New Zealand by only 1 species, whereas the other 20 species are distributed over South America. All these South American species are dioecious. Many species have bi-lobed lemmas and a well-developed awn; only the lemmas of *Cortaderia selloana*, the pampasgrass, as well as of related species have no apical lobes thus the narrow papery lemmas appear unawned. All the genera mentioned above agree in their leaf-anatomy.

All that remains to be considered are the two remaining species *Danthonia grandiflora* and *D. subulata*, which are, however, confined to the mountains of Ethiopia. Their spikelet-structure, as well as both shape and the indumentum of the lemma, is almost identical with the same characters observed in *Danthonia schneideri*, a true member of this genus. The latter species was described from Yunnan, but its area of distribution stretches over the Himalayas. Thus *Danthonia grandiflora* and *Danthonia subulata* represent the last outposts of this group of *Danthonia* in the southern hemisphere. From its centre of distribution, ranging from Indonesia to Australia and New Zealand, the genus stretches across the Himalayas into Ethiopia, where it is represented by the only endemic species of *Danthonia* in Africa.

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