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HILDEMAR SCHOLZ

Notes on *Bromus danthoniae* and relatives *(Gramineae)*

Abstract

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Based on studies of herbarium material and the relevant literature, arguments are given for an emended circumscription and definition of the Near-Middle East endemic *Bromus* sect. *Triniusia*, hitherto regarded as monotypic. The section is here characterized by strongly acute apical lemma teeth in combination with lemma awn triplets. The new concept results from the recognition of a second species besides *B. danthoniae*, i.e. *Bromus turcomanicus* with somewhat deviate, very blunt lemma lobes, described as new to science (only known from the type locality). The new concept also lays stress on the fact of frequent transitional links between the three subspecies of *B. danthoniae* here recognized. Of these, *B. danthoniae* subsp. *rogersii* is described as a subspecies new to science, while *B. danthoniae* subsp. *pseudodanthoniae* is a new combination, made to treat the taxon sometimes considered a separate species, *B. pseudodanthoniae*, more appropriate. *B. lanceolatus*, here lectotypified, remains excluded from *B.* sect. *Triniusia*.

Introduction

It is still almost a commonplace that many species and subspecies are undescribed or badly known, even in temperate regions. Therefore, much work has to be done in taxonomy as the basic discipline of life science (Minelli 1993), i.e. in the description and the inventory of these basic units of biodiversity (Claridge & al. 1997). Before such final work in critical plant groups has been accomplished, one reasonably has to resist the temptation towards too hasty constructed phylogenetic trees by means of new research techniques as, e.g, in the brome studies of Pillay & Hilu (1995), where not infrequently sparse, insufficient and doubtfully or wrongly determined material has been used.

W and Central Europe, the Mediterranean area and the Near-Middle East region are the centres of the past and ongoing evolution of annual brome grasses as well as the hot-spots of brome grass diversity, and the latter region is the 'hottest' of all. In a previous publication on a particular group of about 6-7 annual *Bromus* species in the Near and Middle East, informally called "*Bromus pectinatus* complex", the author tried to sail between the Scylla and Charybdis of an extreme splitting and extreme lumping (Scholz 1981), both counter-effective for judging biodiversity. Keeping this in mind the subject of the present study is the Near-Middle East endemic, formerly monotypic *Bromus* sect. *Triniusia*, here presented in a new circumscription

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comprising two species, *B. danthoniae* (subdivided in three subspecies, one of them sometimes regarded as a separate species, *B. pseudodanthoniae*, and then excluded from *B.* sect. *Triniusia*) and *B. turcomanicus* sp. nova.

The study is based on herbarium material of the Natural History Museum Vienna (W), which contains one of the richest Near-Middle East grass collections worldwide, and of the herbarium of the Botanic Garden and Botanical Museum Berlin-Dahlem (B). The results attained are preliminary ones.

Bromus* sect. *Triniusia

Bromus sect. *Triniusia* (Steud.) Nevski in Trudy Sredne-Aziatsk. Gosud. Univ., Ser. 8c, 17: 23. 1934 ≡ *Triniusia* ["*Triniusa*"] Steud., Syn. Pl. Glum 1: 328. 1854, s.str. – Typus: *Bromus danthoniae* Trin.
[– *"Bromus* sect. *Neobromus"* auct. non (Shear pro subg.) Hitchc. (1935): Bor in K. H. Rechinger, Fl. Iranica 70: 130. 1970. – Note: *Bromus* subg. *Neobromus* Shear is a phyletically quite distinct South American taxon (type: *B. trinii* E. Desv., see Matthei 1986)].

Lemma ovate to oblongate-lanceolate, with usually three (one central and two lateral) awns and two acute or blunt apical teeth often slightly laterally incised, glabrous or hairy. Two species.

Key to the taxa of *B.* sect. *Triniusia*

1. Apical lemma lobes blunt; central awn inserted at most 2 mm below apex . . . . . 2. *B. turcomanicus*
– Apical lemma lobes sharply acute; central awn inserted at least 2 mm below apex . . . 2
2. Spikelets strongly laterally compressed; lemmas 6-10 mm broad, the upper with three recurved or spreading awns . . . . . 1a. *B. danthoniae* subsp. *danthoniae*
– Spikelets not as above; lemmas 3-6 mm broad 3
3. Central awn of upper lemmas spreading or recurved, lateral awns ± erect; plants of dry habitats . . . . . 1b. *B. danthoniae* subsp. *pseudodanthoniae*
– Central and lateral awns erect; plants of moist montane habitats . . . . . 1c. *B. danthoniae* subsp. *rogersii*

1. *Bromus danthoniae*

Bromus danthoniae Trin. in Meyer, Verz. Pfl. Cauc. Casp. Meer: 24. 1831 ≡ *Triniusia danthoniae* (Trin.) Steud., Syn. Pl. Glumac. 1: 328. 1854 ≡ *Bromus macrostachys* subsp. *danthoniae* (Trin.) Asch. & Graebn., Syn. Mitteleur. Fl. 2: 627. 1901 ≡ *Bromus lanceolatus* var. *danthoniae* (Trin.) Dinsm., Fl. Syria Palest. Sinai, ed. 2, 2: 775. 1933. – Holotypus: [Azerbaydzhan],"in collibus lapidosis aridis prope pag. Swant, 22.6.1830, *C. Meyer*" (LE; isotypi LE; see Cvelev 1976).
= *Bromus danthoniae* var. *lanuginosus* Roshev. in Trudy Glavn. Bot. Sada 38: 135. 1926 (n.v.).

Distribution: From Turkey, Syria, Lebanon, Palestine and Saudi Arabia eastwards to Pakistan, Tibet and Uzbekistan. Dry screes, slopes and as a weed in fields, rarely in wet places.

Variation: The material of the species shows considerable variation. Three polymorphic subspecies that are, however, not clearly demarcated, can be discerned.

a. *Bromus danthoniae* subsp. *danthoniae* – Fig. 1.

Spikelets 10-45 × 5-15(-20) mm, ovate or oblongate-lanceolate, 6-20-flowered, strongly laterally compressed. Lemmas excl. awns 10-16 × 6-10 mm, 9(11)-nerved, sharply acute, bifid to quadri-

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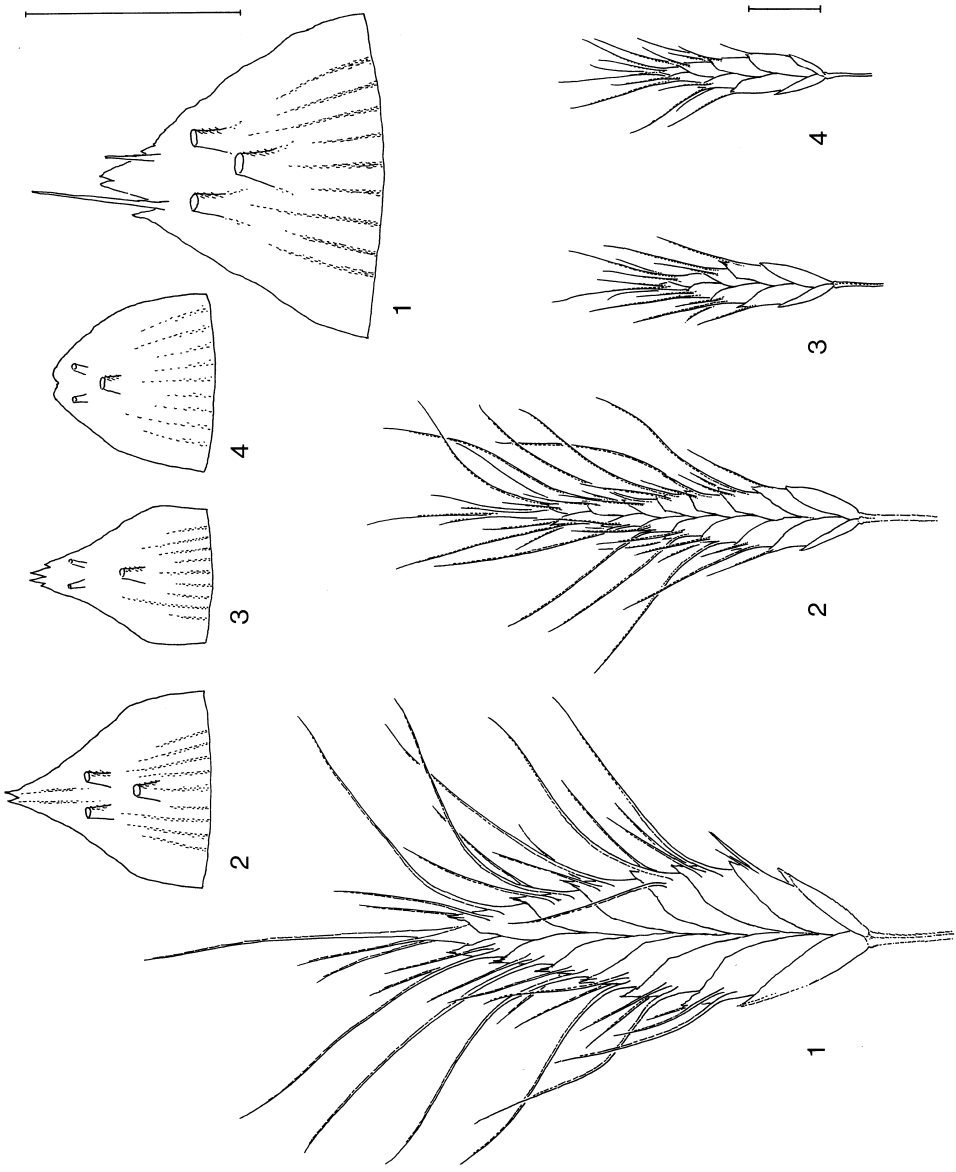


Fig. 1-4. *Bromus* sect. *Triniusia*; spikelets and distal part of lemmas (awns resected) – 1. *B. danthoniae* subsp. *danthoniae*, Irak, *J. Bornmüller 1851* (B); 2. *B. danthoniae* subsp. *pseudodanthoniae*, Saudi-Arabia, *Chaudhary 7966* (B); 3. *B. danthoniae* subsp. *rogersii*, holotype (B); 4. *B. turcomanicus*, holotype (W). – Scale bars = 5 mm.

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fid, the marked marginal angles sometimes with a blunt tooth; middle and upper lemmas 3-awned, sometimes 5-awned; 3 awns strongly bent or recurved in fruiting state, the other two awns (if present) erect, short, filiform, mostly dorsally subterminal, rarely terminal; central awn inserted 3-6(-7) mm below apex, about as long as or longer than lemma. Anthers 1.2-2 mm long.

Ic.: Bor 1968: t. 47; Bor 1970: t. 20; Cope 1982: fig. l64.

Distribution: Throughout the range of the species.

Representative specimens
TURKEY: (B9) Prov. Van, Bendimahi, in Getreidefeldern am Westrand des Dorfes, 1700 m, 15.7.1981, *Th. Raus 4289* (B); (C7) 39 km E of Siverek Karacadak, 1100 m, 37° 45′N, 39°45′E, 14.6.1986, *R. M. A. Nesbitt 674* (B). — LEBANON: Montium Antilibani in declivitatibus prope Baalbek, 1150-1300 m, 19.5.1910, *J. Bornmüller 13057* (B). — JORDAN: Wadi, 35 km W of Azraq Oasis, 14.5.1976, *V. Täckholm 8994* (B). — IRAQ: Mosul (Kurdistan), ad confines Turciae prov. Hakkari, in ditione oppidi Zakho; in jugo inter Dagh al Radzjiem et Sharanish, in saxosis calc., c. 900 m, 2.-4.7.1957, *K. H. Rechinger 10809* (W). — IRAN: Prov. of Luristan, Dorud, dry slope, 24.5.1941, *W. N. Koelz 17738* (W); North Gonbad, between 2 + 8 km E of Moraveh Teppeh, alongside Afrak River, 300 m, 20.5.1976, *T. F. Hewer H3806* (W). — AFGHANISTAN: Tirin, in collibus inter lacum artificiale "Arghandab Reservoir", 31°50′N, 65°45′E et Tirin, 32°40′N, 65°50′E, 1400-1700 m, 23.5.1967, *K. H. Rechinger* (W).

b. *Bromus danthoniae* subsp. *pseudodanthoniae*

Bromus danthoniae subsp. *pseudodanthoniae* (Drobov) H. Scholz, **comb. & stat. nov.** – Fig. 2.
≡ *Bromus pseudodanthoniae* Drobov in Feddes Repert. 21: 39. 1925. – Typus: not indicated; described from Uzbekistan (near Tashkent); lectotype (see Cvelev 1976 sub *B. pseudodanthoniae*): TAK.
= *Bromus macrostachys* var. *triaristatus* Hackel in Flora 62: 155. 1879. – Typus: not indicated; described from Turkey (Cilicia).
= *Bromus danthoniae* var. *submuticus* Mouterde, Nouv. Fl. Liban Syrie 1: 127. 1966. – Typus: Syria, "Palmyre, Tell Daba", *Pabot* (E?).
[– *Bromus danthoniae* var. *uniaristatus* Melderis in Ark. Bot. 5(1): 63. 1960, nom. inval. (no type specimen cited); described from Lebanon].
[– *"Bromus lanceolatus"* auct. p.p., non Roth (1797): Bor 1970, Cope 1982].

Spikelets and lemmas smaller and narrower. Lemmas c. 4-5 mm broad, often only the uppermost lemmas 3-awned; the two lateral awns rather thin, more or less filiform or setiform (rarely suppressed in specimens with small spikelets); central awn inserted 2-4 mm below apex, strongly bent in fruiting state. Anthers usually shorter than 1.2 mm. Leaf sheaths pubescent, rarely glabrous.

Ic: Pénzes 1936: fig. VII46a-f, XV54c.

Melderis' invalidly named taxon clearly belongs to this subspecies, as is evident from the description stating that the lemma lobes of only one or two upper florets are (triple-)short-aristate ("spiculis subuniaristatis (lobis lemmatis unis vel duorum flosculorum superiorum infra apicem in aristis brevibus protractis)", Melderis 1960: 63). Cvelev (1976) wrongly cited the name under *B. danthoniae*.

The name *Bromus pseudodanthoniae* Drobov is often neglected in the literature (e.g. Bor 1970), or, if not so, is either placed in the synonymy of *B. lanceolatus* Roth (Cope 1982) or accepted for one or the other distinct species closely related to *B. lanceolatus* (2n = 28), viz *B. oxyodon* Schrenk (2n = 28) and *B. scoparius* L. (2n = 14). It has, however, not been considered in relation to *B. danthoniae* Trin. (2n = 14, 28?).

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The relegation of *Bromus pseudodanthoniae* and *B. danthoniae* to different sections, *B.* sect. *Sapheneuron* Nevski and *B.* sect. *Triniusia* (Steud.) Nevski respectively (Cvelev 1976, see also Cope 1982), is in striking contrast to its common unique feature of the three awns on (at least) the upper lemmas *(B.* sect. *Triniusia)*, whereas *B. lanceolatus* and other species of *B.* sect. *Sapheneuron* (often included in *B.* sect. *Bromus*, see Smith 1970, Cope 1982) have only a single lemma awn throughout (or are rarely awnless).

In comparison with *Bromus danthoniae*, the spikelets of *B. pseudodanthoniae* are to a lesser degree laterally compressed, they are sometimes smaller and the lemmas are usually thinner and more coriaceous. However, the two taxa completely intergrade in the distinguishing characters (despite of different chromosome numbers so far known!) and in the Near-Middle East region many intermediate populations exist. Therefore the subspecific status is much more appropriate for *B. pseudodanthoniae*. Any further subdivision of the taxon is, at least for the present, premature. Recent isoenzyme analyses by Oja (1998) seem to confirm the close affinities of *B. pseudodanthoniae* and *B. danthoniae*.

The speculation by Cvelev (1976) of a hybrid origin of *B. pseudodanthoniae* as *B. danthoniae* × *B. scoparius*, which appears unlikely even if only the morphology of both these species is considered, is, on the other hand, not compatible with recent molecular biological studies (Ainouche & Bayer 1997).

Distribution: Scatteredly distributed throughout the range of the species. Restricted to dry areas.

Representative specimens
Syria: Mari/Euphrat, 10.4.1993, *W. Lang 13* (B). — Lebanon: Steinige Abhänge des Dsch. Sanin, 2200-2600 m, 11.6.1904, *A. Kneucker 160* (B). — Iraq: Betw. Ana and Qaium, 13.4.1972, *H. Hamid 39218* (B); Distr. Sulaimaniya (Kurdistan), in ditione pagi Penjwin, 19.-20.6.1957, *K. H. Rechinger 10397* (W). — Saudi Arabia: Shaqra, 25.2.1984, *S. A. Chaudhary 7966* (B). — Iran: Asemen Mobarak, Gatschsar, 2300 m, 12.6.1965, *Tregabor 33* (W); Semnan prov., Touran Protected Area SE of Shahrud, Shakh-e-Biar SW Biarjomand, 1150 m, 4.5.1978, *H. Freitag 15074* (B). — Pakistan: Quetta, Yaro prope Bostan, 30°23′N, 67°00′E, 40 km NNE Quetta versus Pishin, in arenoso-argillosis, 1450 m, 8.5.1965, *K. H. Rechinger 28943* ("*Bromus lanceolatus*", W). — Turkmenistan: Pr. Ashabad, in deserto argilloso, 10.5.1897, *D. Litwinow 2243* ("*Bromus lanceolatus*", W). — Afghanistan: Kabul, Ruderalstelle in einem Garten, 1780 m, 21.5.1951, *A. Gilli 645* (W); Prov. Ghorat, Darrah-i-Tarbolagh bei Sare Bum (an der Straße nach Daykundi), 2880 m, 29.7.1970, *D. Podlech 18964*, cult. Bot. Gard. Graz 1977 (B).

c. *Bromus danthoniae* subsp. *rogersii*

Bromus danthoniae subsp. *rogersii* (C. E. Hubbard ex) H. Scholz, **subsp. nova** – Fig. 3.
Holotypus: Afghanistan, Prov. Bamian, Bandi-i Amir, ad lacum Bandi Gholaman, c. 34°23′N, 67°17′E, c. 2800 m, 16.7.1962, *K. H. Rechinger 18477* (B; isotypus W).

Similis subsp. *pseudodanthoniae* sed paniculis linearioribus et strictioribus et spiculis brevioribus differt. Lemmata 6-9 × 3-4 mm; arista centralis et aristae laterales plusminusve erectae. Culmi solitarii vel fasciculati strictissime erecti, ad 30 cm alti.

Similar to subsp. *pseudodanthoniae*, but the panicle narrower, stiffer, and the spikelets shorter. Lemmas 6-9 × 3-4 mm; central awn and lateral awns more or less upright. Culms solitary or loosely tufted, stiffly erect, up to 30 cm high.

The name *Bromus rogersii* on two sheets of *Rechinger 18477* was in 1963 ascribed by Bor to C. E. Hubbard, the late famous British agrostologist, but was never published. The eponym "*rogersii*" is here taken up. That name was given by Hubbard in honour to Charles Gilbert Rogers (1864-1937), British forester and botanist, who collected plants mainly in India, Burma and E Africa.

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Distribution: A taxon of moist, montane habitats, hitherto known from Iran and Afghanistan.

Other specimens seen
IRAN: Semnan prov., Touran Protected Area (SE of Shahrud), clay flat NE of Dowchah, 1150 m, 17.8.1976, *H. Freitag s.n.* (B); Durud, Luristan, 5000 ft., 20.5.1940, *W. N. Koelz 15480* (B). — AFGHANISTAN: Ghorat Province, 17.3 miles W of Chagcharan, by Hari Rud-Usturkhan, 7200 ft., flat riverside plain, 20.6.1971, *C. Grey-Wilson & T. F. Hewer 1176A* (W); sine loco, *H. Volk s.n.* (B).

2. *Bromus turcomanicus*

Bromus turcomanicus H. Scholz, **sp. nova** – Fig. 4.
Holotypus: Turkmenistan, Pr. Ashabad, Gaudan, 29.5.1898, *D. Litwinow 2304* ("*Bromus danthoniae*") (W; isotypus LE?).

Culmi erecti, ad 25 cm alti, basi fasciculati, scabri, in partibus superioribus brevipilosi. Vaginae inferiores brevi-pubescentes; foliorum laminae 20-60 × 1-2 mm, scabrae et hirsutae; ligulae dentatae 0.5 mm longae. Panicula simplex, densa, contracta, 3-4 cm longa. Spiculae 5-7-florae, oblongae, 10-20 × 3-5 mm, glabrae. Glumae inaequales, obtusae plusminusve mucronatae; inferiores 3-nerviae, 4-5 mm longae, superiores 5-7-nerviae, 5-6(-10) mm longae. Lemmata coriacea marginibus angulatis, 7-8 × 3-4 mm, aristata, apice brevi-bilobata lobis valde obtusis; superiora triaristata aristis centralibus 1-1.5 mm infra apicem insertis, inferiora uniaristata; aristae 2-10 mm longae leviter curvatae. Palea lemmatis aequilonga. Stamina 3, antherae c. 1 mm longae.

Culms erect, up to 25 cm high, scabrous to somewhat shortly pilose below the panicle. Lower leaf sheaths finely pubescent; leaf blades 20-60 × 1-2 mm, scabrous and hirsute; ligules toothed, 0.5 cm long. Panicle racemelike, dense, 3-4 cm long. Spikelets 5-7-flowered, oblong, 10-20 × 3-5 mm, glabrous. Glumes unequal, obtuse and more or less mucronate; the lower 3-nerved, 4-5 mm long, the upper 5-7-nerved, 5-6(-10) mm long. Lemmas coriaceous, with angled margins, 7-8 × 3-4 mm, at the apex with two short and very blunt lobes; upper lemmas 3-awned, the central awn inserted 1-1.5 mm below apex, lower lemmas 1-awned; awns 2-10 mm long. Palea nearly as long as lemma. Stamens 3, anthers c. 1 mm long.

Bor (1970) cited *Litwinow 2304* under *Bromus danthoniae* var. *danthoniae* (the variety with glabrous spikelets). But there is only a superficial resemblance of the new species and *B. danthoniae* due to the awn triplets of the upper lemmas.

Bromus turcomanicus strikingly differs from *B. danthoniae* s.l. in exhibiting both the very blunt (not sharply acute) lemma lobes and the high insertion point of the awn, so that in combination with its coriaceous lemma texture and the nearly racemose panicle *B. turcomanicus* remotely resembles e.g. *B. racemosus* L. of *B.* sect. *Aphaneroneuron* Nevski.

Distribution: The species is known so far only from the type locality in Turkmenistan.

Addendum

The distribution area of *Bromus danthoniae* Trin. in the Near-Middle East region is smaller than that of *B. lanceolatus* Roth (*B. macrostachys* Desf.) of *B.* sect. *Sapheneuron*, which is a clear-cut species with an extended distribution area ranging from Central Asia to the Canary Islands. *B. lanceolatus* is also bred as an ornamental plant. Although ecological factors and possible hybridization give rise to some variation in *B. lanceolatus* (Ainouche & al. 1996), its species boundaries are never blurred. The actual reason for confusion of *B. danthoniae* and *B. lanceolatus* is therefore only the bewildering polymorphism of *B. danthoniae* s.l., which renders the species recognition difficult.

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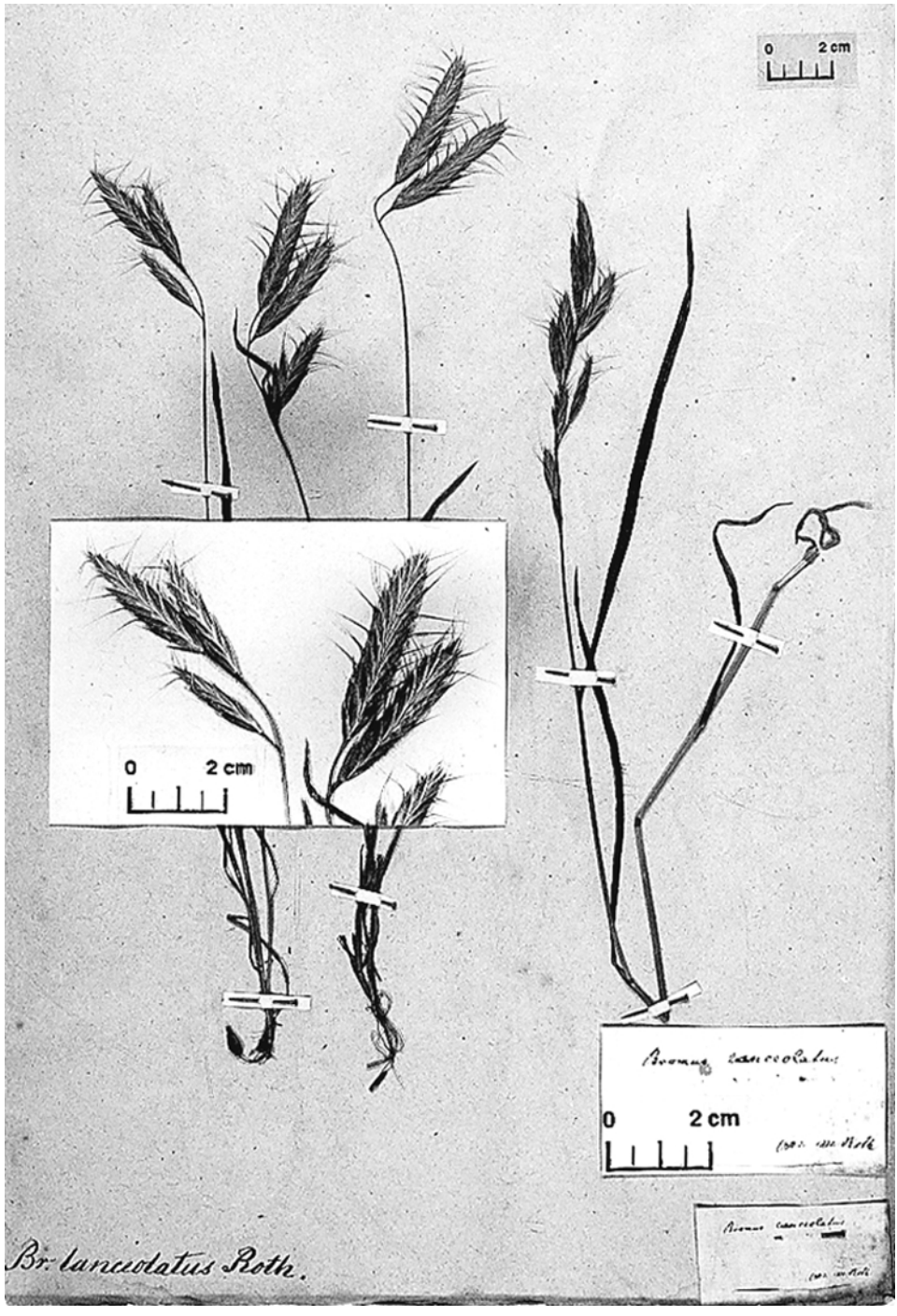


Fig. 5. *Bromus lanceolatus* Roth – lectotype specimen (BREM).

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Albrecht Wilhelm Roth (1757-1834) gives in his "Catalecta botanica" (1797) a detailed description of *Bromus lanceolatus* based on plants of unknown origin (probably from the Canary Island) cultivated in his personal garden ("*Bromi canariensis* nomine semina benignitati debeo amici aestumatiss. Cel. Roemeri"; Roth 1797: 20). Original material kept in the herbarium of Roth (1925 incorporated in B) was destroyed in World War II by a British air raid at Berlin in 1943. Are any other original specimens suitable for lectotypification extant? Cvelev (1976) mentioned a possible isotype, "*B. lanceolatus* Roth, cult.", in St Petersburg (former Leningrad, LE), but the better choise seems to be a specimen found in the herbarium of the Übersee-Museum Bremen (BREM).

Bromus lanceolatus Roth, Catal. Bot.: 18. 1797. – Lectotypus (designated here): "*Bromus lanceolatus*, 1802, m ? *Roth*" (BREM – Fig. 5).

In every detail the three paniculate culms of *Bromus lanceolatus* mounted on the lectotype sheet (Fig. 5) are in perfect agreement with both the protologue and the conventional use of the name.

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