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Bromus cincinnatus (Poaceae): perennial oat-grass or annual brome-grass?

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Abstract. A former lectotype for *Bromus cincinnatus* Ten. (Poaceae) has been superseded, as it is in serious conflict with the protologue. Another element of the protologue has been designated as the effective lectotype. The new lectotype is identified as coespecific with *Bromus intermedius* Guss., a Mediterranean species of *Bromus* L. subg. *Bromus*. The new combination *Helictochloa panormitana* (Lojac.) Romero Zarco is proposed for the species originally described as *Avena australis* Parl., nom. illeg., which is currently known as *Helictochloa cincinnata* auct. The lectotypes of *Avena panormitana* Lojac., *Avena opulenta* Lojac., and *Bromus intermedius* Guss. are also designated.

Keywords. *Avena*, *Bromus*, *Helictochloa*, nomenclature, typification, Gramineae.

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Introduction

The subject of this note, *Bromus cincinnatus*, was published by Michele Tenore (1780–1861) in a volume entitled *Flora medica universale, e flora particolare della Provincia di Napoli* (1822-1823, cf. Peruzzi *et al.*, 2019) catalogued under number 13,905 in *Taxonomic Literature II*; this volume is part of a larger work by the same author, entitled *Corso delle botaniche lezioni... seconde edizione*, of which it is Volume IV.

This name remained in obscurity for more than a century, until Holub (1962) rescued it by publishing the name *Avenochloa cincinnata* (Ten.) Holub, which he justified with a simple comment: "*Gewöhnlich ist diese Art unter dem Namen Avena australis Parlat. bekannt*" (this species is normally known by the name of *Avena australis* Parlat. [sic]). Indeed, "*Bromus cincinnatus* Ten.! fl. nap. 3. p. 85. ex expecimine" is cited as a synonym in the protologue (Parlatore, 1850: 285–286), and the reference "Ten. l. c. tab. 104. f. 1" is included. These citations refer to the third volume of *Flora Napolitana*, a later work by Tenore (1824–1830), which includes a Latin diagnosis along with an Italian description with the same characteristics of the original publication. In the locotypic indication of *Avena australis,* Tenore is mentioned again: "*Nelle colline aride e in luoghi montuosi del regno di Napoli, dove l'ha trovato il cav. Tenore, e di Sicilia ove s'incontra a preferenza nel Val di Mazzara, e presso Palermo. Fiorisce in Maggio e Giugno ed è perenne*". Another important point to note is that Parlatore adds the following in his observations: "*Quanto al sinonimo del Tenore ne sono certo per un esemplare del bromus [sic] cincinnatus avuto dall'autore medesimo*" (regarding the synonym of Tenore, I am sure from a specimen of *Bromus cincinnatus* obtained by the author himself).

In Holub's opinion, these circumstances (implicit in his combination) would make the name of Parlatore illegitimate, as it includes the name *Bromus cincinnatus* without excluding the type (Art. 52.2, *(e)* of the ICN; Turland *et al.*, 2018). The species described by Parlatore would later receive various names, all of them based on the epithet of Tenore, in accordance with the dominant taxonomic criteria of each time:

Avenochloa cincinnata (Ten.) Holub in Acta Horti Bot. Prag. 1962, 84 (1962)
Avenula cincinnata (Ten.) Holub in Folia Geobot. Phytotax. 11(3): 294 (1976)
Helictotrichon cincinnatum (Ten.) Röser in Diss. Bot. 145: 126 (1989)
Avenula bromoides subsp. *cincinnata* (Ten.) Romo in Bot. J. Linn. Soc. 108(3): 205 (1992), 'cincinnatus'
Helictochloa cincinnata (Ten.) Romero Zarco in Candollea 66(1): 102 (2011)

Subsequently, Röser (1989: 126) designated a lectotype for *Bromus cincinnatus*. This lectotype is a specimen sent by Tenore to Parlatore in March 1844 and preserved in the *Museo di Storia Naturale di Firence* (FI); it is undoubtedly identified with the species described by Parlatore as *Avena australis*. The image of the lectotype was published by Röser (1989, 249 plate

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15) and is currently available online (Bazzani, 2010; FI 007056, photo!).

The purpose of this paper is to elucidate the relationship between *Bromus concinnatus* and *Avena australis* and to discuss the nomenclatural consequences of the identities of both names.

Materials and Methods

Herbarium acronyms are according to Thiers (2022). Heterotypic synonyms are indicated with the symbol "=". Misidentifications and illegitimate names are preceded by an en dash ("–").

Results and Discussion

Typification of the name *Bromus cincinnatus* Ten.

The lectotypification of Röser (1989) suffers from two important objections, however. First, it is in serious conflict with the protologue of *Bromus cincinnatus* (Turland *et al.*, 2018: art. 9.19, case *c*), because in the original diagnosis it is stated: "*spigette quasi cilindriche... foglie inferiori villose, e guaine mollemente villose biancastre... Trovasi fra i grani… Annua*" (almost cylindrical spikelets... lower leaves hairy, and whitish, loosely hairy sheaths... Found among the grains… Annual). These characteristics are frequent in certain annual species of the genus *Bromus*. In contrast, *Avena australis* sensu Parl. (i.e. *Helictochloa cincinnata* auct.) is a perennial species, with slightly flattened spikelets, lower leaves scabrous on the veins, and glabrous sheath, and its habitat is grasslands, not crops. The figure accompanying the second description of Tenore (1824–1830: pl. 104. fig. 1) shows a branched panicle and spikelets with lemmas provided with a subterminal awn, which are typical characters of several *Bromus* species. However, the traditional concept of the name *Avena australis* has been applied to a species with racemiform inflorescence and clearly dorsal awns (Röser, 1989 sub *Helictotrichon cincinnatus*; Romero Zarco, 1984 sub *Avenula cincinnata*). Second, there is no absolute certainty that the designated lectotype is part of the original material, since it was received by Parlatore from Tenore in March 1844, long after the description of *Bromus cincinnatus* had been published. The specimen could be part of the original material or not. Fortunately, there is an element in the protologue that must be considered part of the original material: the figure of Barrelier (1714) mentioned in the protologue as "Barr. obs. 1226. ic. 24. f. 2" (Turland *et al.*, 2018: art. 9.4, case *a*). This figure undoubtedly represents an annual species of *Bromus* L. subg. *Bromus*.

It is evident that Tenore lacked confidence in identifying the species involved. Indeed, several species of *Bromus* with twisted awns resemble some species of *Helictochloa* of the so-called "*bromoides* group" (Röser, 1989). However, the choice of a lectotype could not be based on determinations made after the description of the taxon. For the reasons explained, we consider that the lectotypification of Röser (1989) should be rejected in accordance with art. 19.9 of the ICN (Turland *et al.*, 2018). To date, no herbarium specimen has been found to indisputably be part of the original material for Tenore's name. R. Vallariello (Herbarium NAP) kindly sent me the photo of the only sheet from the Tenore collection identified as *Bromus cincinnatus*: NAP 0001416. It contains a specimen with wide leaves and a dense and undeveloped inflorescence. As it is an immature material, it can only be assumed that it belongs to a species of *Helictochloa* (*H. cincinnat*a auct. or *H. praetutiana* (Parl. ex Arcang.) Bartolucci *et al.*). On the label, possibly written by Tenore himself (cf. Burdet, 1978), several scientific names can be read: *Bromus cincinnatus* var. [illegible], *Avena pratensis*, and *A. scheuchzeri*, together with the word: "Calabria". None of this data suggests that it is original material.

The figure of Barrelier (1714) is proposed here as an effective lectotype, as it has the dual benefit of being part of the original material and being consistent with the description of the species.

Bromus cincinnatus Ten., Fl. Med. Univ. 1: 52 (1822)
Locotypic indication: "Trovasi fra i grani" [Naples, Italy]
Lectotype (designated here): [illustration] "Gramen Phalaroides, minus erectâ spicâ, obliquis aristis *Barr. Icon. 24, n. II*", Barrelier, *Plantas per Galiam, Hispaniam et Italiam observatae, iconibus aeneis exhibita*, 1226 (1714). Figure 1.
Epitype (designated here): "Bromus intermedius Guss. // siti scoberti ervosi xerof. sopra Castello monti verso 600 m. nel... [?] 2.VII.16" [c. Naples, Italy], M. Guadagno (PI 030450), photo!. Link: https://pi.jacq.org/PI030450.

Identification of the lectotype: *Bromus intermedius* Guss., Fl. Sicul. Prodr. 1: 114 (1827), according to Parlatore (1842: 79, in the synonymy of *Serrafalcus intermedius*).
Consequently, Parlatore (1850) erroneously cited the name *Bromus cincinnatus* as a synonym of his *Avena australis*, a name that, according to the ICN, is to be considered an illegitimate replaced name of *Bromus cincinnatus* itself.

Identity of *Bromus cincinnatus*

To establish the identity of *Bromus cincinnatus,* we only have the original description and figures from Barrelier (1714) and Tenore (1824–1830). The most important characteristics are: 1) the annual habit; 2) the broad, branched panicle, with erect, nonwhorled branches; 3) spikelets with short or medium peduncles; and 4) divaricate awns.

When reviewing the checklist of native vascular flora in Italy (Bartolucci *et al.*, 2018), the Mediterranean species that most closely resemble this description are as follows:



Figure 1. Illustration of Barrelier (1714: icon. 24); left, "Gr. Phalar. majus acerosum nutante spica [= *Bromus squarrosus* L.]; right, lectotype of *Bromus cincinnatus* Ten., "Gr. Phalar. minus erecta spic Oblic. aristis" [= *Bromus intermedius* Guss.].

- *B. arvensis* L. is discarded due to its whorled branches and straight awns.
- *B. commutatus* Schrad. is similar to *B. intermedius*, except for the texture of the lemmas (leathery in the former, herbaceous in the latter), but its awns are straight.
- *B. grossus* Desf. ex DC. is a central European or sub-Mediterranean species with straight awns.
- *B. hordeaceus* subsp. *molliformis* (J. Lloyd ex Billot) Maire & Weiller is also discarded due to its dense panicle.
- *B. intermedius* Guss. meets all the characteristics of *B. cincinnatus*; thus, this species is selected by eliminating the others.
- *B. japonicus* Thunb. has a whorled panicle, with slightly nodding spikelets and generally straight awns; it is a relatively uncommon species.
- *B. lanceolatus* Roth is clearly differentiated by Tenore himself from his *B. cincinnatus* (Tenore, 1824–1830); the appearance of the panicle and the proportions of the spikelets are also different.
- *B. racemosus* L. is similar to *B. intermedius*, except for the texture of the lemmas (somewhat leathery in the former, herbaceous in the later), but its awns are straight.
- *B. secalinus* L., with spikelets that look different from the previous species due to their somewhat divaricate lemmas with inrolled margins; straight awns.
- *B. squarrosus* L. corresponds to the figure adjacent to the designated lectotype of *B. cincinnatus* (Barrelier, 1714: icon. 24, fig. I), and its spikelets are nodding.

The identity of *B. cincinnatus* with *B. intermedius* is supported by the opinion of Parlatore (1842: 79), who included the *nomen specificum legitimum* of Barrelier in the synonymy of *Serrafalcus intermedius* (Guss.) Parl. Therefore, *B. cincinnatus* should be the priority name for *B. intermedius*.

Typification of the name *Bromus intermedius* Guss.

Locotypic indication: "In pascuis apricis collium; Palermo a Baida, Ficuzza, Piana"
Lectotype (designated here): "Br. intermedius Nob. // Baida", NAP, barcode 0001468 (photo!). Figure 2

According to Acedo & Llamas (2021: 1039), the lectotype was designated by Steinberg (1981). However, this is not exactly true. Steinberg (1981: 417) only indicates that the syntypes are at NAP-G, adding several specimens as "isosyntypi" from other Italian herbaria. He did not designate a lectotype. According to the photos received from R. Vallariello, the Gussone collection of *Bromus intermedius* at NAP consists of three hebarium sheets: (1) NAP 0001467, "April-Majo // in pascuis collium // Baida. Ficuzza", including three parts folded into the same sheet (with only one label); (2) NAP 0001468, "Baida", and (3) NAP 0001469, "Ficuzza". All syntypes



Figure 2. Lectotype of *Bromus intermedius* Guss. Baida [Sicily, Italy], NAP, barcode 0001468. © Università degli Studi di Napoli Federico II, Orto Botanico. Reproduced with permission.

contain similar plants, but according to Burdet (1975), only the first two labels correspond to Gussone's handwriting. Part of NAP 0001467 was reproduced by Acedo & Llamas (1999: 97, fig. 23) and contains plants from at least two different gatherings. Therefore, the sample NAP 0001468 is the most suitable for designation as a lectotype.

Typification of the names *Avena panormitana* Lojac. and *A. opulenta* Lojac.

It is necessary to select a new name for the perennial oat-grass currently known as *Helictochloa cincinnata* auct. The Sicilian botanist Michele Lojacono Pojero (Palermo, 1853–Messina, 1919) described two similar species in the vicinity of Palermo (Sicily), and both can be identified with the perennial oat-grass described by Parlatore:

Avena panormitana Lojac., Fl. Sicul. 3: 303 (1909). *Avena australis* Parl. is mentioned in the protologue "ex parte", and with doubts about its identity with *Bromus cincinnatus* Ten. None of these mentions makes Lojacono's name superfluous (Turland *et al.* 2018: Art. 52.2 and Note 1).

Avena opulenta Lojac., Fl. Sicul. 3: 304 (1909), is differentiated from the previous species by trivial characters. For instance, the number of florets on each spikelet or the number of panicle branches.

There is a certain abundance of material identified as *Avenula cincinnata* in the *Herbarium Mediterraneum Panormitanum* (PAL, see link in the references) and several specimens appear to be related to the publication of either of the two names. Most of these specimens were originally labeled *Avena australis* or *A. pratensis*. Additionally, there are other Lojacono's specimens from Sicily in other herbaria (CGE, FI, G, LY, VER), all of them identified as *Helictotrichon cincinnatus* (Röser, 1989). In the POWO (2022) database, *Avena panormitana* appears as a synonym of *Helictochloa bromoides* (Gouan) Romero Zarco subsp. *bromoides*, while *A. opulenta* is listed as a synonym of *H. pratensis* (L.) Romero Zarco subsp. *pratensis*. These errors were carried over from ancient floras, in which a very broad criterion was used to delimit the species. Neither of these two taxa are found in Sicily. (Parlatore, 1850; Röser, 1989; *Portale della Flora d'Italia*, 2021.2).

Avena panormitana has been chosen as the basionym of the correct name (Turland *et al.*, 2018: Art. 11.5 of ICN). The following nomenclatural combination is proposed for the species described by Parlatore as *Avena australis* (type excluded):

Helictochloa panormitana (Lojac.) Romero Zarco, **comb. nova**

Basionym: *Avena panormitana* Lojac, Fl. Sicul. 3: 303 (1909)

= *Avena opulenta* Lojac., Fl. Sicul. 3: 304 (1909)

– *Avena australis* Parl., Fl. Ital. 1(2): 285 (1850), quod descriptio, typo excluso

– *Bromus cincinnatus* sensu auct. pluribus, non Ten., Fl. Med. Univ. 1: 52 (1822)

– *Avena nebrodensis* Tod., nom. in herb.: PAL 17567; 17568; 17580

Locotypic indication: "Sull'arido calcare di parecchi monti attorno Palermo a S. Martino Her. Pan !"

Lectotype (designated here): PAL 17579, photo! [label 1] "Avena convoluta // Palermo a San Martino, in montosis"; [label 2] "non est A. australis ? però rami a tre spighette" [scripsit Lojacono Pojero]; [3, written on the sheet] "Av. panormitana mihi, S. Martino! MLP" [scripsit Lojacono Pojero]. Figure 3.

The PAL herbarium contains other specimens from the calcareous mountains of Sicily that could be part of the original material of *Avena panormitana*, but only the chosen specimen contains direct evidence in the form of the author's handwritten annotation. Lojacono Pojero's way of working was somewhat neglected in the data on the labels, where neither the collector nor the date of collection usually appear; thus, the choice of lectotypes in this author is usually problematic and must be based on the adequacy of the original description in comparison to the specimen characteristics (Domina *et al.*, 2014).

In the case of *Avena opulenta*, two specimens may be part of the original material: PAL 17575 and PAL 17576. Neither of them contains a label; however, the comments associated with the images of the specimens identify them as original material. In both cases, the footnote indicates "*Il foglio reca il timbro 'Legato A. Todaro'. Su questi individui Lojacono-Pojero ha basato la descrizione della sua Avena opulenta*" (the sheet bears the stamp 'Legacy A. Todaro'. On these individuals Lojacono-Pojero based the description of his *Avena opulenta*). According to G. Domina (pers. comm.), these comments were added by unknown herbarium assistants over the last 20 years. Among these specimens, PAL 17576 shows the inflorescence characteristics better.

Locotypic indication: "Sicilia ! (*s. loc. spec. in Herb. priv. Tod.*).".

Lectotype (designated here): PAL 17576, photo! Stored under the name *Avenula cincinnata* (Ten.) Holub. Link to the photo of the lectotype:
http://147.163.105.223/herbarium_vdetails_en2.asp?idmode=adv&id=29527

Sintype: PAL 17575, photo! Stored under the name *Avenula cincinnata* (Ten.) Holub. Link to the photo of the sintype:
http://147.163.105.223/herbarium_vdetails_en2.asp?idmode=adv&id=29526

According to Domina *et al.* (2011), Lojacono was a disciple of Todaro and moved to Messina in 1913. It is assumed that when he moved, he took part of his herbarium with him, now lost. However, in the case of *Avena opulenta*, the protologue clearly mentions plants without a specific locality from Todaro's private herbarium, currently at PAL. Therefore, although there is no direct proof that the two cited specimens are part of the original material (there is no handwriting or date), it is evident that the specimens from Todaro's herbarium were available to him prior to the publication of volume 3 of the *Flora Sicula*.



Figure 3. Lectotype of *Avena panormitana* Lojac. [Sicily, Italy] Todaro, PAL 17579.
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Conflict of interest

None.

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