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## Notes on Grasses (Poaceae) for the *Flora of China*, I: *Deyeuxia*

Sylvia M. Phillips

Herbarium, Royal Botanic Gardens, Kew, Surrey TW9 3AB, United Kingdom.  
s.phillips@kew.org

Wen-Li Chen

Institute of Botany, Chinese Academy of Sciences, Beijing, 100093, China.  
chenwl@ns.ibcas.ac.cn

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**ABSTRACT.** Two problematical species from the Himalaya that lie on the boundary between *Agrostis* and *Deyeuxia* are discussed. One is transferred to *Deyeuxia* as *Deyeuxia petelotii* with the new synonym *D. continentalis*. The name *Deyeuxia abnormis* J. D. Hooker is retained for the second species, which is confirmed as distinct from *D. zenkeri*. Two other species are transferred to *Deyeuxia* from *Calamagrostis*: *Deyeuxia sichuanensis* and *Deyeuxia korotkyi*.

**Key words:** *Aniselytron*, *Calamagrostis*, China, *Deyeuxia*, Himalaya, Poaceae.

The genera *Agrostis* L., *Calamagrostis* Adanson, and *Deyeuxia* Clarion ex P. Beauvois form an intergrading complex of three incompletely separated entities. Treatments of this complex vary considerably, even in recent works, so it has been necessary to carefully consider the options for the treatment for the *Flora of China*.

*Agrostis* has always been maintained separately, while *Calamagrostis* and *Deyeuxia* are either maintained separately or *Deyeuxia* is sunk into *Calamagrostis*. *Calamagrostis* and *Deyeuxia* are kept separate by S. L. Lu (1987) in *Flora Reipublicae Popularis Sinicae*, but united by Koyama (1987) in his treatment of the Japanese flora. They are united by Tzvelev (1976) for the former Soviet Union, but kept separate by Bor (1960) for the Indian subcontinent and Veldkamp (1996) for Malesia. Simon (1993) kept them separate in Australia and also Rugolo de Agrasar (1978) in South America. There is no consistency within Chinese provincial Floras. For example, *Deyeuxia* was maintained in *Flora Qinghaiica* by Lu (1999), but sunk in *Flora Sichuanica* by J. L. Yang (1988).

Although *Agrostis* has always been maintained separately, the boundaries between *Agrostis* and both *Calamagrostis* and *Deyeuxia* are just as ill-defined as that between *Calamagrostis* and *Deyeuxia*. It therefore seems logical to us that either one large genus with sections is recognized, or else

three segregate genera, but not a halfway position of two genera. We prefer to recognize three genera to avoid an unwieldy conglomerate, while acknowledging that some species will cause problems. This also follows the treatment of the complex for China by Lu (1987), and avoids the need for many new combinations in *Calamagrostis*. Following this concept, most species of *Calamagrostis* sensu lato are referable to *Deyeuxia*. The genus *Calamagrostis* sensu stricto is confined to relatively few north temperate species.

The majority of species in the complex can be placed in one of the three genera without difficulty, according to the following key:

- 1a. Glumes clearly shorter than floret.
  - 2a. Lower glume up to 1/2 floret length, usually much shorter or vestigial; rachilla extension minute, glabrous . . . . . *Aniselytron*
  - 2b. Lower glume 1/2 floret length or more; rachilla extension distinct, penicillate . . . *Deyeuxia*
- 1b. Glumes equaling or longer than floret.
  - 3a. Spikelets usually less than 5 mm; callus glabrous or shortly hairy; lemma hyaline; rachilla extension often absent . . . . . *Agrostis*
  - 3b. Spikelets often more than 5 mm; callus bearded, hairs 1/3 as long as to longer than floret (if shorter, penicillate rachilla extension present); lemma membranous to firm; rachilla extension present or absent.
    - 4a. Lemma at least 3/4 as long as glumes, usually firm; callus hairs almost as long as to clearly shorter than floret; rachilla extension present, penicillate . . . *Deyeuxia*
    - 4b. Lemma 1/2–2/3 as long as glumes, membranous; callus hairs often much exceeding floret; rachilla extension absent, or if present glabrous or shortly hairy . . . . . *Calamagrostis*

There are a number of troublesome intermediates, and it must be stressed that no character combinations provide a definitive way for assigning all the species in this group. Two such problematical species, *Deyeuxia petelotii* (Hitchcock) S. M. Phillips & W. L. Chen and *D. abnormis* J. D. Hooker,

which we have had to consider for the *Flora of China* account, are discussed below. They lie on the boundary between *Agrostis* and *Deyeuxia*, with an open panicle of small spikelets as in *Agrostis*, but a bearded callus and penicillate rachilla extension as in *Deyeuxia*. Two other species are transferred here from *Calamagrostis* to *Deyeuxia*.

A few intermediate and outlying species from this complex have been described in two other genera, *Aniselytron* Merrill and *Aulacolepis* Hackel. The small Asian genus *Aniselytron* was revised by Korthof and Veldkamp (1984 [1985]), and is discussed below under *D. petelotii*. *Aulacolepis* Hackel (1907) is illegitimate, as it is a later homonym of *Aulacolepis* Etingshausen (1893). Under our generic concept, its species are divided between *Aniselytron* and *Deyeuxia*.

***Deyeuxia petelotii*** (Hitchcock) S. M. Phillips & W. L. Chen, comb. nov. Basionym: *Aulacolepis petelotii* Hitchcock, J. Wash. Acad. Sci. 24: 291. 1934, gen. illegit. *Aniselytron petelotii* (Hitchcock) Soják, Cas. Nar. Muz. Praze, Rada Prir. 148: 202. 1979 [1980]. *Neoaulacolepis petelotii* (Hitchcock) Rauschert, Taxon 31: 561. 1982. *Agrostis petelotii* (Hitchcock) Noltie, Edinburgh J. Bot. 56: 386. 1999. *Calamagrostis petelotii* (Hitchcock) Govaerts, World Checkl. Seed Pl. 3: 11. 1999. TYPE: Vietnam. Tonkin: near Chapu, ca. 1900 m, Aug. 1933, A. Pételot 4743 (holotype, US; isotype, P).

*Agrostis continentalis* Handel-Mazzetti, Symb. Sin. 7: 1297, t. 40 f. 2. 1936. Syn. nov. *Deyeuxia continentalis* (Handel-Mazzetti) L. Liou, Vasc. Pl. Hengduan Mountains 2: 2240. 1994. TYPE: China. Yunnan: between Yuanmou and Hailo, 1050–1350 m, 10 Oct. 1914, H. Handel-Mazzetti 5018 (holotype, W).

*Anisachne gracilis* Keng, J. Wash. Acad. Sci. 48: 117. 1958. *Aniselytron gracilis* (Keng) N. X. Zhao, J. Trop. & Subtrop. Bot. 3(2): 50. 1995. TYPE: China. Guizhou: Pichieh, 1400 m, 1 June 1943, Hou Hsueh-yuh 2143 (holotype, N not seen).

*Anisachne gracilis* var. *multinodis* Y. Y. Qian, Bull. Bot. Res., Harbin 18: 398. 1998. TYPE: China. Yunnan: Lancang, 1900 m, 24 Nov. 1993, Qian Yi-yong 3154 (holotype, HITBC; isotypes, NEFU, SMAO none seen).

*Distribution.* Northeastern India, Bhutan, China (Guizhou, Yunnan), North Vietnam.

*Deyeuxia petelotii* appears to be widespread from northeastern India through southern China to northern Vietnam, at elevations of 1000–3400 m. It has been described as new several times within this area, and its anomalous generic position can be seen from the synonymy above. We agree with L. Liou (1994) that it is best placed in *Deyeuxia* because of its bearded callus and penicillate rachilla

extension. The description of the rachilla as naked in Hitchcock's (1934) protologue is a mistake. The tip is bare, but there are long hairs on its lower half. Liou made the transfer based on *Agrostis continentalis* Handel-Mazzetti, a name that has hitherto been missed by authors outside China. However, this is predated by *Aulacolepis petelotii* Hitchcock from Vietnam.

In *Deyeuxia petelotii* the lemma usually slightly exceeds the glumes, or at least the lower glume, as depicted in the figure accompanying the protologue of *Anisachne gracilis* Keng (1958: 118). A paratype specimen, Liu Tchen-ngo 21012 (PE), has been seen. Keng (1958) described his new genus *Anisachne* on the basis of the glumes being a little shorter than the lemma. He acknowledged that otherwise he would refer it to *Deyeuxia*. Although the glumes are usually longer than the lemma in *Deyeuxia*, shorter glumes are also seen in a few species from Australia and New Guinea. Vickery (1940) and Simon (1993) both placed these short-glumed Australian species in *Deyeuxia*. A further complication is that spikelets affected by nematode infection may have abnormally elongated lemmas, as noted by Noltie (2000: 600) and seen by the second author in *D. holciformis* (Jaubert & Spach) Bor and *D. scabrescens* Grisebach in southwestern China.

These slightly short-glumed species of *Deyeuxia* should not be equated with the situation in the small genus *Aniselytron*, where the glumes are both very much shorter than the floret, with the lower glume sometimes vestigial. *Aniselytron* is further distinguished by its short glabrous rachilla extension. We agree with the concept of *Aniselytron* as set out by Korthof and Veldkamp (1984 [1985]), comprising two species, *A. treutleri* (O. Kuntze) Soják and *A. agrostoides* Merrill, both of which occur in China. *Aniselytron* is placed in synonymy under *Calamagrostis* by Clayton and Renvoize (1986: 135), and this treatment is followed by Noltie (2000: 617), although in a note he implicitly agreed with Korthof and Veldkamp that *Aniselytron* merits separate generic status.

It has not been possible to see the type of *Anisachne gracilis* var. *multinodis* Y. Y. Qian. The figure in the protologue shows the floret longer than the glumes, as in *D. petelotii*, but the habit is more typical of *D. abnormis*.

***Deyeuxia abnormis*** J. D. Hooker, Fl. Brit. India 7: 268. 1897 [1896]. *Calamagrostis abnormis* (J. D. Hooker) U. Shukla, Grasses N.-East. India: 45. 1996. TYPE: India. Khasia, Nonkreem, Oct. 1850, J. D. Hooker & T. Thomson s.n. (lectotype, designated by Noltie (1999: 386, *Agrostis* 12, right-hand specimen "B"), K).

*Agrostis nagensis* Bor, Kew Bull. 9: 497. 1954. *Deyeuxia nagensis* (Bor) Veldkamp, J. Econ. Tax. Bot. 13: 74. 1989. TYPE: NE India. Nagaland, Japvo, 28 Sep. 1935, N. L. Bor 6449 (holotype, K).

**Distribution.** Northeastern India, Bhutan, China (Yunnan).

*Deyeuxia abnormis* is very similar to *D. petelotii*, as recognized by Keng when describing *Anisachne*. The two have often been confused, especially in northeastern India where both may grow together. The confusion dates back to Hooker (1896: 268), although it seems likely that he did distinguish them in the field as he assigned two species numbers, *Agrostis* nos. 11 & 12 (these are not collection numbers). All elements of the protologue of *D. abnormis* at Kew, except two of the three sheets of Hooker & Thomson *Agrostis* 12, are indeed *D. abnormis*. Two of the sheets of *Agrostis* 12 are *Agrostis petelotii*, and the third is a mixture of both species, with the right-hand specimen "B" being *D. abnormis*. Noltie (1999: 386) lectotypified *D. abnormis* on this right-hand specimen "B" of the mixed sheet, correcting a previous wrong lectotypification by Bor. Bor (1960: 392) recognized only one species, *D. abnormis* (under the name *Agrostis zenkeri*, see below). However, close inspection clearly reveals that two species are involved. Their distinguishing features have been set out by Noltie (1999: 387), and the main points are summarized below:

Spikelets 1.9–2.5(–3) mm; glumes slightly shorter than floret; callus hairs < 1 mm, not visible between glumes; leaf sheaths smooth . . . *D. petelotii*  
Spikelets 2.5–3.5 mm; glumes equaling or longer than floret; callus hairs 1.2–2 mm, visible between glumes; leaf sheaths scabrous . . . . . *D. abnormis*

The name *Deyeuxia abnormis* has frequently been treated as a synonym of *Agrostis zenkeri* Trinius (1841). Veldkamp transferred *A. zenkeri* to *Deyeuxia* as *A. zenkeri* (Trinius) Veldkamp (1985), and Davidse placed it in *Calamagrostis* as *C. zenkeri* (Trinius) Davidse (1994). However, we regard this as a different, little-known species, probably from southern India.

The type of *Agrostis zenkeri* (holotype, LE) consists of a single flowering culm without basal parts. There is a photograph of the type at Kew and a full description by Veldkamp (Korthof & Veldkamp, 1984 [1985]: 219). As pointed out by Noltie (1999: 384), much has already been written about the correct identity of this taxon, but it is necessary to add a further note here. Veldkamp was unable to equate it with any species known to him, following J. D. Hooker (1896: 258) who many years earlier listed it as a doubtful species.

Bor (1954, 1960) thought the type specimen of *Agrostis zenkeri* represented the same species as specimens from northeastern India described as *Deyeuxia abnormis* by Hooker. This view has been generally followed and was accepted by Noltie (1999, 2000). However, we find that the type of *A. zenkeri* differs from material of *D. abnormis* in several important respects as follows:

Palea 2/3 as long as lemma; anthers ca. 0.8 mm;  
callus hairs 1.2–1.8 mm . . . . . *Deyeuxia abnormis*  
Palea as long as or slightly longer than lemma;  
anthers ca 1.2 mm; callus hairs ca. 1 mm . . . . .  
. . . . . *Agrostis zenkeri*

Therefore, we disagree with Bor and Noltie that *Deyeuxia abnormis* should be treated as a synonym of *A. zenkeri*, but instead agree with Veldkamp that *A. zenkeri* is a species of uncertain application.

There has been much discussion about the provenance of the type of *Agrostis zenkeri*. The type specimen at LE quite clearly bears a label stating that it comes from the Nilgiris in southern India, and Bor (1954) argued convincingly that it was collected by Bernard Schmid and then sent to Zenker. As no further material of this species has been collected from the area, it has been supposed that a mix-up of labels might have occurred (Bor, 1954; Noltie, 1999). However, there is no real evidence for this. Bor also erroneously described the lemma of *A. zenkeri* as 3-nerved; in fact, it is 5-nerved as correctly observed by Hooker (1896: 258). Both *A. zenkeri* and *D. abnormis* have 5-nerved lemmas.

The protologue description of *Calamagrostis srilankensis* Davidse (1994: 107) from montane grassland in Sri Lanka agrees quite well with the description of the type of *Agrostis zenkeri* by Veldkamp. In this species the lemma midnerve is variable, sometimes extending nearly to the lemma tip (as in *A. zenkeri*) and sometimes excurrent from near the base. It has been transferred to *Deyeuxia* by Veldkamp (1996: 410). Unfortunately, there is no isotype specimen of *C. srilankensis* at Kew, although it is said to be present in the protologue. We are not pursuing this further as it is not a Chinese problem, but it seems likely that the type of *A. zenkeri* was indeed collected in southern India, and may even be conspecific with *D. srilankensis*.

***Deyeuxia sichuanensis*** (J. L. Yang) S. M. Phillips & W. L. Chen, comb. nov. Basionym: *Calamagrostis sichuanensis* J. L. Yang, Acta Bot. Yunnan. 5: 47. 1983. TYPE: China. Sichuan: Wenchuan, Wolong, 2850 m, J. L. Yang 8221 (holotype, SAUT not seen; isotypes, CDBI not seen, PE).

*Distribution.* China (Gansu, Sichuan).

*Deyeuxia sichuanensis* has the scabrous lemma, callus hairs only half as long as the lemma, and penicillate rachilla extension of a typical *Deyeuxia*, as nicely shown in the illustration accompanying the protologue (1983: 48). It is similar to *D. nepalensis* Bor, but can be distinguished as follows:

Lemma awned from near middle; awn ca. 1.2 mm, included in spikelet; anthers ca. 1 mm . . . . .  
. . . . . *D. sichuanensis*  
Lemma awned from near apex; awn 3–6 mm, exserted from spikelet; anthers ca. 2 mm . . . . . *D. nepalensis*

***Deyeuxia korotkyi*** (Litvinov) S. M. Phillips & W. L. Chen, comb. nov. Basionym: *Calamagrostis korotkyi* Litvinov, Schedae Herb. Fl. Ross. 55: no. 2750. 1918. TYPE: *Korotky H.F.R. 2750* (holotype, LE not seen).

*Calamagrostis turczaninowii* Litvinov, Not. Syst. Herb. Hort. Petrop. 2: 115. 1921. *Calamagrostis korotkyi* subsp. *turczaninowii* (Litvinov) Tzvelev, Zlaki SSSR: 304. 1976. *Deyeuxia turczaninowii* (Litvinov) Y. L. Chang ex S. L. Lu, Fl. Reipubl. Popularis Sin. 9(3): 205. 1987. TYPE: Russia. Zabaikal district, 6 Aug. 1909, *I. Blagoveshchenskii* & *G. Poplavskya 1472* (lectotype, designated by Tzvelev (1976: 304), LE not seen).

*Distribution.* Mongolia, Russia (E Siberia), China (N Heilongjiang, N Nei Mongol, NW Xinjiang).

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