

## The *Anthoxanthum horsfieldii*, *A. formosanum*, and *A. japonicum* Complex (Gramineae) in E. Asia

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東アジアのタカネコウボウ類（イネ科）の分類

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*Anthoxanthum japonicum* (Maxim.) Hack. ex Matsumura var. *japonicum*, *A. formosanum* Honda, and *A. viridescens* Honda are distinct varieties of *A. horsfieldii* (Kunth ex Bennett) Mez (Gramineae). The necessary new combinations are proposed.

*Anthoxanthum japonicum* (Maxim.) Hack. ex Matsumura (Gramineae) generally has been regarded as an endemic species of Honshu, Japan, with a variety *sikokianum* (Ohwi) Ohwi in Shikoku and Yakushima (Ohwi 1965). Similarly, *A. formosanum* Honda (incl. *A. viridescens* Honda) from Taiwan has been considered as distinct (Hsu 1978). Recently T. Koyama (1987) has united var. *sikokianum* and *A. formosanum* with *A. luzoniense* Merr. from Luzon, the Philippines, and called this *A. japonicum* ssp. *luzoniense* (Merr.) T. Koyama. His use of the subspecific level is not so much an indication of taxonomic difference as well as a denial of any other infra-specific rank (see also Veldkamp 1989). As there were no names available at the subspecific level, Koyama was entitled to use what he pleased, at the varietal level, however, '*sikokianum*' would have had to be used for the taxon in Koyama's circumscription. This paper is the result of a subsequent study of the

taxonomy and nomenclature of the taxa involved.

In 1985 Ms. Y. Schouten and I have revised *Anthoxanthum* for the Malaysian area, and we concluded that *A. luzoniense* had to be regarded as a variety of *A. horsfieldii* (Kunth ex Bennett) Mez. This is a very polymorphic species, in fact uniting *Anthoxanthum* with *Hierochloë* R. Br. It occurs with at least 10 varieties in the Malaysian area, Thailand, Khasia and Burma [*A. clarkei* (Hook. f.) Ohwi], and as far West as the Pulneys in South India (*A. borii* Pal et Jain). In the various areas the representatives are rather uniform and each can be distinguished from the others, be it that in some instances the differences are only minute. To avoid an unwieldy hierarchy and nomenclature which would hardly aid a better understanding of the complex it was decided to regard them all as varieties.

At the time we did not study *A. japonicum* as we were unaware that it would be so closely related as is

now reported by Koyama, while no material of *A. formosanum* s.l. was available to us. After Koyama's paper material was received from the Yu-shan National Park Headquarters Herbarium, Taiwan ('Y-S'), while others were asked on loan from K, TAI, TI, and TNS. From these it turned out that Koyama was quite right in merging the three taxa, but his synonymy goes too far, for four distinct varieties appear to be involved. For reasons of priority *A. horsfieldii* remains the correct name for the species.

*Anthoxanthum formosanum* was described by Honda (1926), who one year later (1927) also distinguished *A. viridescens*. Ohwi (1941) united them without comment, in which he was followed by Hsu (1971, 1975, both by implication, and 1978). In fact, from the specimens seen it really appears that two taxa are involved, which differ in sufficient characters to keep them distinct. Geographically they appear to be largely sympatric, but may well differ in their habitat. Data are very scant because of the parsimonious field labels of the collectors.

A. Uppermost ligules 2.5–3.5 mm high. Blades (loosely) involute, 5.5–13 cm by 2–2.5 mm. Panicles 2.5–7 cm long, the longest lowermost branch 0.8–2.2 cm long, 1–7-spikeled. Spikelets 4.75–5.5 mm long. First lemmas 4.4–4.75 mm long, awn 0.8–1.5 mm long; second lemmas 4.25–4.5 mm long, awn 4.5–5.5 mm long; third lemmas 2.5–2.75 mm long. .... var. *formosanum*

A. Uppermost ligules 4–7 mm high. Blades flat or margins inrolled, 8.5–30 cm by 2.75–9.5 mm. Panicles 7–17 cm long, the longest lowermost branch 3–4.5 cm long, 9–17-spikeled. Spikelets 5.25–7.75 mm long. First lemmas 5–6 mm long, awn 1.5–2.75 mm long; second lemmas 4.5–6.35 mm long, awn 5–6.25 mm long; third lemmas 2.75–3.5 mm long. .... var. *viridescens*

Some new combinations are therefore required. For a better understanding descriptions have been added, which are based on material seen, only, and not

on descriptions, which appear to be misleading if not erroneous. The taxa may therefore be more variable.

The curators of the Yu-shan National Park Headquarters Herbarium, Taiwan ('Y-S'), K, TAI, TNS, and TI are gratefully acknowledged for sending material on loan.

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## TAXONOMY

*Anthoxanthum horsfieldii* (Kunth ex Bennett) Mez var. **luzoniense** Y. Schouten.

*A. horsfieldii* (Kunth ex Bennett) Mez var. *luzoniense* Y. Schouten in Y. Schouten & Veldk., *Blumea* **30** (1985) 337. — *A. luzoniense* Merr., *Philip. J. Sc.* **1** (1906) Suppl. 178. — *A. japonicum* (Maxim.) Matsumura ssp. *luzoniense* (Merr.) T. Koyama, *Grasses Japan* (1987) 223, 486. — Type: Merrill 4713 (PNH, lost, K, US).

Perennials. Culms up to 85 cm long, simple. Sheaths tight, sheaths sparsely puberulous upward, glabrescent, smooth to scaberulous. Ligule collar-shaped, the basal shortest, 1.1–6 mm high. Blades flaccid, flat to loosely involute, 5–12.5 cm by 4.5–9 mm, puberulous above, glabrous and slightly scaberulous beneath, margins sparsely pilose. Panicles contracted, erect, 5–12.5 cm long, branches and pedicels glabrous. Basal branches (1 or) 2 together, the longest one up to 6 cm long, naked in the lower 0.15–0.4th, 5–14-spikeled. Spikelets 5.9–6.7 by 1.5–3.2 mm. Glumes ovate, glabrous; lower glumes (3.2–)3.9–5.2 by 2.2–2.6 mm, 0.67–0.8(–0.85) times as long as the upper one, acute, (1–)3-nerved at least at base; upper glumes (4.8–) 5.6–6.6 mm long, acuminate. Lower two florets epaleate, sterile. First rachilla nodes 0.3(–0.5) mm long, second ones straight, 0.15–0.25(–0.3) mm long.

Lemmas oblong; first lemmas (3.4–)4.5–5.2 mm long, (0.5 mm shorter to) 0.2–0.5(–1.1) mm longer than the lower glume, awn inserted at 0.6–0.7(–0.75)th, 1.1–2.6 mm long; second lemmas (3.2–)4.1–4.7 mm long, awn inserted at 0.3–0.4th, 5–6.8 mm long, column stout, dark, 2.1–3 mm long, subule 2.8–3.8 mm long; third lemmas ovate-oblong, 2.2–3 mm long, 0.6–0.67(–0.85) times as long as the lower glume, 0.4–0.5(–0.55) times as long as the upper one, 0.55–0.65 times as long as the first lemma, 0.6–0.75 times as long as the second lemma; smooth, glabrous, mucro rarely present. Anthers 1.6–2.5 mm long.  $2n = ?$

Distribution. Philippines: Luzon (Pulog).

Habitat. Open grasslands, forest edges, 2000–2800 m alt.

Specimens seen. BS 8890 (McGregor) (K, L, NY); Jacobs 7204 (L); 7253 (K, L); Merrill 6614 (NY).

***Anthoxanthum horsfieldii*** (Kunth ex Bennett) Mez var. ***formosanum*** (Honda) Veldk., comb. nov.

*Anthoxanthum formosanum* Honda, Bot. Mag. Tokyo **40** (1926) 318. — Type: Faurie 232 (TI, holo, P).

*Anthoxanthum japonicum* (Maxim.) Hack. ex Matsumura ssp. *luzoniense* auct. non T. Koyama, Gr. Japan & Neighb. regions (1987) 223, 486, p.p.

Perennials. Culms 10–60 cm long, simple. Sheaths fairly loose, sheaths glabrous to sparsely pilose, smooth. Ligule collar-shaped, the basal shortest, 0.25–3.5 mm high. Blades stiff, (loosely) involute (see note), (4.5–)5.5–13 cm by (1.5–)2–2.5(–4.5) mm, glabrous to pilose above, glabrous beneath, margins glabrous to sparsely pilose. Panicles contracted, erect, 2.5–7 cm long, branches glabrous, pedicels usually sparsely spiculate, basal branches 1–3 together, the longest one 0.8–2.2 cm long, naked in the lower 0.2–0.5th, 1–7-spikeled. Spikelets (4.25–)4.75–5.5 by 1.75–2.75 mm. Glumes ovate, glabrous, suffused with purple; lower glumes (3–)3.35–4 by 1.8–2.3 mm, 0.64–0.76 times as long as the upper one, acute, 1-nerved; upper glumes (4.25–)4.75–5.25 mm long,

broadly cuneate to acuminate, 3(–5)-nerved. Lower two florets epaleate, sterile. First rachilla nodes 0.2–0.25 mm long, second ones crooked, 0.25–0.4 mm long. Lemmas oblong; first lemmas (3.9–)4.4–4.75 mm long, 0.5–1.5 mm longer than the lower glume, awn inserted at (0.6–)0.67–0.77th, 0.85–1.5 mm long; second lemmas (3.75–)4.25–4.5 mm long, awn exerted, inserted at 0.28–0.35(–0.53)th, (3–)4.5–5.5 mm long, column slender to stout, pale to dark, (1.25–)1.5–2.75 mm long, subule (1.75–)2.5–3.25 mm long; third lemmas ovate-oblong, 2.5–2.75 mm long, 0.65–0.83 times as long as the lower glume, 0.48–0.55(–0.63) times as long as the upper glume, 0.5–0.64 times as long as the first lemma, 0.56–0.67 times as long as the second lemma; smooth, glabrous. Anthers c. 1.5 mm long (once seen).  $2n = ?$

Distribution. Taiwan: Hsinchu: Taipinshan; Ilan: Nanhutshan (Pianan-ambu); Chiayi: Alisan.

Habitat. Not recorded, the type at 2500 m.

Note. The type has both the smallest and largest spikelets observed. S. Sasaki 10/28 differs by having flat leaves.

Of the varieties considered here var. *formosanum* is most distinct from var. *luzoniense*, which differs by the uppermost ligules 2–6 mm long; blades loosely involute to flat, 10–32 cm by 4.5–9 mm; spikelets 5.9–6.7 mm long; lower glumes 3.9–5.2 by 2.2–2.6 mm, 0.67–0.8 times as long as the upper one, usually 3-nerved at base; first lemmas shorter than to 0.5 mm longer than the lower glumes.

Specimens seen. Faurie 232 (TI), S. Sasaki 10/28 (TAI), S. Suzuki 4 (TI), 5064 (TI), 5065 (TI).

***Anthoxanthum horsfieldii*** var. ***viridescens*** (Honda) Veldk., comb. nov.

*Anthoxanthum viridescens* Honda, Bot. Mag. Tokyo **41** (1927) 379. — Lectotype: Matsuda ('Matuda') Gram. 14 (TI, holo).

*Anthoxanthum formosanum* auct., non Honda: Ohwi, J. Jap. Bot. **17** (1941) 493, p.p.; Hsu, Taiwan Gr. (1975) 253, p.p., t. 21; Hsu, Fl. Taiwan **5** (1978)

405, p.p., t. 1378.

*Anthoxanthum japonicum* (Maxim.) Hack. ex Matsumura subsp. *luzoniense* auct. non T. Koyama, Gr. Japan & Neighb. regions (1987) 223, 486, p.p. Perennials. Culms 32–100+ cm long, simple. Sheaths loose, sparsely pilose to glabrous, smooth. Ligule collar-shaped, the longer lacerate, the basal shortest, 0.5–7 mm high. Blades stiff, flat or margins inrolled, 8.5–30 cm by 2.75–9.5 mm, glabrous to pilose above, glabrous beneath, margins glabrous to sparsely pilose. Panicles contracted, erect, 7–17 cm long, branches glabrous, pedicels glabrous to sparsely spiculate, basal branches 1–3 together, the longest one 3–4.5 cm long, naked in the lower 0.28–0.42th, 9–17-spikeled. Spikelets 5.25–7.75 by 1.75–3 mm. Glumes ovate, glabrous, straw-coloured to purple-suffused; lower glumes 3.5–5.25 by 1.8–2.6 mm, 0.61–0.81 times as long as the upper one, acuminate to shortly mucronate, 1-nerved; upper glumes 5.5–7.5 mm long, broadly cuneate to acuminate, 3(–5)-nerved. Lower two florets epaleate, sterile. First rachilla nodes 0.25–0.35 mm long, second ones crooked, 0.5–0.75 mm long. Lemmas oblong; first lemmas (4.5–)5–6 mm long, 0.5–2 mm longer than the lower glume, awn inserted at 0.46–0.71th, (1.3–)1.5–2.75 mm long; second lemmas (4.35–)4.5–6.35 mm long, awn exerted, inserted at 0.25–0.38th, (4.5–)5–6.25 mm long, column stout, dark, 2–2.5 mm long, subule 2.75–4.1 mm long; third lemmas ovate-oblong, 2.75–3.5 mm long, 0.62–0.79 times as long as the lower glume, 0.43–0.52 times as long as the upper glume, 0.52–0.63 times as long as the first lemma, 0.53–0.67 times as long as the second lemma; smooth, glabrous. Anthers 1.9–2.6 mm long.  $2n = ?$

Distribution. Taiwan: Miaoli: Hsuehshan; Nantou: Hohuanshan, Nengkaoshan ('Nokozan'); Hualien: Ch'ilaichushan; Chiayi: Yushan (Morrison), fide Hsu (1978, t. 1378).

Habitat. Grasslands, sunny rocky areas, under pine trees, once recorded at 3300 m alt.

Note. Var. *luzoniense* differs by lower glumes usually 3-nerved at base; second rachilla node straight, 0.15–0.25 mm long; first lemmas 4.5–5.2 mm long, shorter than to 0.5 mm longer than the lower glumes; second lemmas 4.1–4.7 mm long.

Specimens seen. Chen 15366 (L, 'Y-S'), 15963 (L, 'Y-S'); Huang and Hsieh 7199 (TAI); Matsuda ('Matuda') Gram. 14 (TI), 28 (TI), S. Sasaki 24/8/1929 (TAI).

Hsu 11144 and Suzuki 11/7/1935 probably belong here according to the plates in Hsu (1975) and (1978), respectively.

***Anthoxanthum horsfieldii*** (Kunth ex Bennett) Mez var. ***japonicum*** (Maxim.) Veldk., comb. nov.

*Hierochloë japonica* Maxim., Mel. Biol. **12** (1886) 929. — *Anthoxanthum japonicum* Hack. ex Matsumura, Bot. Mag. Tokyo **11** (1897) 443; Tateoka, Bull. Nat. Sc. Mus. Tokyo B, **13** (1987) 123. — *Anthoxanthum japonicum* Matsumura subsp. *japonicum*: T. Koyama, Gr. Japan & Neighb. regions (1987) 223, 486. — Type: R. Yatabe AO 1881 (LE, holo).

*Anthoxanthum japonicum* var. *cryptatherum* Honda, Bot. Mag. Tokyo **51** (1937) 56. — *Anthoxanthum japonicum* forma *cryptatherum* Ohwi, J. Jap. Bot. **17** (1941) 492. — Type: K. Hiyama 69 (TI, holo).

*Anthoxanthum japonicum* var. *villicaule* Honda, Bot. Mag. Tokyo **51** (1937) 56. — *Anthoxanthum japonicum* forma *villicaule* Ohwi, J. Jap. Bot. **17** (1941) 492. — Type: K. Hiyama 68 (TI, holo).

*Anthoxanthum sikokianum* Ohwi, J. Jap. Bot. **17** (1941) 493. — *Anthoxanthum japonicum* (Maxim.) Hack. ex Matsumura var. *sikokianum* (Ohwi) Ohwi J. Jap. Bot. **17** (1941) 493, nom. inval., Art. 34.1.c, Fl. Jap. (1965) 152, invalid, Art. 33.2 (see note). — Type: Z. Tashiro s.n. (KYO, holo).

Perennials. Culms (30–)50–105 cm long, simple or few-branched at base. Sheaths usually tight, sometimes loose, glabrous to sparsely pilose, smooth.

Ligule collar-shaped, the basal shortest, 0.75–5.5 mm high, sometimes pilose outside ('villicaule'). Blades flaccid to somewhat stiff, usually flat, 7.5–25.5 cm by 3–10 mm, sparsely to densely pilose above, glabrous to sparsely pilose beneath, smooth, margins glabrous to pilose. Panicles loosely contracted, erect, (4.5–)7–13 cm long, branches glabrous, rarely up to moderately pilose, usually with some spicules on the pedicel, basal branches 1 or 2 together, the longest one (1.4–)2.5–6 cm long, naked in the lower 0.2–0.64th, (3–)5–17-spikeled. Spikelets (4.5–)5–7.5 by 1.5–3 mm. Glumes ovate to elliptic, glabrous; lower glumes 2.85–5 mm by 1.4–2 mm, 0.55–0.78 times as long as the upper one, obtuse to acute, 1–3-nerved; upper glumes 4.5–7.4 mm long, 3-nerved, broadly cuneate to acuminate. Lower two florets epaleate, sterile. First rachilla joint c. 0.25 mm long, the second ones straight, (0.35–)0.5–2 mm long. Lemmas oblong; first lemmas 3.5–5.25 mm long, 0.5–1.75 mm longer than the lower glume, awn inserted at 0.49–0.74th, 0.75–1.75 mm long, not exserted; second lemmas (3–)3.25–5.5 mm long, awn exserted at least in fruit (see note sub 'cryptatherum'), inserted at 0.25–0.47th, 2.5–5.8 mm long, column usually weak and pale, not or slightly twisted, 0.6–2.5 mm long, often hardly distinct from the 1.9–3.75 mm long subule; third lemmas ovate-oblong, (2.5–)2.75–3.25 mm long, 0.6–0.95 times as long as the lower glume, 0.44–0.82 times as long as the upper one, 0.57–0.75 times as long as the first lemma, 0.52–0.92 times as long as the second lemma; smooth, glabrous. Anthers 1.5–2.65 mm long.  $2n = 70$ .

Distribution. Japan: Honshu, Shikoku, Yakushima (see map in Tateoka 1987).

Habitat. Possibly indicated in the Japanese labels I cannot read; forest margins, alpine herbages, 1300–2660 m alt.

Notes. At the varietal level the epithet '*japonicum*' is to be used due to the rules on autonyms. It was established automatically, even when not mentioned

(Art. 26.2, 32.6), when the varieties '*cryptatherum*' and '*villicaule*' were described by Honda (1937), and has priority over these when merged (Art. 57.3).

The combination *Anthoxanthum japonicum* var. *sikokianum* Ohwi was not validly published in 1941, because Ohwi cited it in synonymy under *A. sikokianum*; it may have been validated elsewhere, e.g. in Ohwi's Flora of Japan (1953) 103 (n.v.) Koyama (1987) p. 486, but not by Ohwi in the English edition of the Flora of Japan (1965) 152, as the full and direct reference to the basionym is lacking. As the combination here is regarded as a synonym of var. *japonicum* and not of var. *luzoniense*, as was suggested by Koyama, it seemed irrelevant to spend too much time on the problem.

Variety '*villicaule*' was said to differ by pubescent sheaths and ligules. The expression of pubescence is a variable and specimens with densely barbate nodes, ligules, and blades seem to represent one end of the scale. Such plants seem to grow mingled with the typical form, e.g. H. Tobita collected both on the same day on Mt. Yatsugatake, Nagano Pref.

Variety '*cryptatherum*' would have short, enclosed awns on the second lemma. It was described on two specimens, the type from Honshu and the paratype from Shikoku. Ohwi (1941) said that the latter probably would belong to var. *sikokianum*. I agree with his remark that during anthesis the awns may still be small and enclosed within the glumes, while during maturation the sterile lemmas gradually enlarge whereby the awn of the second lemma becomes exserted, more robust, dark, and twisted. The '*villicaule*' specimen of Tobita also has enclosed awns, so might be attributed to '*cryptatherum*' as well. It seems to me that both have no standing.

Variety '*sikokianum*' would be the form found in Shikoku and Yakushima, differing by loosely involute blades, a denser panicle, the upper glumes oblong-ovate, abruptly acuminate. I have not seen the type, but other specimens from Shikoku do not differ

in any respect from those of Honshu. The original description mentions the presence of hairs on the inflorescence branches; these do occasionally occur in Shikoku, and in Honshu specimens as well. Tateoka (1987) having seen Shikoku and Yakushima material places them in *A. japonicum*. The chromosome number is  $2n = 70$  here, too.

This variety is of the three the least distinct from var. *luzoniense*, which differs especially by the 2.2–2.6 mm wide lower glumes, usually 3-nerved at base; second rachilla nodes 0.15–0.25 mm long; first lemmas shorter than up to 0.5 mm longer than the lower glumes.

Specimens seen: Abe 8a (TI); 8b (TI); Hiyama 68 (TI); 69 (TI); Ito 5/8/1936 (TI); Karizumi 10/10/1954 (TNS); Kimura 39 (TNS); Mizushima 18/7/1950 (TI); 9/7/1951 (K, TI); 15/10/1953 (TI); Nakai 5/8/1931 (TI); Takatou 230 (TNS); Takeda 24/8/1904 (K); 28/8/1906 (K); Tateoka 16535 (L); H. Tobita 30/7/1937 (2x, TI); Watanabe 28/8/1895 (K); Yamanaka 5/9/1966 (TNS); Yamazaki 10/8/1976 (TI).

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#### 要 旨

インド東部から東南アジアに広く分布する多型種である *Anthoxanthum horsfieldii* は各地で明瞭な型が認められ、これらは変種として扱われている。東アジアから記録されているタカネコウボウ、台湾ハルガヤ *A. formosanum* およびナガボハルガヤ *A. viridescens* も *A. horsfieldii* の変種として扱うことを提案した。新組合せとともに各変種を再記載した。