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AGROSTIS (GRAMINEAE) IN MALESIA AND TAIWAN

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SUMMARY

In Malesia and Taiwan there are 6 species of *Agrostis* Linné (Gramineae). *Agrostis rigidula* Steud. has 8 varieties, 5 in Malesia and 4 (incl. one Malesian) in Taiwan. *Agrostis clavata* Trin. is native in Taiwan and once found in New Guinea. *Agrostis gigantea* Roth must be called *A. stolonifera* Linné var. *ramosa* (S. F. Gray) Veldk. and is partly native, partly introduced in Malesia. *Agrostis hirta* Veldk. is a new species from New Guinea. New combinations for varieties are proposed in *A. rigidula* and the Indian *A. pilosula* Trin.

INTRODUCTION

Agrostis Linné (Gramineae) is a genus with many taxonomic problems. It is part of a group of closely allied genera and sometimes only arbitrarily distinguished from some of these; at the same time many of its species are difficult to delimitate. In the present treatment the generic definition as proposed by Vickery (1940) has been accepted for convenience, while many of the species formerly recognized for Malesia and Taiwan have been reduced to varieties of *A. rigidula* Steud. Two of these were originally described in *A. canina* Linné by Hackel and Stapf and I am not all too certain that *A. rigidula* can be distinguished from this in a satisfactory way. To answer that question, however, a revision of that perplexing complex must be made, which was of course quite beyond the intentions of this regional revision. With that uncertainity in mind I have here chosen to keep them distinct.

Linné originally described *Agrostis* in 1737 as having awned lemmas and well-developed paleas ('*Cor: bivalvis ... altera major aristata.*'), which diagnosis was maintained in his subsequent writings up to 1759, where the requirement of awns is deleted. From 1737 on, however, he had already admitted unawned species to *Agrostis*, as in the Flora Lapponica he described *Agrostis panicula inferne verticillatim laxa, superne contracta*, which became *A. rubra* in 1753. The exact identity of this species is uncertain; Widén (1971, p. 55) stated that its type is an unawned specimen of the *A. canina* group, while Tutin (1980, p. 406) refered the name to *A. vinealis* Schreb. (and to *A. mertensii* Trin., but Widén said already that this is incorrect); presumably it has therefore also a minute palea. The other species in the Flora Lapponica, *Agrostis panicula tenuissima*, was also unawned, as it was numbered among the 'Muticae' as *A. capillaris* in 1753; this one has a well-developed palea (see also f. 8 in Widén).

Linné's concept of the genus was vague, as he admitted himself: *Agrostis character difficilis est, sed quum reliqua genera sat bonos characteres habent, hujus generis esse gramen collegitur, in quo ille locum non habent* (Giseke, 1792). In 1753 the genus had

become a mixture of species which are presently referred to *Apera* Adans., *Deyeuxia* Beauv., *Mibora* Adans., *Oryzopsis* Michx., *Poa* Linné, and *Sporobolus* R. Br. Only four of the twelve then described are still in *Agrostis*, of which one, *A. rubra*, is of uncertain identity: *A. canina, A. capillaris*, and *A. stolonifera*.

The original circumscription was partly based on his own observations as is indicated by the asterisk, partly on species described and depicted by Scheuchzer (1719):

Gramen paniculatum, supinum, ad infima culmorum genicula, foliorum fasciculis donatum was in 1753 cited under *A. canina.*

Gramen caninum vineale was apparently never cited by Linné (cf. Richter, 1840) and is *A. vinealis.*

Gramen arundinaceum, panicula densa viridi-argentea, splendente, aristata was not cited in 1753; it appears as *Agrostis calamagrostis* in 1759, now known as *Achnatherum calamagrostis* (Linné) Beauv.

Gramen serotinum, arvense, panicula contracta, pyramidali is cited in 1753 under *A. rubra,* but in 1762 Linné removed it to the new species *Milium lendigerum*, which is *Gastridium ventricosum* (Gouan) Schinz & Thell.

In view of the above it will not be surprising that the selection of the type of *Agrostis* has been the subject of much discussion. Extensive remarks have been made by Hitchcock (1905, 1920), Philipson (1937), Widén (1971, p. 10) and further notes have been given by Björkman (1960, p. 17, 23), Kerguélen (1975, p. 58, 298), and the Index Nominum Genericorum 1 (1979) 42 ('ING'). Obviously everyone wants to retain the name in the current sense, so all species now transferred to other genera should be ruled out, while the implicit lectotypification by Adanson (1763) must be rejected.

Adanson retained only one species in *Agrostis, 'Gramen Scheuz. 57.'* The author is of course Scheuchzer, but on the page indicated we find *Imperata cylindrica* (Linné) Beauv. described, which does not fit Adanson's own description. More likely is that another mistake was made, the same as made by Linné in 1753, and perhaps caused by it, and the grass on p. 507 is intended. This is what Linné called *Agrostis arundinacea*, which is the type of *Deyeuxia* Beauv. If it is felt that Adanson should be followed in his choice, *Agrostis* must be conserved with a conserved type making *Agrostis* Adans. a later heterotypic homonym.

Beauvois (1812), although claiming that he took his concept also from Adanson, placed *A. arundinacea* in *Cinna* Linné, and of Linné's original species retained only the enigmatic *A. rubra*, referring the others to *Vilfa* Adans., *Agraulus* Beauv., and some others. As *A. rubra* cannot serve as the type Beauvois has therefore made a heterotypic homonym.

Agrostis capillaris has apparently never been considered as a candidate for typification, although it was one of the first species of *Agrostis* described by Linné. Possibly this is due to the fact that only recently the application of this name has become clear.

Agrostis alba has been selected by some, e.g. the ING, but the type of this name has turned out to be *Poa nemoralis*, as was pointed out by Bowden (1960) and Widén (1971, p. 100). It is in the Van Royen Herbarium in L sub no. *913.62–84*. The name has been used for what generally is called *A. gigantea* Roth now, or *A. stolonifera* by those, who like me do not think that the two can be distinguished. *Agrostis stolonifera* was therefore proposed as the type by Hitchcock (1920), tentatively followed by Kerguélen (1975).

Previous authors have included *A. alba, A. gigantea*, and *A. stolonifera* in sections which were highly suggestively named *'Eu-agrostis'* or *'Agrostiotypus'*. *Agrostis stolonifera*, however, is not among the species Linné referred to in Scheuchzer and it usually has no awn, wherefore Linné included it in his 'Muticae'.

The three authors who have more or less recently made thorough partial revisions of *Agrostis*, Philipson, Björkman, and Widén, have all choosen for *A. canina*. Although it has a minute palea, the lemma is awned and it is one of Scheuchzer's original species. I therefore tend to agree with this choice.

Following Vickery (1940) those species have been included here which have glumes thicker than the very thin lemma, usually no rachilla process, and no or few, short hairs on the callus. *Deyeuxia* would be different by having glumes thinner than the indurated lemmas, a hairy rachilla process, and a rather long-hairy callus. *Calamagrostis* has the callus hairs usually at least as long as the indurated lemmas and no rachilla process. There are of course intermediate forms. Some of these belong to a mainly South-temperate group of species with a glabrous or shortly hairy callus, thin lemmas, and a glabrous to hairy rachilla process. They have sometimes been included in *Lachnagrostis* Trin., but this genus has recently not been accepted and the species have been included in *Agrostis*. Conform to this general usage I have therefore included the lectotype of *Lachnagrostis*, *A. avenacea* Gmel., but a critical study might show that, if *Agrostis, Calamagrostis*, and *Deyeuxia* are to be accepted on such arbitrary grounds, *Lachnagrostis* can be distinguished just as well.

A number of infra-generic taxa has been proposed by several authors, but as Björkman (1960) already concluded none of these attempts is very satisfactory. He suggested that the division proposed by Rouy (1913) would be the best, but this deals with Western European species, only.

Great importance in the delimitation of taxa in *Agrostis* has been attributed to habit (rhizomes, stolons, lax or contracted panicles, etc.), absence or presence of an awn and its place of insertion on the lemma, the relative length of the palea, size of the anthers, etc.

The habit of a plant may give some clue to its identity. In Malesia and Taiwan rhizomes are hardly ever seen and then only as small ones; stolons are very rare, too. As a character in identification they are of no use at all here and elsewhere, for basal parts are often not collected. Thus *A. rubra* cannot be identified. As far as stolons go one needs, moreover, to have a well-developed specimen as stolons are only produced during a certain period of growth, as may for instance be observed in A. stolonifera in Europe.

The shape of the panicle can be useful, but it must be kept in mind that it will be contracted at first, may spread at anthesis (or not) and then remain so, but may also contract again during fruiting.

Awns have been considered a useful character to distinguish species, but unfortunately the expression and development of this structure is not as constant as one might wish: species generally muticous may have specimens where an awn is more or less to very well-developed, mixtures of awned and muticous spikelets sometimes even occurring within the same inflorescence (e.g. as in the type of *A. rigidula*, see note there). Likewise, awned species have the odd unawned specimen causing the distinction of infra-specific taxa as *'aristata'* or *'mutica'*, or the suggestion of hybridisation between awned and

muticous taxa. Infra-specific hybridisation has been reported from experiments, but in Malesia and Taiwan I have the impression that it does not occur, contrary to Jansen's (1953) suggestion. Although the awn offers a hazardous character it has generally been employed in keys, and so it is here, too. It seems advisable to check more than one spikelet when in doubt and to be not too much shocked when awns are found where they shouldn't occur, or are absent when they should be there. In reassurance it may be said that the character usually causes no real problem in the practice of identification.

Within certain limits the relative size of the palea is a useful character, but as can be seen in the *A. rigidula* complex this, too, may be variable within a species, or, if one prefers a narrow species concept, within a tightly knit reticulate alliance. From the experience obtained here it seems highly unlikely that it can be used as a character on a subgeneric or sectional level.

A curious correlation exists between the relative length of the palea and the development of an anatomical feature of the lemma (and sometimes also of the palea) called the '*Trichodium*-net'. The shorter the palea is the better in general this 'net' is developed as has been extensively discussed by Björkman and Widén. This 'net' is caused by the presence of transverse beams on the exterior walls of the dorsal epidermic cells. The lateral walls of these cells are strongly undulated and the beams connect the tips of the intrusive waves; they are therefore alternate in adjacent cells and form a fine network which can best be seen with a microscope by focussing up and down. Now, when the palea is less than a third as long as the lemma, this net is present in nearly all cases studied (Björkman, p. 34, f. 1); the longer the palea the fainter the net usually becomes, until it cannot be detected anymore. Although it is a very curious phenomenon, this gradual expression coupled to the relative length of the palea prohibits again its use as an infra-generic character; at least in *A. rigidula* it can only be used at an infra-specific level. This 'net' is apparently restricted to *Agrostis* and a few related genera. In *Keniochloa* Melderis (= *Colpodium* Trin.) and *Zingeria* Smirn. it is also present, but there caused by beams on the interior walls. Curiously enough the 'net' is also well-developed in the African species of *Agrostis* which have a long palea (and, by the way, a developed rachilla process), and *A. capillaris* Linné (formerly *A. vulgaris* With. or *A. tenuis* Sibth.). This suggests that the development of the net and the palea may be governed by two independent though closely linked centers and is not a polytopic expression of a single one.

All these considerations have led me to believe that it is not possible to distinguish species in the *A. rigidula*-complex in Malesia and Taiwan, but varieties only. As they differ in characters often employed to distinguish species by, at least in keys, it is not surprising to note that some of them key out to different species when they are compared with larger-scale treatments, e.g. for Europe (Widén, 1971, Tutin, 1980), Russia (Shishkin, 1934), India (Bor. 1960), and North America (Hitchcock & Chase, 1951). This suggests that either a very narrow species concept is used in this genus, or that the features would be more dependable elsewhere outside Malesia and Taiwan, which would be rather surprising.

The differences between the varities of *A. rigidula* are only small and especially the two most wide-spread ones, var. *remota* and var. *rigidula*, are the most variable and most difficult to distinguish. Jansen (1953) thought that the best character here was the smoothness against scabridity of the panicle branches. This works reasonably well for the

Javanese collections, but becomes more difficult outside that island. He also thought that the two were growing together and had many intermediates, probably of hybrid origin. In fact it turned out that the two are virtually non-overlapping. Intermediate specimens can therefore not be of a hybrid origin but show the unreliability of the features that supposedly distinguish the 'species'. In general practice one would call these two taxa subspecies merely because of their allopatry, but then immediately some problems arise about the other taxa to show the fallacy of this automatism.

The infra-specific, sympatric taxa of Mt. Kinabalu and Taiwan are morphologically somewhat more distinct from each other than 'subsp.' *rigidula* is from 'subsp.' *remota*. One would like to accord a higher rank to these sympatric ones therefore, but that is now impossible. Moreover, 'subsp' *rigidula* is sympatric with the Taiwanese forms, so the rule 'Allopatry = subspecies' becomes difficult to maintain.

Then, also, the relationship seems so reticulate that a hierarchy of subspecies and varieties cannot be built in a satisfying way. The only possibility is then to give all taxa the same rank.

The differences are so small that no more than a varietal rank seemed appropriate.

To keep the account balanced in its taxonomic evaluations I could not maintain *A. gigantea* Roth as a species distinct from *A. stolonifera* (see note there), as they differ even less from each other than the varieties of *A. rigidula*.

The Taiwan representatives of *Agrostis* were studied to see whether *A. rigidula* occurred on that island as well. The material seen has mainly come from KYO and L, so for a good revision more should really have been seen, especially that of TAI on which Hsu's (1978 and earlier) opinions are based. On the other hand KYO gave a good representation of all taxa involved and it seemed a waste of effort not to present the descriptions now that they were available. More specimens will probably cause slight alterations in variability but the delimitation of the taxa, I trust, will not be affected.

Two species, one of which new, have been accepted although they are known from single collections only, one of them even mixed: *A. clemensorum* Bor and *A. hirta* Veldk. The reasons for doing so will be explained under each, but in essence they have been included because no matching described species could be discovered.

Among the species compared for *A. hirta* was *A. pilosula* Trin. from India about which a few nomenclatoral remarks can be made here.

Steudel (1854) took up the taxon now called *A. pilosula* Trin. var. *ciliata* (Trin.) Bor twice, once as *A. ciliata* Trin. (p. 174) and once as *Calamagrostis ciliata* (Trin.) Steud. (p. 193). The latter name he based on Royle 67, 71, 303, thus coming to the same conclusions in lecto-typification as reached by Bor (1954) a century later.

A. pilosula Trin. var. *wallichiana* is through Hooker *f.* (1896) based on *A. wallichiana* Steud.; the correct authorship is (Steud.) Bor (See Art. 33,2 and Example; Rowley, 1980; Taxon 30, 1981, 117, Prop. 33 C).

A. pilosula Trin. var. *royleana* (Trin.) Bor is illegitimate as Bor cited in the synonymy *Calamagrostis pilosula* (Trin.) Hook. *f.* var. *alpestris* Hook. *f.* Fl. Br. Ind. 7 (1896) 264. The correct combination must be **A. pilosula** Trin. var. **alpestris** (Hook. f.) Veldk., *comb. nov.*

Although Hooker *f.* said that *A. pilosula* would also occur in Ceylon this was not followed by Bor (1954, 1960). I have seen both var. *pilosula* and var. *pilosula* and var.

wallichiana from that island. Collections of the first (*Thwaites CP 2394*, NY, and *Ballard 1208, L)* have a distinctly longer palea than found in specimens from the Continent; they may represent an undescribed variety.

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London, Bot. 51 (1937) 73; Ohwi, Bot. Mag. Tokyo 55 (1941) 350; Vickery, Contr. N. S. W. Nat. Hb. 1 (1941) 101; Bor, Grasses (1960) 383; Björkman, Symb. Bot. Upsal. 17, 1 (1960) 1; Monod de Froideville in Back. & Bakh. *f.*, Fl. Java 3 (1968) 523; Widén, Fl. Fenn. 5 (1971) 1; Hsu, Fl. Taiwan 5 (1978) 397. — L e c t o t y p e: *A. canina* Linné (but some take *A. alba auct. non* Linné = *A. stolonifera* Linné, see introduction).

Vilfa Adans., Fam. Pl. 2 (1763) 495. — L e c t o t y p e: *Agrostis stolonifera* Linné.

Trichodium Michx., Fl. Bor. Am. 1 (1803) 41. — L e c t o t y p e: *T. laxiflorum* Michx. [= *A. hyemalis* (Walt.) B. S. P.].

Decandolia Bastard, Ess. Fl. Maine & Loire (1809) 28. — T y p e: Not indicated, includes *D. stolonifera* (Linné) Bastard = *Agrostis stolonifera* Linné.

Agraulus Beauv., Agrost. (1812) 5, 146. — L e c t o t y p e: *A. caninus* (Linné) Beauv. (= *A. canina* Linné).

Lachnagrostis Trin., Fund. Agrost. (1820) 128. — *Agrostis* sect. *Lachnagrostis* Desv. in Gay. Fl. Chil. 6 (1853) 320. — L e c t o t y p e: *L. filiformis* (Forst.) Spreng. *ex* Trin. (= *A. avenacea* Gmel.).

Notonema Raf., Neogenyton (1825) 4. — T y p e: *A. arachnoides* Ell., 1816, *non* Poir., 1810 (= *A. elliottiana* Schult.).

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Pentatherum Nabelek, Publ. Fac. Sc. Univ. Masaryk, Brno 11 (1929) 9. — T y p e: *P. olympicum* (Boiss.) Nabelek (= *A. olympica* Boiss.).

Neoschischkinia Tzvel., Bot. Zurn. 53 (1968) 309. — T y p e: *N. elegans* [Thore *ex* Loisel.] Tzvel. based on *A. elegans* Thore *ex* Loisel., 1809, *non* Salisb., 1796 (= *A. tenerrima* Trin.).

Annual or perennial grasses. *Ligules* membranous. *Spikelets* in panicles, laterally compressed, 1-flowered, articulating above the glumes. *Glumes* ± long-persistent, subequal, membranous, usually 1-nerved, keeled, keel ± scabrous, acute to acuminate, rarely aristulate. *Rachilla* process usually absent, or microscopic, rarely developed and pilose. *Lemma* membranous to scarious, thinner and usually distinctly shorter than the glumes, rounded on the back, 5-, rarely 3-nerved, muticous or dorsally awned, apex ± truncate to ± 4- or 5-dentate, callus glabrous or laterally short-hairy. *Palea* shorter to much shorter than the lemma, then sometimes inconspicuous, ± as long as the ovary, 2-nerved when long. *Lodicules* 2, free, thin, veinless, glabrous. *Anthers* usually 3. *Styles* 2, free at base; stigmas emerging laterally at anthesis. *Caryopsis* dorsally grooved to terete; hilum subbasal, punctiform; embryo small.

D i s t r i b u t i o n. 150–200 spp. worldwide in temperate areas and on tropical mountains; in Malesia 6 species, of which 5 native and 1 once introduced; in Taiwan 2 species, both native.

KEY TO THE MALESIAN TAXA

1a. Palea minute, exceptionally up to 0.8 mm long and 0.4 times as long as the lemma . 2
b. Palea well-developed, more than 1 mm long and at least 0.4 times as long as the lemma 7
2a. Anthers 0.2–0.5 mm long, 0.15–0.4 times as long as the lemma. — Spikelets 1.6–2.25 mm long. Once in New Guinea. . . . . **2. A. clavata**
b. Anthers 0.55–1.4 mm long, 0.3–0.6 times as long as the lemma. — Spikelets (1.65–)1.9–4.5(–5) mm long 3
3a. Palea minute, exceptionally as long as 0.4 mm and 0.2 times as long as the lemma. — Not in Borneo (yet). 4

b. Palea 0.3–0.8 mm long, 0.16–0.4 times as long as the lemma 5
4a. Branches of the panicle usually scabrous. Spikelets usually 1.65–2.8 mm long. Lemma up to 2 mm long. Awn usually absent. Anthers 0.55–1 mm long. — C., E. Java, Timor, Celebes, Philippines, very rare elsewhere. **5a. A. rigidula** var. **rigidula**
b. Branches of the panicle usually smooth. Spikelets usually 3–4.5 mm long. Lemma usually 1.75–3 mm long. Awn usually 2–4.5 mm long. Anthers 0.9–1.4 mm long. — Sumatra, W. Java, New Guinea, very rare elsewhere. . . **5h. A. rigidula** var. **remota**
5a. Uppermost ligules ± collar-shaped, truncate, 1.25–2 mm long. Spikelets 1.65–1.85 mm long. Lemma 1.5–1.6 mm long. — Once in Java . . . . . **3. A. clemensorum**
b. Uppermost ligules triangular, ± acute, usually much longer. Spikelets usually more than 2.5 mm long. Lemma usually more than 1.75 mm long. — Borneo 6
6a. Leaf blade smooth. Panicle contracted, densely spikeled, hardly exserted; lowermost longest branch 2–4.8 cm long. Awn usually 2.1–2.75 mm long. Palea 0.3–0.5 mm long . . . . . **5c. A. rigidula** var. **borneensis**
b. Leaf blades scabrous. Panicle effuse, lax, exserted; lowermost longest branch 4.5–8.5 cm long. Awn usually absent or weakly developed. Palea 0.5–0.75 mm long **5d. A. rigidula** var. **diffusissima**
7a. Lemma more or less pubescent, if glabrous rachilla process well-developed, hairy . 8
b. Lemma glabrous. Rachilla process absent, exceptionally up to 0.2 mm long, glabrous 9
8a. Rachilla process 0.3–0.45 mm long, hairy. Lemma 1.75–2.1 mm long. Palea 0.6–0.75 times as long as the lemma. Anthers 0.4–0.5 mm long. — Timor, New Guinea **1. A. avenacea**
b. Rachilla process at most 0.25 mm long, glabrous. Lemma 2.65–2.85 mm long. Palea 0.43–0.47 times as long as the lemma. Anthers 0.75–0.9 mm long. — Once in New Guinea. . . . . **4. A. hirta**
9a. Stolons absent. Leaves narrow, up to 1.5 mm wide, smooth. Awn 2.5–4 mm long, inserted below the middle of the lemma. — Borneo **5g. A. rigidula** var. **kinabaluensis**
b. Stolons present. Leaves wide, up to 9 mm wide, scabrous. Awn absent or as a minute tooth in the upper half of the lemma. — N. Sumatra, E. Java, Borneo, Luzon **6. A. stolonifera** var. **ramosa**

KEY TO THE TAIWAN TAXA

1a. Awn usually present (check several spikelets!). — Palea usually 0.3–0.5 mm long, 0.25–0.33 times as long as the lemma. Anthers 1–1.2 mm long, 0.54–0.73 times as long as the lemma . . . . . **5e. A. rigidula** var. **formosana**
b. Awn absent. 2
2a. Palea 0.15–0.5 mm long. 3
b. Palea 0.5–0.85 mm long 4
3a. Anthers 0.2–0.5 mm long. — Panicle branches usually scabrous. Lemma 1.25–1.6 mm long. Callus ± glabrous. Palea 0.2–0.5 mm long, 0.13–0.36 times as long as the lemma. Anthers 0.15–0.4 times as long as the lemma . . . . . **2. A. clavata**

b. Anthers 0.5–1 mm long. — Panicle branches usually smooth. Lemma 1.5–1.8 mm long. Callus usually puberulous. Palea 0.15–0.3 mm long, 0.1–0.17 times as long as the lemma. Anthers 0.33–0.57 times as long as the lemma

5a. A. rigidula var. **rigidula**

4a. Panicle contracted, up to 3 cm wide, densely spikeled. Lower glume 2–2.35 mm long. Callus ± glabrous. Anthers 0.6–0.7 mm long, 0.38–0.47 times as long as the lemma

5b. A. rigidula var. **arisan-montana**

b. Panicle effuse, up to 8 cm wide, loosely spikeled. Lower glume 1.5–2 mm long. Callus puberulous. Anthers 0.8–1.1 mm long, 0.55–0.73 times as long as the lemma

5f. A. rigidula var. **fukuyamae**

1. Agrostis avenacea Gmel.

Agrostis avenacea Gmel., Syst. Nat. 2, 1 (1791) 171; Vickery, Contr. N. S. W. Nat. Hb. 1 (1941) 113; Björkman, Symb. Bot. Ups. 17, 1 (1960) 37; Burbidge, Austr. Gr. 2 (1968) 64, pl. 17; Henty, Bot. Bull., Lae 1 (1969) 25; Royen, Alp. Fl. N. G. 2 (1980) 1123, f. 364. — *Avena filiformis* Forst., Fl. Ins. Austr. (1786) 9, *non Agrostis filiformis* Vill., 1787. — *A. filiformis* Spreng., Mant. Fl. Hall. (1807) 32, *non* Vill., 1787. — *A. novae-hollandiae* Beauv., Agrost. (1812) 148, 153, *nom. nov.* for *Avena filiformis* Forst., superfl. — *A. forsteri* R. & S., Syst. Veg. 2 (1817) 359, *nom. superfl.*; A. Rich. in d'Urv., Voy. Astrol. (1832) 131. — *Lachnagrostis filiformis* Spreng. *ex* Trin., Fund. Agrost. (1820) 128, pl. 10. — *Lachnagrostis forsteri* Trin., Gram. Unifl. (1824) 217, *nom. superfl.* — *Deyeuxia forsteri* Kunth, Rév. Gram. 1 (1829) 77, *nom. superfl.*; De Castro, Garcia de Orta 12 (1964) 60. — *Calamagrostis forsteri* Steud., Nomencl., ed. 2, 1 (1840) 250, *nom. superfl.* — *Calamagrostis filiformis* Cockayne, Rep. Bot. Surv. Tongariro Nat. Park (1908) 35, *non* Griseb. (1868); Pilg. *ex* Östenfeld, Dansk Vid. Selsk. Biol. Medd. III, 2 (1921) 9. — *Deyeuxia filiformis* Petrie in Chilton, Subant. Isl. N. Zeal. 2 (1909) 474; Zotov, Trans. & Proc. Roy. Soc. N. Zeal. 73 (1943) 235; non Hook. *f.*, 1896. — *Calamagrostis avenacea* Becher., Candollea 7 (1938) 519. — *A. avenacea* var. *avenacea*: Villamil, Kurtziana 5 (1969) 402. — T y p e: *Hb. Forster* (*ex* Sprengel in Hb. *Willdenow no. 2208*, B, cf. microfiche IDC 7440; Hb. *Thunberg no. 2597*, UPS, cf microfiche IDC 1036), Nova Zeelandia et Insula Paschatis.

Agrostis retrofracta Willd., Enum. Pl. 1 (1809) 94; Hitchc., Brittonia 2 (1936) 117. — *Vilfa ? retrofracta* Beauv., Agrost, (1812) 182 (16, 148). — *Lachnagrostis retrofracta* Trin., Fund. Agrost. (1820) 128. — *Lachnagrostis willdenowii* Trin., Gram. Unifl. (1824) 217, *nom. superfl.* — *Deyeuxia retrofracta* Kunth, Rév. Gram. (1829) 77. — *Calamagrostis retrofracta* Link, Hort. Berol. 2 (1833) 247; Steud., Nomencl., ed. 2, 1 (1840) 251. — *Calamagrostis willdenowii* Steud., Syn. 1 (1854) 192. *nom. superfl.* — T y p e: *Hb. Willdenow 1692* (B, holo, cf. microfiche IDC 7449; L?), Nova Hollandia (cult. in Hort. Bot. Berol.).

Agrostis debilis Poir. in Lamk., Encycl., Suppl. 1 (1810) 249. — *Vilfa debilis* Beauv., Agrost. (1812) 181 (16, 147). — T y p e: *Herb. Desfontaines* (P, holo, see also Kunth, Enum. Pl. 2, Suppl., 1835, 188, sub *Deyeuxia retrofracta*), cultivée au Jardin des Plantes de Paris. Son lieu natal m'est inconnu.

Agrostis ligulata Steud., Syn. 1 (1854) 173. — T y p e: *Blondowsky 155* (P, holo), South Australia, Port Adelaide.

Deyeuxia forsteri (R. & S.) Kunth var. *aristata* Benth., Fl. Austr. 7 (1878) 579, *comb. ill.* — *Deyeuxia filiformis* (G. Forster) Petrie var. *aristata* Dom., Bibl. Bot. 85 (1915) 352, *comb. ill.* — S y n t y p e s: *Oldfield s.n., Pries s.n.* (K), Australia.

Deyeuxia forsteri (R. & S.) Kunth var. *laeviglumis* Benth., Fl. Austr. 7 (1878) 579, *comb. ill.* — *Deyeuxia filiformis* (G. Forster) Petrie var. *laeviglumis* Dom., Bibl. Bot. 85 (1915) 352, *comb. ill.* — S y n t y p e s: *Cunningham s.n., Fraser s.n., Gargurevich s.n., Green s.n., Robertson s.n.* (K), Australia.

Agrostis avenacea Gmel. var. *perennis* Vickery, Contr. N. S. W. Nat. Hb. 1 (1941) 114. — T y p e: *Cleland H 242* (K, holo, n.v.), S. Australia, Encounter Bay, January 1925.

Agrostis leonii Parodi, Rev. Arg. Agron. 29 (1962) 19, f. 3. — T y p e: *León 516* (BAA, holo, n.v.), Argentina, Provincia de Buenos Aires, partido de Lobos, ruta 3, km 89, en una cuneta a lo largo del camino, abundante. 1 January 1962.

I furthermore suspect that most of the varieties distinguished by Cheeseman (Man. N. Zeal. Fl., 1906, 868–869), Domin (1915), and Zotov (Trans. Proc. Roy. Soc. N. Zeal. 73, 1943, 235) belong here. All combinations proposed by these authors are illegitimate.

Loosely tufted annual or perennial, then with a few cataphylls at base, without rhizomes or stolons, branching intra- and/or extra-vaginally at base, glabrous. *Culms* up to 1 m long. *Sheaths* smooth; uppermost *ligules* triangular, 4.5–10 mm long, acute, scarious, easily tearing; *blades* ± erect, flat, sometimes involute, up to 22 cm by 4.5 mm, upperside scabrous, lower smooth to scabrous. *Peduncle* scabrous below the inflorescence. *Panicle* at base enclosed by the sheath, rather dense and secund, ultimately exserted, then ± erect and very effuse, as wide as long to wider, up to 35 cm long; branches scabrous, the lowermost 4–10 (or more?) together, the longest up to 20 cm long, distally many-spikeled. *Spikelets* (3.1–)3.25–4(–5.4) mm long. *Glumes* ovate-lanceolate, the lower longer than the upper. *Rachilla* process 0.3–0.45(–0.9) mm long, long-hairy, hairs 0.3–0.65 (–1.1) mm long. *Lemma* (1.5–)1.75–2.1(–2.65) mm long, (0.4–)0.5–0.6 times as long as the lower glume, faintly 5-nerved, hairy at least in the marginal zone to densely hairy all over, very exceptionally glabrous (see note), apex truncate, 4-dentate, the outer teeth sometimes elongated; callus short, oblique, hairs (0.25–)0.35–0.4(–0.7) mm long; awn inserted in the 0.45–0.65th part of the lemma, (3.35–)3.5–5.1 mm long, geniculate, exserted; column 1.25–2 mm long, often brownish, arista often purplish. *Palea* 1.25–1.6(–2) mm long, 0.6–0.75(–0.9) times as long as the lemma, 2-nerved, shortly bidentate, glabrous. *Anthers* (0.35–)0.4–0.5(–1) mm long, 0.22–0.33(–0.37) times as long as the lemma.

Distribution. Malesia: Lesser Sunda Isles (Timor, G. Tatamailau), New Guinea: Irian Jaya (Lake Habbema, Mt. Wilhelmina), Papua New Guinea (W. Highlands: Lagaip, Tomba, Alipe, Kepaka; Enga: Mt. Ne/Kerewa, Sirunki, Yobobos grasslands, Sugarloaf, Yogos, Tambul, Parwas; S. Highlands: Kaguba, Mt. Giluwe, Lake Onim, Mt. Ialibu; Chimbu: Kurumugl, Mt. Wilhelm, Sinasina, Gembogl, Waimambuno; E. Highlands: Aiyura, Daulo Pass; Madang: Simbay Valley; Morobe: Edie Greek, Mt. Kaindi, Samanzing, Sambagan; Northern: Lake Myola, Mt. Kenive, Mt. Suckling; Central: Vanapa Valley, Mt. Albert Edward); Australia to the Pacific, Easter Island, introduced elsewhere.

Ecology: Weed of disturbed, usually rather rich and moist grounds, e.g. fallow gardens, roadsides, *Axonopus*-lawns, *Imperata*- and *Cyathea*-grasslands, open *Eucalyptus*-forest, etc.; (1675–)1900–3700 m alt. This species apparently belongs to the 'Steppenreiter'. Burbidge (1968) gave the following account: 'The panicles ('seedheads') break away and may be blown considerable distances by the wind. Where abundant or in areas with other grasses whose heads are blown about in a similar manner they become piled against fences and other obstructions so densely as to constitute a hazard to wooden posts in the event of bushfires. There is a case on record where seedheads, which included those of this species, accumulated in a railway cutting to a depth sufficient to prevent the wheels of a train from gripping the rails.'

Collector's notes. Leaves pale to midgreen. Spikelets pale to purplish green to pale brown. Anthers yellow. Stigmas white. Flowering at 16.00 hrs.

U s e. Eaten by sheep in Australia.

V e r n a c u l a r n a m e s. *Amilkul* (Sinasina, Nimai), *antarumban* (Enga, Yogos), *elgelambu*, *ema* (Onim), *engagamp* (Tomba), *engelyambo kola*, *engil(i) yambo koga* (Medpla, Kaugel), *hera* (Onim), *kalipe sili* (Enga, Poio), *roboreh, robre* (Enga, Poio, Kepilam), *undi* (Kaugel), *wejemaja* (Chimbu, Masul), *blown grass* (Eng.).

N o t e s. For the position of this species and some related ones in *Agrostis* see the introduction.

Vickery (1941) has distinguished a var. *perennis* for perennial plants with a rhizome, a more rigid culm about 70 cm high, and anthers of about 0.7 mm long, but as these characters occur alone or in various combinations such a variety cannot be distinguished. Similarily the many varieties named by Zotov (1943) for which the combinations had already been made by Domin (1915) are extreme forms perhaps of some local significance, but apparently part of the general variation observed elsewhere.

The plants seem to be chasmogamous, but very often a single anther is retained in the apex of the lemma or the fold of the upper glume, etangled in the stigmas suggesting cleistogamy. Non-functional anthers were observed in *Brass & Meijer-Drees 9969*. This collection and others from Lake Habbema and Mt. Wilhelmina have exceptionally large spikelets.

No collections from Malesia seem to come from natural habitats, time and again the collectors cite disturbed areas. I have personally never observed it in the sub-alpine grasslands of New Guinea outside human influence. It would therefore seem to have been introduced, but on the other hand there are some very early records from areas which had not previously been visited by Europeans, so the species must have been there already, e.g. those from Lake Habbema and Mt. Wilhelmina mentioned above. As the species spreads through the mountains, only, such gatherings suggest that the species is at least partly native in New Guinea.

A collection from Timor (*Van Steenis 18386*) consists of plants with both large and small spikelets which have glabrous lemmas. This would suggest *A. billardieri* R. Br. from Australia, but otherwise the plants fit *A. avenacea* much better: spikelets smaller than 4.5 mm, awn inserted above the middle of the lemma, small anthers, etc.

There is possibly an isotype of *A. retrofracta* Willd. in L (sub *no. 908.87–187*) in the Persoon Herbarium annotated '*Agrostis retrofracta* W *ex* Hb. Berol.'. The specimens cited by Vickery (1941, p. 113) cannot be isotypes because of the date: the species was described in 1809 whereas the specimens were cultivated in 1818.

2. Agrostis clavata Trin.

Agrostis clavata Trin. in Spreng., Neue Entd. 2 (1821) 55; Shishkin, Fl. U.S.S.R. 2 (1934) 179; Ohwi, Bot. Mag. Tokyo 55 (1941) 355; Björkman, Symb. Bot. Ups. 17, 1 (1960) 67, 99; Chung, Korean Gr. (1965) 106; Hultén, Fl. Alaska (1968) 101; Tateoka, Bull. Nat. Sc. Mus. 11 (1968) 161; Widén, Fl. Fenn. 5 (1971) 61; Anon., Icon. Corm. Sin. 5 (1974) t. 7051; Probatova, Nov. Syst. 11 (1974) 60; Tutin, Fl. Eur. 5 (1980) 233. — *A. michauxii* Trin., Gram. Unifl. (1824) 206, *nom. superfl.*, *non* Zuccagni, 1806. — *Trichodium clavatum* Schult. & Schult., Mant. 3 (1827) 556. — *A. clavata* var. *typica* Björkman, Symb. Bot. Ups, 17, 1 (1960) 70, *nom. inval.* — *A. clavata* ssp. *clavata*: Tateoka, Bull. Nat. Sc. Mus. 11 (1968) 162, f. 1-c, -d; Tzvel., Not. Syst. 8 (1971) 62. — T y p e: 'Camtschatca' (LE, holo, fide Shishkin, but see Widén; *n.v.*).

Agrostis tenuiflora Steud., Syn. 1 (1854) 163, *non* Willd., 1797. — L e c t o t y p e: *Buerger s.n.* (L, holo, sub no. 908.77–177), Japan.

Agrostis matsumurae Hack. *ex* [Matsumura, Bot. Mag. Tokyo 11 (1897) 445, *nomen*] Honda, J. Fac. Sc. Imp. Univ. Tokyo III, 3, 1 (1930) 188, 191, *descr. in clave*; Björkman, Symb. Bot. Ups, 17, 1 (1960) 70, f. 15. — *A. clavata* Trin. ssp. *matsumurae* Tateoka, Bull. Nat. Sc. Mus. Tokyo 11 (1968) 161, f. 1-a, -b; Hatusima, Fl. Ryukyus (1971) 857; Hsu, Taiwan Gr. (1975) 241, f. 15; Fl. Taiwan 5 (1978) 398. — *A. clavata* Trin. var. *matsumurae* Tateoka *ex* Anon., Icon. Corm. Sin. 5 (1976) 111, 1060, *nom. inval.* — T y p e: *Matsumura 37* (TI, holo; W; *n.v.*), Japan, Prov. Musashi, Tokyo, Meguro, 13 June 1880.

Agrostis bottnica Murbeck, Bot. Not. (1898) 13. — T y p e: *Fristedt s.n.* (LD, S, *n.v.*), Sweden, S. Ångermanland, Björnmyran, Långsele Inn, 1857.

Agrostis clavata Trin. forma *aprica* Lindberg, Pl. Fin. Exs. (1906) 16 (*n.v.*). — T y p e: ? (Name not in Chase & Niles, Index to grass species, 1962).

Agrostis clavata Trin. forma *umbrosa* Lindberg, Pl. Fin. Exs. (1906) 16 (*n.v.*). — T y p e: ? (Name not in Chase & Niles).

? Agrostis macrothyrsa Hack. in Fedde, Repert. 7 (1909) 318; Tzvel., Not. Syst. 8 (1971) 62. — T y p e: *Faurie 813* (W, holo; KYO; *n.v.*), Insula Sachalin, in silvis prope Wladimirsk, July 1908.

Agrostis clavata Trin. forma *flaccida* Krylov, Fl. Alt. 7 (1914) 1590 (*n.v.*). — T y p e: ?, Russia, Altai.

Agrostis clavata Trin. forma *robustior* Krylov, Fl. Alt. 7 (1914) 1590 (n.v.). — T y p e: ?, Russia, Altai.

Agrostis teberdensis Litw., Sched. Hb. Fl. Ross. 8 (1917) 139. — T y p e: *Litwinow Hb. Fl. Ross. 2678* (LE, holo, *n.v.*), Russia, Prov. Kuban (Caucasus), in silva ad fl. Teberda med. provenit in trunco arboris jacente putrido. 5 July 1905.

Agrostis formosana Ohwi, Bot. Mag. Tokyo 55 (1941) 354. — T y p e: *Ohwi 2372* (KYO, holo; K), Taiwan, Prov. Taihoku, Taiheizan, Mururoahu, Kyanrawa, Mt. Taiheizan. 26 May 1933.

Agrostis clavata Trin. var. *nukabo* Ohwi, Bot. Mag. Tokyo 55 (1941) 356; Masamune, Sc. Rep. Kanazawa Univ. 4 (1956) 245; Björkman, Symb. Bot. Ups. 17, 1 (1960) 70, 100; Chen & Hsu, J. Jap. Bot. 37 (1962) 301, 310. — *A. exarata* Trin. var. *nukabo* Koyama, J. Jap. Bot. 37 (1962) 233; Walker, Fl. Okinawa (1976) 198. — T y p e: *Ohwi 9181* (KYO?, holo, *n.v.*), Japan, Kyoto.

The following description is based on Taiwanese and Malesian material.

Tufted annual or perennial, then with a few cataphylls at base, without rhizomes or stolons, branching intra- (sometimes extra- ?) vaginally at base, glabrous. *Culms* up to 65 cm long. *Sheaths* smooth; uppermost *ligules* ± quadrangular, 0.75–2 mm long, apex rounded, erose; *blades* ± erect, flat, up to 18 cm by 3.5 mm, ± smooth to scaberulous. *Panicle* either effuse and laxly spikeled, up to 18 by 12 cm (*'clavata'*), or contracted, somewhat lobed and rather densely spikeled, 8.5–19 by 1–3 cm (*'matsumurae'*, *'nukabo'*); branches usually scaberulous, lowermost 2–8 together, longest 4.6–7.5 cm long, naked in the lower 0.4–0.6th (the shorter often spikeled nearly to base: *'matsumurae'*, *'nukabo'*). *Spikelets* 1.6–2.25 mm long. *Glumes* unequal, the lower longest, ovate-lanceolate. *Rachilla* process absent. *Lemma* 1.25–1.6(–1.7) mm long, 0.67–0.82 times as long as the lower glume, acutish, 5-nerved, Trichodium-net well-developed; callus oblique, small, glabrous or with an occasional up to 0.1 mm long hair; awn absent. *Palea* 0.2–0.5 mm long, 0.13–0.36 times as long as the lemma. *Anthers* 0.2–0.5(–0.55) mm long, 0.15–0.4 times as long as the lemma.

D i s t r i b u t i o n. N. Europe to Sachalin, Japan, Taiwan, introduced in Malesia: Papua New Guinea, Enga Distr., lower Tale valley near Yogos village. (See also Hultén, 1968, map).

E c o l o g y. Moist, rather eutrophic places, open forest, disturbed areas, in New Guinea on a steep face of a road cutting at 1980 m.

V e r n a c u l a r n a m e. Ind (Enga, Yogos).

C h r o m o s o m e n u m b e r. n = 21 (Chen & Hsu, 1962), 28 (Chung, 1965), 2n= 42 (Probatova, 1974).

N o t e s. *Agrostis michauxii* Trin. is not a synonym of *A. perennans* (Walt.) Tuckerm., although the first name in the synonymy given by Trinius is *Trichodium decumbens* Michx., a synonym of the latter name. The combination *A. decumbens* (Michx.) ... could not be made because of *A. decumbens* Host. (1809), while the epithet of the second synonym *T. laxiflorum* Michx. could not be used, either, because of *A. laxiflora* Poir. (1810). Trinius should therefore have used '*clavata*' for his species as he cited *A. clavata* as the third synonym. *A. michauxii* is therefore a superfluous name for the latter and homotypic with it (Art. 7. 11).

Ohwi (1941) included *A. valvata* Steud. and *A. macrothyrsa* Hack. in his synonymy of *A. clavata*. The first is a distinct species as is shown by the type (*Buerger s.n.*., L, no. 908.77–374) presently known as *A. nipponica* Honda, which name it must replace (Veldkamp, in press). The second name might not belong here, either, as the lower glume is said to be shorter than the upper, and not the reverse as in *A. clavata*, while the anthers are 0.7 mm long. Shishkin (1934, p. 187) regarded it as distinct, but Probatova (1974) and Tzvelev (1971) included it without further comment. The latter also remarked that *A. tederbensis* would be the same species as *A. clavata*.

Agrostis formosana Ohwi was included by Hsu (1978) in *A. arisan-montana* Ohwi, possibly because Ohwi said that the 'palea 1/4–3/5 lemmatis', but the latter figure is no doubt a misprint for '2/5' which agrees much better with the type material.

Many authors have distinguished a var. *nukabo* Ohwi or subsp. *matsumurae* Honda mainly based on the shape of the inflorescence, effuse in the first, contracted and densely spikeled in the latter. Tateoka (1968) rejecting previous attempts at delimitation distinguished them by altitudinal distribution, flowering time, and whether the branches bore spikelets in the upper part only, or to the base. Tzvelev (1971) separated them on the width of the blade and lengths of the spikelet and pedicel. Anonymos (1976) referred to the length of the ligule and distribution in China. Hsu (1978) mentioned only '*matsumurae*' for Taiwan. In fact both forms occur together in S. E. Asia, as is for instance shown by the type material of *A. tenuiflora* Steud., in which both are represented. The differences mentioned by Tateoka, Tzvelev, and Anonymos can also be explained by the fact that high altitude or higher latitude plants will tend to flower later than the ones of lowlands or lower latitudes, and mountain plants especially under more adverse circumstances which may well influence their development. Indubitably the species is more variable in S.E. Asia than in Europe (see also Widén, 1971). I therefore do not think the two can be distinguished at a varietal level or even higher.

Shimada 4849B (KYO) is tentatively included here; it has exceptionally large spikelets (2.1–2.5 mm long, lemma 1.8–1.9 mm long) thus resembling *A rigidula* Steud. var. *rigidula* of which it is perhaps a cleistogamic form which would account for the small anthers so typical for *A. clavata* but not observed in the other taxon.

Koyama (1962) stated that *A. clavata* would not be distinct from *A. exarata* Trin. To check this would entail a revision of that variable species which seemed to be too much beyond the scope of this regional revision. One has to stop somewhere.

For various misidentifications see also Honda (1930), Ohwi (1941), and Widén (1971).

3. Agrostis clemensorum Bor

Agrostis clemensorum Bor, J. Ind. Bot. Soc. 42A (1963) 12, f. 2A–H. — T y p e: *Clemens 30438* (K, holo), Java, G. Gede, under the structure on the summit, 10.000 ft. Forest. Leaves and stem rigid. 7–9 September 1932.

Perennial, branching extra-vaginally at base, with some small, close-set cataphylls, apparently without rhizomes or stolons. *Culms* up to 40 cm long, geniculate at base, rooting in the decumbent nodes. *Sheaths* smooth; uppermost *ligules* truncate, 1.25–2 mm long, rather thick; *blades* erect, flat, 10–17.5 cm by 4–5 mm, scabrous. *Panicle* contracted, 4–9 by 0.6–1.5 cm, finally well-exserted; branches scabrous, ± erect, the lowermost rather abortive, sometimes spikeled to base. *Spikelets* 1.65–1.85 mm long. *Glumes* unequal, the lower longest, ovate-oblong. *Rachilla* process absent. *Lemma* 1.5–1.6 mm long, 0.87–0.97 times as long as the lower glume, acute, faintly 5(?)-nerved, Trichodium-net very distinct; callus oblique, small, glabrous; awn absent. *Palea c.* 0.5 mm long, 0.3–0.33 times as long as the lemma. *Anthers* 0.8–0.9 mm long, 0.5–0.6 times as long as the lemma, yellow, becoming purple.

D i s t r i b u t i o n. Only known from the type.

E c o l o g y. Said to grow in the forest, but along the rim of the crater of the Gede there is only low scrub and grassland.

N o t e s. This species was found near a 'structure' on the summit of Mt. Gede, which I suppose refers to a triangulation beacon. On this often visited and botanically well-known mountain this can be assumed to be a magnet to tourists and it is therefore surprising that it has not been collected by others as it should be different from other grasses in the field.

At first sight the plants are reminiscent of *A. stolonifera* Linné *s.l.*, but the short palea and the well-developed Trichodium-net seem to rule out that species-complex which is moreover unknown from the Gede. These characters agree better with the *A. rigidula*-complex in Java and then best with var. *rigidula*, but the specimens are immediately different by their rigid habit, much more rigid then depicted by Bor, their broad, flat leaves, extremely small spikelets, the glabrous callus, the long palea, and also by its occurrence outside that variety's presently known distribution in Java. Because of the relatively long palea the Bornean varieties of *A. rigidula* come to mind, especially because the Clemenses extensively collected there and even used an altered label of their Kinabalu Expedition here, but as can be seen from the key and the descriptions such a possible mix-up in labeling does not seem to be the case.

4. Agrostis hirta Veldk., *sp. nov.*

Agrostis avenacea auct. non Gmel.: Royen, Alp. Fl. N. G. 2 (1980) 1125, *pro vern. 'pa'u'*.

Ab aliis speciebus malesianensis lemmatibus pilis praecipue in partibus marginalibus, aristis 5.5–6.5 mm longis in 0.4–0.55-plo parti lemmatis, processo rachillae nullo vel minutissimo glabro differt. — T y p e: *Hoogland & Schodde 7046 p.p.* (L, holo, LAE, NSW; CANB, *n.v.*), New Guinea, Enga Distr., N. slopes Sugarloaf, along Wapu River, in swampy depression in treefern grassland, 2185 m, 13 July 1960. Vern. *pa'u* (Enga, Poio).

Perennial (?), branching intra-(?)vaginally at base, apparently without rhizomes or stolons. *Culms* erect, up to 1.2 m long. *Sheaths* smooth; uppermost *ligule* 7.5 mm long,

apex obtuse, erose; *blades* erecto-patent, lower rather flaccid, ± flat to involute, up to more than 30 cm by 3 mm, scabrous. *Peduncle* scabrous upwards. *Panicle* effuse, 30 by 8 cm, branches erecto-patent, scabrous, the lowermost 7 together, longest 12.5 cm long, naked in the lower 0.6th, loosely many-spikeled. *Spikelets* 4.35–4.75 mm long. *Glumes* subequal, the lower longest, ovate-lanceolate, *Rachilla* process absent to 0.25 mm long, glabrous. *Lemma* 2.65–2.85 mm long, 0.6–0.65 times as long as the lower glume, faintly 5-nerved, Trichodium-net absent, sparsely pubescent mainly in the marginal areas, apex truncate, ± erose; callus oblique, small, hairs 0.35–0.5 mm long; awn inserted in the 0.4–0.55th part of the lemma, 5.5–6.5 mm long, column 1.6–3.25 mm long. *Palea* 1.25 mm long, 0.43–0.47 times as long as the lemma, faintly 2-nerved. *Anthers* 0.75–0.9 mm long, 0.17–0.3 times as long as the lemma, yellowish.

D i s t r i b u t i o n. New Guinea, Enga Distr., N. slopes Sugarloaf, along the Wapu River.

E c o l o g y. Swampy depression in *Cyathea*-grassland; 2185 m alt.

V e r n a c u l a r n a m e. *Pa'u* (Enga, Poio), which probably means 'grass', as it is also recorded for *Anthoxanthum angustum* (Hitchc.) Ohwi, *A. longifolium* (Reeder) Royen, *Chionochloa archboldii* (Hitchc.) Conert (*fide* Royen, 1980, p. 1227), and *Agrostis avenacea* Gmel.

N o t e. The duplicate number in K is *Agrostis rigidula* Steud. var. *remota* (Buse) Hoynck & Linden, while it is a mixture of both in LAE. Superficially it does resemble this variety, but there are sufficient differences to reject the assumption that this would be a sport with hairy lemmas of the latter taxon. Hybridization of *A. rigidula* with *A. avenacea* with its hairy lemmas and developed rachilla process seems unlikely, as no hybrids of the latter with other species are on record.

5. Agrostis rigidula Steud.

For the synonymy see under the varieties.

Perennials, branching intra- and/or extra-vaginally at base, rarely with a short rhizome or very short stolons. *Culms* erect or geniculate at base and rooting at the decumbent nodes, up to 85(–150) cm long. *Sheaths* smooth; uppermost *ligules* ± quadrangular to ovate-oblong to triangular, up to 7 mm long, apex truncate to acute, erose or fimbriate; *blades* erecto-patent to ± erect, involute or flat, up to 25 cm by 6.5 mm, smooth to scabrous. *Panicle* contracted to effuse, up to 30 cm long; branches smooth to scabrous, the lowermost 1–14 together, the longest 2-11 cm long, usually many-spikeled, naked in the lower 0.1–0.73d. *Spikelets* 1.5–4.1(–4.4) mm long. *Glumes* unequal, the lower longest, ovate-oblong to -lanceolate. *Rachilla* process absent. *Lemma* 1.2–3.25 mm long, (0.5–)0.6–0.8(–0.97) times as long as the lower glume, acutish to truncate and erose, more or less 5-nerved, Trichodium-net developed to absent; callus oblique, small, hairs 0.1–0.3 mm long; awn absent or present, then inserted at 0.3–0.8th of the lemma, up to 4 mm long. *Palea* 0.1–2 mm long, 0.1–0.75 times as long as the lemma. *Anthers* (0.4–) 0.55–1.4(–1.55) mm long, 0.36–0.73(–0.8) times as long as the lemma, yellow to purple.

Distribution. Taiwan, Malesia.
Ecology. Montane and subalpine areas.

a. var. **rigidula — Map 1.**

Agrostis rigidula Steud., Syn. 1 (Apr. 1854) 171; in Zoll., Syst. Verz. (June 1854) 55; Miq., Fl. Ind. Bat. 3 (1857) 378; Koord., Exk. Fl. Java 1 (1911) 147; Koord.-Schumach., Syst. Verz. 1 (1911) 16. — Type: *Zollinger 2589* (P, holo, see note), Java, in arenosis vulcanicis M. Tengger, 8000 ped.

Agrostis infirma Buse in Miq., Pl. Jungh. (Aug. 1854) 342; Miq., Fl. Ind. Bat. 3 (1857) 377; Koord., Exk. Fl. Java 1 (1911) 147; Back. in Heyne, Nutt. Pl. (1927) 231, *p.p.*; (1950) 261, *p.p.*; Handb. Fl. Java 2 (1928) 208, *p.p.*; Steen, Bull. Jard. Bot. Btzg III, 13 (1934) 211; Henr., Blumea 3 (1940) 438; Jansen, Reinwardtia 2 (1953) 225; De Castro, Garcia de Orta 12 (1964) 60; Monod de Froideville in Back. & Bakh. *f.*, Fl. Java 3 (1968) 524; Veldk. in Steen, Mt. Fl. Java (1972) pl. 22, f. 5. — Type: *Junghuhn s.n.* (L, holo, no. 903.342–37), Java, Dieng, in graminosis paludosis planitiei, 6200 ped., March.

Agrostis elmeri Merr., Publ. Gov. Lab., Philip. 29 (1905) 7; Philip. J. Sc. 1, Suppl. (1906) 375; Enum. Philip. Fl. Pl. 1 (1923) 81; Steen., Bull. Jard. Bot. Btzg III, 13 (1934) 211. — Type: *Elmer 6558* (PNH, holo, †; US), Philippines, Luzon, Prov. Benguet, Mt. Santo Tomas, open grassy slope, 2000 m alt., 1 July 1904.

Agrostis clarkei auct. non Hook. *f.*: Hayata, Bot. Mag. Tokyo 21 (1907) 52; J. Coll. Sc. Imp. Univ. Tokyo 25 (1908) 237. — *A. morrisonensis* Hayata, Icon. Pl. Form. 7 (1918) 86, f. 53; Ohwi, Bot. Mag. Tokyo 55 (1941) 355; Hsu, Taiwania 16 (1971) 230; Taiwan Gr. (1975) 245, excl. fig. = var. *formosana* (Hack.) Veldk.; Anon., Icon. Corm. Sin. 5 (1976) 850; Hsu, Fl. Taiwan 5 (1978) 400. — *A. flaccida* Hack. var. *morrisonensis* Honda, Bot. Mag. Tokyo 40 (1926) 324; J. Fac. Sc. Imp. Univ. Tokyo III, 3, 1 (1930) 190. — Lectotype: *Kawakami & Nakahara s.n.* (TI, holo, *n.v.*), Formosa, Chiayi, in verticem montis Morrison, ad 12000 ped. alt., November 1905 (fide Hsu, 1971).

Agrostis celebica Mez in Fedde, Repert. 17 (1921) 303. — Type: *Warburg 16817* (B, holo, †; US), Celebes, Gipfel des Berges Kraeng (= Peak of Bonthain), November 1888.

Agrostis hochreutineri A. Camus in Hochr., Candollea 6 (1936) 413. — Type: *Hochreutiner 2461* (G, holo), Java, Dieng, gazon sur les pistes au-dessous du lac Talaga Warna, 2060 m alt., 7 November 1904.

Agrostis canina auct. non Linné: Bor, Dansk Bot. Ark. 25 (1967) 55.

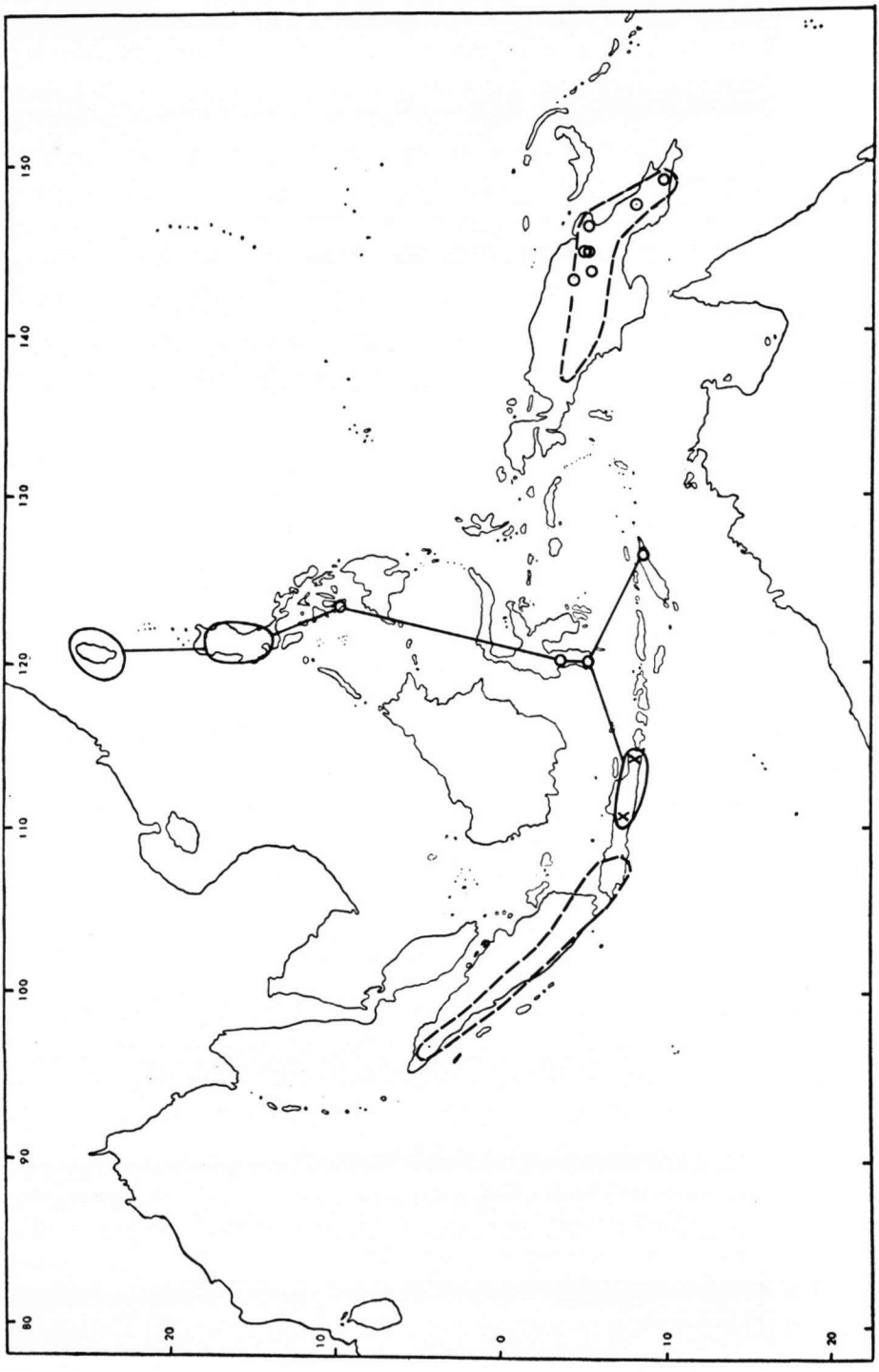
Diagnosis of Malesian material (after Linden & Voskuil, msc.).

Blades 1.5–5 mm wide, ± smooth when narrow, often scabrous when broad. *Panicle* loosely contracted, branches becoming patent in fruit, usually scabrous, the lowermost longest (2.5–)4–9 cm long. *Spikelets* 1.9–2.8(–3.4) mm long. *Lemma* (1.2–)1.4–2(–2.25) mm long, Trichodium-net well-developed; callus hairs usually absent, or few, rarely up to 0.2 mm long; awn absent, rarely weakly developed, up to 0.75 mm long. *Palea* 0.2–0.4 mm long, 0.12–0.25 times as long as the lemma. *Anthers* (0.4–)0.55–1 mm long, 0.27–0.5 times as long as the lemma.

Diagnosis of Taiwan material.

Blades up to 2 mm wide, smooth to slightly scaberulous. *Panicle* contracted to effuse, branches ± smooth, the lowermost longest up to 8 cm long. *Spikelets* 1.85–2.85 mm long.

Map 1: Distribution of *Agrostis rigidula* Steud. var. *rigidula* (continuous line and o) and var. *remota* (Buse) Hoynck & Linden (broken line and x).


80
90
100
110
120
130
140
150
20
10
0
10
20

Lemma 1.5–1.8(–2.15) mm long, Trichodium-net well-developed; callus hairs absent to 0.25 mm long; awn absent. *Palea* 0.15–0.35 mm long, 0.1–0.17 times as long as the lemma. *Anthers* 0.5–1 mm long, 0.25–0.57 times as long as the lemma.

Distribution. Taiwan, Malesia: Java (Central: Jeng, G. Merbabu; East: G. Lawu, G. Kawi, G. Welirang, G. Tengger, G. Smeru, G. Argopuro, G. Hyang), Lesser Sunda Isles (Timor: G. Tatamailau), Celebes (Southwest: G. Rantemario, G. Bonthain), Philippines (Luzon: Barrio Agawa, Barrio Sinipsip, Mt. Data, Pauai, Mt. Polis, Mt. Pulog, Mt. Santo Tomas, Mt. Tabayoc; Negros: Mt. Canlaon), New Guinea (W. Highlands: Kaipare; Chimbu: Mt. Wilhelm; S. Highlands: Ibiwara; Morobe: Rawlinson Range; Central: Neon Basin, Lake Myola).

Ecology. Open mountain forests (pine, oak, *Casuarina, Eucalyptus*) and alpine grasslands, on sand dunes in the Bromo Sandsea, sometimes on tussocks in bogs, in disturbed areas as a pioneer; 1700–3200 m alt., in the Barrio Agawa at 975 m, on Mt. Wilhelm at 4050 m.

Collector's notes. Tufted. Spike purplish. Locally abundant, sometimes vegetation-forming and giving a purplish sheen to the grassland.

Vernacular names. Java: *bunerbun, kembalan (alus), pari apa alus, rumput pari kesit* (Jav.), *jukut kidang* (Sund.); Philippines: *sasamon* (Ig.).

Uses. Relished by sheep and presumably by deer (*'jukut kidang'*). One analysis showed a high feeding value (Backer, 1927, 1950).

Notes. Jansen (1953) thought that the type of *A. rigidula* was of hybridogenous origin, stating that the lemmas were awned, whereas Steudel described them as muticous. In fact some spikelets have minute, included awns, and others have none. This has been observed in other collections as well, as was also pointed out by Backer (1928). The palea said to be as long as the lemma by Steudel is of course minute, and Henrard (1940) was quite correct in suggesting that Steudel, who is not known for his careful dissecting methods and subsequent observations, probably tore the flimsy lemma in two. *Zollinger 2589* in G is mislabeled and represents *Deyeuxia australis* (Zoll. & Mor.) Jansen; in P such specimens are labelled *2589-X*.

This variety has also been reported from China (Kwantung, Mt. Lohfau) by Merrill as *A. elmeri (Merrill 10924* in Philip. J. Sc., Bot. 13, 1918, 131). I have not seen his specimens, not have I seen many continental Chinese collections, but the treatment of *Agrostis* by Anonymos (Icon. Corm. Sin. 5, 1976, 850) would suggest that it does not occur there.

The collections from Taiwan show less variation than those from Malesia, which is not surprising, I have here given a separate diagnosis of it for local users, who knew it as *A. morrisonensis*. Two gatherings (*Okamoto 28 p.p.*, Kizangun, KYO; *Van Steenis 20981*, Mt. Morrison, L) are doubtfully included. They differ by having distinctly larger spikelets (*c.* 3 mm long), lemma 2–2.25 mm long, palea 0.5–0.6 mm long, 0.22–0.27 times as long as the lemma, anthers 0.75–1.1 mm long. The plate given by Hsu (1975) seems to represent *A. rigidula* var. *formosana* (Hack.) Veldk. because of the presence of an awn on the lemma.

The holotype of *Agrostis celebica* Mez was destroyed during the last war, but a senescent fragment is preserved in US. Although only some empty glumes are present

there seems to be no reason not to include it here. The description and topotypic material support this identification.

b. var. **arisan-montana** (Ohwi) Veldk., *comb. nov.*

Agrostis arisan-montana Ohwi, Acta Phytotax. Geobot. 2 (1933) 161; Bot. Mag. Tokyo 55 (1941) 356; Hsu, Taiwan Gr. (1975) 239, f. 14 (but cf. *A. clavata*!); Fl. Taiwan 5 (1978) 398, pl. 1375 (but cf. *A. clavata*!). — T y p e: *Owhi 3463* (KYO, holo; K), Formosa, Prov. Tainan, Mt. Arisan, 3 July 1933.

Blades up to 6 mm wide, slightly scaberulous. *Panicle* contracted, somewhat lobed, branches scabrous, the lowermost longest (2–)4–6.5 cm long. *Spikelets* 2–2.35 mm long. *Lemma* 1.5–1.7 mm long, Trichodium-net present but faint; callus hairs absent or very few, up to 0.2 mm long; awn absent. *Palea* 0.5-0.75 mm long, 0.3–0.5 times as long as the lemma. *Anthers* 0.6–0.7 mm long, 0.38–0.47 times as long as the lemma.

D i s t r i b u t i o n. Taiwan.

E c o l o g y. 'Medium altitudes' (Hsu, 1978).

N o t e s. Ohwi (1933) described the anthers as 0.3 mm long, but in the type specimen all seen were 0.6–0.7 mm. In fact the size of the spikelets, palea, and anthers makes this variety immediately distinct from *A. clavata* Trin. *'matsumurae'* with which it can otherwise easily be confused when using Hsu's keys as the anthers are there recorded as too short. His plates, both of 1975 and 1978, strongly suggest that *A. clavata* is shown. In the plate of 1975 the size of the spikelets seems too small and no dimension is given for the anther which also seems too small; the palea is described as equally long to the lemma, but in the plate it is 0.7 mm long. In 1978 no scale is given, but the plant depicted has rather few-spikeled and naked branches of the panicle unlike the present variety; the palea is not depicted. Hsu (1978) cited *Hsu 424* both here and under *A. clavata*.

In the Iconographia Cormophytorum Sinicorum 5 (1976) this taxon is not mentioned. It keys out to *A. perarta* Keng of which I have not seen a valid description nor an authentic specimen. Other invalid names here are apparently *A. brevipes* Keng, *A. micrandra* Keng, *A. megathyrsa* Keng. In the Index all species mentioned under sect. *Agraulus* have been given invalid combinations in the 'genus' *Agraulus*.

c. var. **borneensis** (Stapf) Linden & Voskuil, *comb. nov.*

Agrostis canina Linné var. *borneensis* Stapf, Trans. Linn. Soc., London 4 (1894) 246; Ridl., J. Str. Br. Roy. As. Soc. 46 (1906) 220; Merr., Enum. Born. Pl. (1921) 49. *p.p.*; Steen., Bull. Jard. Bot. Btzg III, 13 (1934) 211; J. M. B. Smith, Mal. Nat. J. 24 (1970) 26, table 2. — *A. reinwardtii* Buse var. *borneensis* Ohwi, Bull. Tokyo Sc. Mus. 18 (1947) 8; Jansen, Reinwardtia 2 (1953) 225. — T y p e: *Haviland 1399* (K, holo), British North Borneo, Mt. Kinabalu, 13000 ft (=3962 m), March–April 1892.
Agrostis infirma auct. non Buse: Merr., Enum. Born. Pl. (1921) 50, pro *Clemens 10631*.

Diagnosis after Linden & Voskuil, msc.

Blades 0.7–2 mm wide, smooth. *Panicle* contracted, branches appressed, smooth, the lowermost longest 2–4.8 cm long. *Spikelets* 2.5–3.25(–3.8) mm long. *Lemma*

(1.6–)1.75–2.25(–2.4) mm long, Trichodium-net ± absent; callus hairs 0.1–0.25 mm long; awn usually geniculate and exserted, inserted at 0.37–0.54th of the lemma, (1.5–)2.1–2.75(–3.5) mm long. *Palea* (0.25–)0.3–0.5 mm long, 0.16–0.33 times as long as the lemma. *Anthers* 0.9–1 mm long, 0.43–0.54(–0.59) times as long as the lemma.

Distribution. Malesia: Borneo (Sabah: Mt. Kinabalu).

Ecology. On granite rocks; 3960–4115 m alt.

Notes. Although it was the first *Agrostis* to be brought down from Mt. Kinabalu it has only been rarely collected since and little is known about it. Collections are sometimes mixed with var. *kinabaluensis* (Ohwi) Veldk. and confusion in literature occurs with var. *diffusissima* (Ohwi) Veldk., so presumably the ecology is not much different from these.

d. var. **diffusissima** (Ohwi) Veldk., *comb. nov.*

Agrostis reinwardtii Buse var. *diffusissima* Ohwi, Bull. Tokyo Sc. Mus. 18 (1947) 8. — Type: *Clemens 33228* = *32327* (BO, holo, BM, *n.v.*; G, K, L, NSW, NY, US), British North Borneo, Mt. Kinabalu, Marai Parai, wet place under great wall, 10500 ft (= 3200 m), 24–26 May 1933.
Agrostis canina Linné var. *borneensis auct. non* Stapf: Merr., Enum. Born. Pl. (1921) 49, pro *Clemens 10630*; J. M. B. Smith, Mal. Nat. J. 24 (1970) 26, table 2.
Agrostis reinwardtii auct. non Buse: J. M. B. Smith, New Phytol. 84 (1980) 553.

Blades 0.5–3 mm wide, usually scabrous. *Panicle* effuse, loosely spikeled, branches patent, ± smooth, the lowermost longest (4–)4.5–8.5 cm long. *Spikelets* (2.35–)2.5–3.5 mm long. *Lemma* (1.85–)2–2.5(–2.7) mm long, Trichodium-net ± absent; callus hairs 0.1–0.3 mm long; awn absent to very weak, enclosed, rarely up to 2.3 mm long, then inserted at 0.47–0.69th of the lemma. *Palea* (0.4–)0.5–0.75 (–1) mm long, (0.17–)0.24–0.37(–0.45) times as long as the lemma. *Anthers* 0.75–1 mm long, 0.36–0.4(–0.5) times as long as the lemma.

Distribution. Malesia: Borneo (Sabah: Mt. Kinabalu).

Ecology. Open granite slopes, among rocks, open clearings, under scrub if the cover is not too close, banks of streams, boggy places, on recent landslides and other disturbed areas; 2720–4115 m alt.

Collector's notes. Small tussocks, tufts with 3 or 4 inflorescences each, sometimes forming dense mats, 60 cm thick with persistent old culms. Spikelets purplish except when young. Anthers cream (also purple *i.s.* JFV).

Notes. Smith (1970) described it as stoloniferous, but such specimens have not been seen; he probably meant geniculate and decumbent, rooting culms which have been noted to form mats (e.g. *Forster F 42*, Paka Cave, K).

Apparently the most common variety on Mt. Kinabalu. It was formerly confused with var. *borneensis* (Stapf) Linden & Voskuil, which is much smaller and always has densely contracted, very dark purple panicles and thus is more similar to var. *kinabaluensis* (Ohwi) Veldk.

e. var. **formosana** (Hack.) Veldk., *comb. nov.*

Agrostis canina Linné var. *formosana* Hack., Bull, Hb. Boiss. II, 4 (1904) 528; Ohwi, Bot. Mag. Tokyo 55 (1941) 354; Chen & Hsu, J. Jap. Bot. 37 (1962) 301, 310. — T y p e: *Fauri 724* (W, holo, *n.v.*; KYO). Formosa, prope Taitum, 7 May 1903.
Agrostis sozanensis Hayata, Icon. Pl. Form. 7 (1918) 85, f. 52; Hsu, Taiwan Gr. (1975) 247, pl. 17, 18; Anon., Icon. Corm. Sin. 5 (1976) 110, 851, f. 7050; Hsu, Fl. Taiwan 5 (1978) 400. — T y p e: Not indicated, 'Formosa, Sozan, Taihoku'.
Agrostis transmorrisonensis Hayata, Icon. Pl. Form. 7 (1918) 84, f. 51; Anon., Icon. Corm. Sin. 5 (1976) 851. — S y n t y p e s: *Kawakami & Hayata 7062* (TI, *n.v.*), Formosa, Randaizan, 1908; *Mori & Koto s.n.* (TI, *n.v.*), Formosa, in montibus centralibus.
Agrostis canina Linné var. *mutica auct. non* Gaud.: Honda, J. Fac. Sc. Imp. Univ. Tokyo III, 3, 1 (1930) 189, *p.p.*
Agrostis perennans auct. non Tuckerm.: Hayata, Icon. Pl. Form. 7 (1918) 86.

Blades up to 4.5(–6.5) mm, smooth to scaberulous. *Panicle* usually widely effuse, loosely spikeled, branches patent, scaberulous, the lowermost longest up to 10 cm long. *Spikelets* 1.75–2.75(–3) mm long. *Lemma* 1.5–1.85(–2) mm long, Trichodium-net absent; callus hairs 0.1–0.2 mm long; awn usually present (see note), inserted at (0.37–)0.55–0.8th of the lemma, 0.75–2.75(–3) mm long. *Palea* variable (0.15–)0.3–0.5 mm long, (0.11–)0.25–0.33(–0.43) times as long as the lemma. *Anthers* 1–1.2(–1.5) mm long, 0.54–0.73(–0.8) times as long as the lemma.

D i s t r i b u t i o n. Taiwan, said to occur in Continental China (Anon., 1976: Yantze River region, Prov. Honan).

E c o l o g y. Very common in N. Taiwan at low altitudes (Hsu, 1975, 1978), but also in grassland at 2750 m.

C h r o m o s o m e n u m b e r. n = 21 (Chen & Hsu, 1972).

N o t e. Close to var. *rigidula* as it is found in Taiwan and mainly different by the presence of awned lemmas although it must be noted that collections have been seen where there were awned and muticous lemmas within the same inflorescence (Ohwi 2008, KYO, Gressitt 428, K). The isotype in KYO has one inflorescence with awned spikelets thus agreeing with the holotype in W, and one with muticous lemmas referable to var. *rigidula*. In general the awned plants have larger anthers and usually a longer palea. The difference between the two is so only slight, but as no intermediates have been seen except for the two mentioned above and as a similar parallel variation is unknown from Malesia I tentatively accept the present variety as distinct.

Contrary to the distinction made by Anonymos (1976) I agree with Hsu that *A. transmorrisonensis* is but a robust form and cannot be distinguished otherwise.

f. var. **fukuyamae** (Ohwi) Veldk., *comb. nov.*

Agrostis fukuyamae Ohwi in Fedde, Repert. 36 (1934) 39; Bot. Mag. Tokyo 55 (1941) 354; Hsu, Taiwan Gr. (1975) 243, f. 16; Fl. Taiwan 5 (1978) 400, f. 1376. — T y p e: *Ohwi 4147* (KYO, holo; K), Formosa, Prov. Taihoku, near the summit of Mt. Nanko-taisan, 19–20 July 1933.

Blades up to 2 mm wide, smooth. *Panicle* contracted at first, soon effuse, loosely spikeled, branches ascending to patent, smooth, the lowermost longest 3.5–6 cm long. *Spikelets* 1.5–2 mm long. *Lemma* (1.2–)1.4–1.75 mm long, Trichodium-net absent (or

extremely faint?); callus hairs 0.25–0.3 mm long; awn absent. *Palea* 0.6–0.85 mm long, 0.4–0.57 times as long as the lemma. *Anthers* 0.8–1.1 mm long, 0.55–0.73 times as long as the lemma.

D i s t r i b u t i o n. Taiwan.

E c o l o g y. 'High altitudes, on exposed rocks' (Hsu, 1978).

N o t e. Only slightly different from the Taiwan representatives of var. *rigidula* by the somewhat shorter spikelets, the longer palea, and (hence?) the apparently absent or extremely faint Trichodium-net, and the relatively long anthers.

Ohwi had some very young specimens barely starting to flower and therefore described the inflorescence as contracted, but all other more mature specimens have a widely effuse panicle. He also described the palea as shorter than I have observed.

The taxon was omitted by Anonymos (1976).

g. var. **kinabaluensis** (Ohwi) Veldk., *comb. nov.*

Agrostis kinabaluensis Ohwi, Bull. Tokyo Sc. Mus. 18 (1947) 8; Jansen, Reinwardtia 2 (1953) 226. — T y p e: *Clemens 30273, pp.* (BO, holo, M, *n.v.*; B, K, L), British North Borneo, Mt. Kinabalu, Low's Peak, among rocks, 13000 ft (= 3962 m), 26 March 1932 (see note).

Blades up to 1.5 mm wide, smooth. *Panicle* contracted, densely spikeled, branches ± appressed, smooth, the lowermost longest up to 4.5 cm long. *Spikelets* (2.25–) 2.8–3.1(–3.5) mm long. *Lemma* 1.5–2.25 mm long, Trichodium-net absent; callus hairs absent; awn (1.65–)2.5–4 mm long, inserted at 0.35–0.4 th of the lemma. *Palea* 1.1–2 mm long, (0.6–)0.75 times as long as the lemma. *Anthers* 1–1.4 mm long, 0.5–0.65 times as long as the lemma.

D i s t r i b u t i o n. Malesia: Borneo (Sabah: Mt. Kinabalu).

E c o l o g y. Open, sunny places in crevices on steep slopes and in shallow, moist places near the edge of scrub; 3350–4050 m alt.

N o t e s. Very similar to var. *borneensis* (Stapf) Linden & Voskuil, which differs by branching extra-vaginally at base, a shorter palea, and smaller anthers. As no intermediary specimens have been seen they are here kept separate.

Clemens 30273, the type, is mixed with var. *diffusissima* (Ohwi) Veldk. in B and K, and with *Poa borneensis* in L.

Clemens 30312 in L has some spikelets with 2 lemmas.

h. var. **remota** (Buse) Hoynck & Linden — **Map 1.**

Agrostis rigidula Steud. var. *remota* (Buse) Hoynck & Linden in Royen, Alp. Fl. N. G. 2 (1980) 1125, f. 365. — *A. stricta* Buse var. *remota* Buse in Miq., Pl. Jungh. (1854) 341, *comb. ill., epith. leg.*!; Miq., Fl. Ind. Bat. 3 (1857) 377. — T y p e: *Junghuhn s.n.* (L, holo, no. 908.76–441), Java, Manellawangee (= G. Pangerango), 9200 ped. (= 2805 m), August.

Agrostis stricta Buse in Miq., Pl. Jungh. (1854) 341; Miq., Fl. Ind. Bat. 3 (1857) 377; *non* Gmel. (1791). — *A. reinwardtii* Van Hall *ex* Buse in De Vriese, Pl. Ind. Bat. Or. 2 (1857) 98; Miq., Fl. Ind. Bat. 3 (1859) 750; Koord., Exk. Fl. Java 1 (1911) 146; Back., Bull. Jard. Bot. Btzg. II, 12 (1913) 7; Hitchc., Brittonia 2 (1936) 117; Henr., Blumea 3 (1940) 436; Jansen, Reinwardtia 2 (1953) 225; Niles & Chase, Index 1 (1962) 95; Monod de Froideville in Back. & Bakh. *f.*, Fl. Java

3 (1968) 524; Walker, J. Ecol. 56 (1968) 450, f. 4; Henty, Bot. Bull., Lae 1 (1969) 25. — T y p e: *Junghuhn s.n.* (L, holo, no. 903.342–99), Java, in planitie centrali cacuminis supremi montis Manellawangee (= G. Pangerango), April.

Deyeuxia javanica auct. non Boerl.: Rendle, J. Bot. 63, Suppl. (1925) 127, *p.p.* — *A. sumatrana* Mez in Fedde, Repert. 17 (1921) 147. — *A. infirma* Buse var. *sumatrana* Jansen, Reinwardtia 2 (1953) 225, see note. — T y p e: *Forbes 2442* (B, holo, *n.v.*; BM, L), Sumatra, Palembang, in sandy ash from vulcano, foot of cone of Mt. Dempo, 9000 ft (= 2745 m), 1881.

Agrostis steenisii De Wit *ex* Jansen, Reinwardtia 2 (1953) 226. — T y p e: *Van Steenis 8624* (BO, holo, *n.v.*; K, L, NY), Sumatra, Atjeh, G. Leusir, Middentop, aloer bij Bivak 6, langs de beekwand, 3250–3500 m alt., 3 February 1937.

Agrostis infirma auct. non Buse: Ridl., J. Fed. Mal. St. Mus. 8 (1917) 127, pro *Robinson & Kloss 95*; Back. in Heyne, Nutt. Pl. (1927) 261, *p.p.*; Handb. Fl. Java 2 (1928) 208, *p.p.*

Agrostis rigidula auct. non Steud.: Ridl., J. Fed. Mal. St. Mus. 8 (1917) 127.

Agrostis tenuis Sibth. var. *aristata auct. non* Druce: Chase & Niles, Index 1 (1962) 95.

Diagnosis after Hoynck van Papendrecht & Linden, msc.

Blades 1.5–4 mm wide, smooth to scabrous. *Panicle* contracted to effuse, branches appressed to patent, usually smooth, lowermost longest up to 11 cm long. *Spikelets* (2.25–)3–4.5(–5) mm long. *Lemma* 1.75–3 mm long, Trichodium-net well-developed; callus hairs 0.1–0.3 mm long; awn usually well-developed, then 2–5.5 mm long, inserted at 0.33–0.75th of the lemma. *Palea* 0.2–0.4 mm long, 0.07–0.2(–0.25) times as long as the lemma. *Anthers* (0.7–)0.9–1.4(–1.55) mm long, (0.32–)0.4–0.8 times as long as the lemma.

D i s t r i b u t i o n. Malesia: Sumatra (Aceh: Laut Pupanji, Goh Lembuh, G. Angasan, G. Kemiri, G. Bandahara, G. Mamas, G. Leusir; West Coast: G. Ophir, G. Singgalang, G. Merapi, G. Kurinci, Danau Swamp; Palembang: G. Dempo), Java (West: G. Gede, G. Pangerango, G. Patuha, G. Papandayan, G. Tankuban Prahu; Central: G. Sumbing; East G. Hyang, see note), New Guinea (Irian Jaya: Mt. Carstensz, Lake Habbema, Mt. Wichmann, Mt. Wilhelmina; Papua New Guinea: W. Sepik: Star Mts.; Enga: Lake Iviva, Yobobos grasslands, Sugarloaf, Yogos, Tambul; W. Highlands: Burgers Mt., Sirunki, Kepaka, Mt. Hagen, Mt. Kegum, Tomba, Mt. Kinkain; S. Highlands: Mt. Giluwe, Lake Onim, Ialibu-town; Chimbu: Mt. Wilhelm, Mt. Kerigomna; E. Highlands: Mt. Michael, Mt. Otto, Mt. Piora; Madang: Mt. Abilala; Morobe: Mt. Saruwaket, Samanzing, Sattelberg; Central: Wharton Range, Mt. Strong, Kosipe Swamp, Neon Basin, Mt. Albert Edward, Mt. Victoria, Lake Myola, Mt. Kenive; Northern: Mt. Suckling; Milne Bay: Mt. Ganaina.

E c o l o g y. Subalpine grasslands in many associations, on Mt. Wilhelm a differential for short-grass bogs, but also in *Deschampsia*-communities, pioneering on landslides, fallow gardens, etc. Usually above 3000 m to 4500 m on Mt. Wilhelmina, sometimes as low as 1375 m in the Danau Swamp, Sumatra.

C o l l e c t o r ' s n o t e s. Tufted, tussock-forming. Culms green to dark purple, nodes dark red; blades pale to midgreen to straw-coloured. Inflorescence green, red, maroon, purple, red-purple, crimson-brown, brown in fruit. Anthers purple (but also yellow JFV). Stigmas purple.

V e r n a c u l a r n a m e s. Sumatra: *pupaddi* (Palembang); New Guinea: *angimiu* (Mairi, Monod), *aminmiakul* (Chimbu, Masul), *era* (Onim), *kuilkal* (Waghi, Minj; Hagen, Toboga), *naminamisi* (Dunantina; Asarao, Kefamo), *pa'u* (Enga, Poio), *tan*

(Enga, Kepilam), *tini* (Mendi), *undi* (Kaugel, Medpla: *'wife of engil yambo koga'* = *A. avenacea*).

N o t e s. As Buse published *'Agrostis (Trichodium) strictum'*, it has been suggested (e.g. by Chase & Niles, 1962) that this combination was based on *Trichodium strictum* (Willd.) R. & S. This, however, is not the case. For one thing Buse gave no reference at all to previous names and for the distribution only gives 'Java', for another several of his type specimens ('specimina authentica') were later variously annotated 'non Trin.', 'A. adstricta, cum jam diversa species a Trinio, A. stricta dicta sit', 'Agrostis stricta mihi. Serius nomen matatum in A. reinwardtii', 'Buse ... speciei auctor.' *'Trichodium'* is not a reference to a basionym, but an indication of the infra-generic affinity of the species.

There is a possibility that the name for the variety employed here is not the correct one under the rules recently (1981) adopted in Sydney. If my notes serve me right the new version of Article 26.2 will more or less be:

'The first valid publication of a name of an infraspecific taxon which does not include the *correct* name of the species automatically establishes the name of another taxon at the same rank, which includes *the name* of the next higher taxon *in the classification adopted by the author in that publication*. The name thus automatically established (autonym) has as its final epithet of the name of that next higher taxon. An autonym is accepted as dating from the first valid publication of a name of another taxon, whether or not the autonym appeared in print at that time. An autonym will automatically acquire priority over the name of equivalent rank.' (Italics mine).

At first sight the solution is simple: *A stricta* was published simultaneously with a non-typical variety *'remota'*. The typical variety was given no name, but a var. *stricta* was implicitedly created, which name has priority. If we regard the whole lot as a variety of *A. rigidula*, the correct combination would then be *A. rigidula* var. *stricta* (Buse) *comb. nov.*

In the present case, however, *A. stricta* is a later homonym of *A. stricta* Gmel., and the question is how one should interprete the requirement of Art. 26.2 (and similar ones dealing with autonymy) that only *correct* names can have subordinate autonyms. What is 'correct'? If this is defined according to Art. 6.5, *A. stricta* Buse cannot establish autonyms, for to be correct a name has to be legitimate, which *A. stricta* Buse is not.

The problem is compounded by the fact that 'correct' is a matter of taxonomic interpretation. Here I regard *A. stricta* Buse as a variety of *A. rigidula*, but it has long been regarded as a distinct species, *A. reinwardtii*, and may turn out to be actually a form of the wide-spread *A. canina* Linné. So at one time one of these three names has been correct, but the other two not. Would the autonyms established under the last two then just vanish? Of course not: once valid, always valid, once legitimate, always legitimate (unless we change or bend the rules). The new Article 32.6 states 'The sole requirement for autonyms ... to be validly published is that the corresponding ... species name must be validly published'. *A. stricta* Buse is valid, the varietal epithet *'stricta'* therefore also.

In the new Art. 26.2 I think one should read some of the words italized by me together: 'correct in the classification adopted by the author in that publication'. This is of course not exactly what the Article states, but in the present case the next higher taxon is the species and it may serve to understand the intention better. Is 'correct' here then still to be read as defined by Art. 6.5? If so, *A. stricta* Buse cannot have valid surbordinate autonyms.

May we weaken this sentence to 'the name (used) in the classification adopted by the author in that publication'? Then the combination *A. stricta* Buse var. *stricta* is valid, and Art. 68.2 (also invoked to create the combination *A. rigidula* var. *remota*) applies. The varietal epithet '*stricta*' is then legitimate and the combination *A. rigidula* var. *stricta* (Buse) *comb. nov.* is required.

It may be noted that no qualification at all is made in the Article about the nomenclatural status of 'the name of the next higher taxon', except that Art. 6.6 requires it to be valid. That it is the species here is fortuitous.

It seems to me that 'correct in the classification etc.' is the better interpretation for the following thought: suppose that, for the sake of argument, *A. stricta* Gmel. would be a correct name and that we in 1982, so after 1854, would want to divide the species into varieties, what would then be the correct name of the typical one? From the above arguments it might be concluded that *A. stricta* Gmel. var. *stricta* would be a later homonym. This would seem a most undesirable exception to the rule of autonymy and such an interpretation should be untenable.

I have therefore assumed that *illegitimate* names should not be able to spawn valid (for then the epithets would still have priority in homonymy) or legitimate autonyms, and have retained the present combination.

Agrostis sumatrana Mez, or *A. infirma* Buse var. *sumatrana* (Mez) Jansen, and *A. steenisii* Jansen differ mainly from the Javanese plants by having more or less scaberulous branches in the inflorescence. *A. steenisii* seems to be a high-altitude form with subulate, pungent leaves. These forms do not seem to warrant a separate status.

This variety has also been found on the Hyang-Plateau, E. Java, where one would expect to find the vicarious var. *rigidula*; only as there are three collections of it (*Koorders 37587, 43416, 43549*, L) mislabeling must be ruled out.

In New Guinea the variability is greater than in West Malesia making delimitation against var. *rigidula* even more difficult. The best characters are the size of the spikelet, of the anthers, and the presence of an awn, although it is occasionally virtually absent and appressed against the lemma so that it may easily be overlooked. As we have been unable to find any difference between the plants from West and East Malesia a very curious disjunct distribution cut in half by that of var. *rigidula* must be accepted for which no really good explanation can be given. A few collections have been made of var. *rigidula* (*q.v.*) in Papua New Guinea.

6. Agrostis stolonifera Linné

var. **ramosa** (S. F. Gray) Veldk., *comb. nov.*

Vilfa alba (Linné) Beauv. var. *ramosa* S. F. Gray, Nat. Arr. Brit. Pl. 2 (1821) 145. — *Agrostis gigantea* Roth var. *ramosa* Philipson, J. Linn. Soc. London, Bot. 51 (1937) 91, t. 9, f. 19, *nom. superfl.* — T y p e: Not indicated and according to Philipson not preserved. The type of the next name might be appointed as lectotype.

Agrostis gigantea Roth, Tent. Fl. Germ. 1 (1788) 31; Bor, Grasses (1960) 387; Hultén, Fl. Alaska (1968) 100; C. E. Hubb., Grasses, ed. 2 (1968) 303, fig.; Widén, Fl. Fenn. 5 (1971) 66, f. 29; Kerguélen, Lejeunia n.s. 75 (1975) 64; Tutin, Fl. Eur. 5 (1980) 234. — *A vinealis* Schreb. var. *gigantea* Willd., Sp. Pl. 1, 1 (1797) 369, *non A. stolonifera* Linné var. *gigantea* Gaud. *ex* Schübler & Martens, 1834. — T y p e: *Roth s.n.* (B, holo, †, G, *n.v.*, but cf. Widén's fig. 29; L), Europe, 'habitat inter arundinum et salices ad ripas Visurgi Ducatus Bremensis'.

Agrostis alba auct. non Linné: Buysman, Teysmannia 23 (1912) 768; Merr., Enum. Philip. Fl. Pl. 1 (1923) 81; Back., Handb. Fl. Java 2 (1928) 209.
Agrostis infirma auct. non Buse: Ridl., J. Fed. St. Mus 8 (1917) 127 pro Robinson & Kloss 112.
Agrostis stolonifera auct. non Linné: Henr., Blumea 3 (1940) 438; Monod de Froideville in Back. & Bakh. *f.*, Fl. Java 3 (1968) 524; J. M. B. Smith, New Phytol. 84 (1980) 566.

For further nomenclatoral references see Philipson, Kerguélen, and Widén.

The following description has been based on Malesian specimens, only.

Perennial, branching intra-vaginally at base and with extravaginal stolons bearing up to several cataphylls, rhizomes absent, glabrous. *Culms* up to 90 cm high, decumbent at base and rooting in the lower nodes. *Sheaths* smooth; uppermost *ligules* triangular, up to 9 mm long, acutish, scarious; *blades* erecto-patent, flat, up to 26 cm by 9 mm, scabrous. *Panicle* ± contracted to somewhat loose and lobed, up to 32.5 by 5.5 cm; branches scabrous, loosely appressed to erecto-patent, the lowermost 5–many together, the longest (3–)7–15.5 cm long, many-spikeled, usually from the base on. *Spikelets* (2–)2.5–3 mm long. *Glumes* ovate-lanceolate, the lower longer than the upper. *Rachilla* process usually absent, exceptionally *c.* 0.2 mm long, glabrous. *Lemma* (1.7–)2–2.25 mm long, 0.8–0.9 times as long as the lower glume, faintly 5-nerved at base, apex acute to erose, Trichodium-net absent; callus oblique, small, glabrous or with up to 0.2 mm long hairs; awn absent or as a minute tooth in the upper 0.5–0.9th part of the lemma. *Palea* (0.9–)1.1–1.6 mm long, (0.55–)0.6–0.7 times as long as the lemma. *Anthers* (1.1–)1.25–1.6 mm long, 0.55–0.75 times as long as the lemma.

Distribution. Northern hemisphere in temperate or mountainous zones, Malesia: Sumatra (W. Coast: G. Kurinci), introduced elsewhere, e.g. in Malesia: Java (East: G. Tengger), Borneo (Sabah: Mt. Kinabalu), Philippines (Luzon: Mt. Santo Tomas).

Ecology. In Malesia in disturbed grassy areas, 1500–3300 m alt.

Note. This taxon is in recent literature usually referred to as *Agrostis gigantea* Roth. The differences between this and *A. stolonifera s.s.* can, however, not be found in the spikelets, as is usual in grasses, but in their habits only. The present form has a more effuse panicle, somewhat broader leaves with rather long ligules, and more than 3 cataphylls on the stolons when these are well-developed, it would also be a hexaploid (2n = 42 + 0–4 B, cf. Tutin, 1980). *A. stolonifera* is most commonly a tetraploid (2n = 28) but the numbers 30, 32, 35, 42, 44, 46 are also reported. I am not satisfied that species should be distinguished on such meager grounds and suspect that perhaps chromosomal races are involved. As I moreover wanted to keep this account balanced, distinct species could not be accepted when varieties are recognized in *A. rigidula* Steud. which differ more between themselves than these 'species'.

Apparently the oldest epithet which can be used under *A. stolonifera* is *'ramosa'*. On the varietal level *'gigantea'* was used by Willdenow before, but cannot be used because of the heterotypic *A. stolonifera* var *gigantea* Gaud. *ex* Schübler and Martens. It is of course quite possible that in the involved literature of European accounts an older epithet than the one employed here is present, but I have not been able to find any which with certainity can be applied.

In older literature this taxon has usually been called *A. alba* Linné, but as has been said in the introduction that name is typified by a *Poa*.

Because it was already collected in 1914 in Sumatra the variety is probably native there. Elsewhere all authors have suggested that it was introduced (e.g. Merrill, 1923, Henrard, 1940, Smith, 1980). The Sumatran collections are the only Malesian ones I have seen with fruits.

In L there is a specimen (*no. 910.91-878*) labeled '*Agrostis gigantea* Roth *variet. Agros. albae, ab ipso Roth*' in the same handwriting as on the isotype in G (cf. Widén, 1971, fig. 29, of it), it is therefore probably an isotype.

SPECIES EXCLUDENDAE

A great number of combinations have been made in *Agrostis* for species which since long have been transferred to other, sometimes quite unrelated genera. It seemed superfluous to enumerate these here. Three species still regarded to belong to *Agrostis* proper have been reported for Java by Buysman (Teysmannia 23, 1912: 768), who cultivated them in his acclimatization garden in Nongkojajar, where they then prospered. *Agrostis alba* Linné [= *A. stolonifera* Linné var. *ramosa* (S. F. Gray) Veldk.] may have escaped from there as was suggested by Henrard (Blumea 3, 1940, 438) and persisted, of the other two I have not seen any material: *A. canina* Linné and *A. vulgaris* With., formerly also known as *A. tenuis* Sibth., but better called *A. capillaris* Linné.

IDENTIFICATION LIST

The numbers refer to the taxa in the preceding enumeration. Numbers between brackets refer to collections mentioned in literature but not seen of which the identity seemed certain. Unnumbered collections have not been included.

ANU 456 (Walker): 1; 477 (id.): 1; 567 (id.): 5h; 697 (id.): 5a; 2012 (Flenley): 1; 5007 (Walker): 5h; 5123: (5h); 5142 (Walker): 5h; 7058 (McVean & Wade): 5h; 7247 (id.): 5h; 7429 (id.): 5h; 7430: 5h; 10693: 1; 10740: 1; 10958 (Hope): 5h; 10981 (id.): (5h); 11317 (Hnatiuk): 5h; 13020 (Wace): 1; 13058 (id.): 5h; 15128 (Smith): 5h; 15139 (id.): 5h; 15333: 1; 15368: 5h; 15429: 1; 15577: 5h; 16440 (Garven): 5h; 28009 (id.): 5a; 28036 (Hope): 5h.

Backer 131: 6; 36066: 5a; Balgooy 431: 5h; 433: 5h; 489: 5h; 562: 5h; 675: 5h; 764-a: 5h; Bowers 132: 1; 309: 1; 404: 5h; 565: 1; 838: 1; 847: 1; Brass 4203: 5h; 4400: 1; 4783: 1; 9050: 5h; 9576: 5h; 10726: 1; 29949: 5h; 30777: 1; 31425: 5h; Brass & Collins 31004: 5h; Brass & Meijer-Drees 9674: 5h; 9717: 5h; 9821: 1; 9864: 5h; 9928: 5h; 9969: 1; 10064: 5h; 10069: 5h; 10116: 1; Breemen 52: 6; BS 4490 (Mearns): 5a; 8832 (McGregor): (5a); 31752 (Santos): 5a; 31828 (id.): 5a; 31912 (id.): 5a; 32687 (id.): 5a; 40221 (Ramos & Edaño): 5a; 40245 (id.): 5a; 40496 (id.): 6; 44984 (id.): 5a; 44998 (id.): 5a; 45101 (id.): 6; 45106 (id.): 5a; Bünnemeijer 857: 5h; 2777: (5h); 4758: 5h; 10050: 5h; 10052: (5h); 12208: 5a.

Chen 12: (5e); 48: (2); Chuang 2751: (5e); Clemens 48: 5a; 6114: 5h; 6919: 1; 7427: 5h; 7428-D: 5h; 8847-a: 5h; 9196: 5a; 9430-A: 1; 9509-A: 1; 9540: 5h; 9838: 5h; 9910: 5h; 10050: 5h; 10630: 5d/g; 10631: 5c; 27072: 5g; 27771: 5g; 27987: 6; 29167: 5c; 29167-A: 5c/g; 29167-b: 5c; 29167-d: 5g; 29175: 5d; 30273: 5d/g; 30312: 5g; 30438: 3; 30448: 5h; 33228 = 32327: 5d; 41958: 5a; 50914: 5d; 50982: 5d; Coert 34–80: 5a; Collenette 21511A: 5g; Cooper 15: 5h; Craig 90: 5h; Craven 2695: 5h; 2728: 5h; 2736: 5h; 2827: 5h; 2853: 5h; 2858: 5h; 3019: 5h; 3071-a: 5h; Cruttwell 1287: 5h.

DeVol 8271: (5e); Docters v. Leeuwen 13150: 5h; Docters v. Leeuwen-Reijnvaan 2127: 5a; 8746: 5h; 12242: 5a.

Elmer 6558: 5a; Engler 5023: (5h); 5133: (5a); Eyma 286: 5h; 654: 5a; 891: 5a.

Faurie 91: 2; 92: 2; 724: 5e; Forbes 2442: 5h; Forster F 42: 5d; F 43: 6; Fraser 47: 1; Fukuyama 3968: 5e; 4070: 2; 4072: 2; 4073: 5e; 4090: 5f; 4784: 5a.

Gilli 413: 1; Gillison 120-A: 5h; 315: 1; 396: 5h; 409: 1; 427: 5a; Gisius 6: 5a; Gressitt 428: 5e.

Haviland 1399: 5c; Hide 329: 1; Hitchcock 18136: 5a; Hochreutiner 266: 5h; 904: 5h; 916: 5h; 2461: 5a; 2617: 5a; 2659: 5a; 2711: 5a; Hoogland & Pullen 5264: 1; 5544: 5h; 5766: 5a; Hoogland & Schodde 6698: 1; 6743: 2; 7046: 4/5h; 7052: 1; 7513: 5h; 7579: 1; 7650: 5h; Hsu 845: (5b); 3266: (5f); 3541: (5b); 5945: (5a); 12143: (5a); 12621: (2); 12676: (5b); Hsu & Kao 139: (5e); Hsu & Kuoh 10814: (5e); Hsu e.a.13864: (5b).

Iwatsuki e.a. 1274: 5h.

Jacobs 7230: 5a; 7259: 5a; 7490: 5a.

Kalkman 4875: 1; Kanai 753607: 5h; Kawakami & Hayata 7062: (5e); Kawakami & Mori 2365: (5a); 2374: (5a); 7054: (5e); Kawakami & Sasaki 2: (5a); 3: (5a); Kjellberg 3035: (5a); Kleckham 22: 5h; Kneucker 856 (Merrill): 5a; Kokawa & Hotta 3447: 5d; 3510: 5d; Koorders 37587: 5a; 37588: (5a); 37590: (5a); 37593: 5a; 37602: (5a); 37603: (5a); 43416: 5h; 43499: 5a; 43545: 5a; 43549: 5h; Koorders 43814: 5a; Kuoh e.a. 7040: (5a); 7454: (2); 14131: (5b).

LAE 52272 (Stevens & Foreman): 5h; 55913 (id.): 1; 55964 (id.): 5h; 57032 (Andrew): 5h; 57048 (id.): 1; 57056 (id.): 1; 57102 (id.): 1; 57126 (id.): 1; 60536 (Croft & Lelean): 5h; 60689 (Croft e.a.): 5h; 61380 (id.): 5h; 61406 (Croft & Hope): 5h; 61936 (Croft e.a.): 1; 65135 (id.): 5h; 65137 (id.): 5h; 65192 (Croft): 5h; 65225 (id.): 1; 65916 (Croft & Hope): 5h; 66183 (Conn): 1; 67274 (Barker): 5h; 67325 (Barker & Umba): 5h; 67351 (id.): 5h; 68024 (Croft & Hope): 5h; Lörzing 2260: 5h.

MacKee 1189: 1; Matsuda 31: (5a); Z-21: (5e); Merrill 4538: 5a; 4542: 5a; 4711: 5a; 4728: (5a); 4812: (5a); 6483-a: 5a; 6492: (5a); 7650: 5a; 7653: 5a; 4729: 5a; 11711: 6; Phil. Pl. 192: 5a; 584: 5a; Meijer 1670: 5h; 3465: 5h; Molesworth-Allen 3288: 5d; Mori 14861: (5f).

NGF 5121 (Womersley): 1; 5985 (McGrath): 5h; 6090 (Womersley e.a.): 1; 8838 (Womersley): 5h; 15285 (id.): 5h; 16628 (Henty & Carlquist): 5h; 16656 (id.): 5h; 20957 (Henty & Galore): 1; 25096 (Gillison): 5a; 30014 (Royen): 5h; 30296 (Ridsdale): 1; 32545 (Coode): 1; 32960 (Coode & Katik): 1; 39564 (Vandenberg): 5h; 40204 (Coode): 5h; 40206 (id.): 5h; 40248 (Coode e.a.): 5h; 40250 (id.): 5h; 46183 (Coode & Stevens): 5h; 46215 (id.): 5h; 46227 (id.): 5h; 46245 (id.): 5h; Noona Dan Exp. 745 (Olsen): (5a).

Owhi 23: 2; 887: 2; 1868: 5a; 2008: 5e; 2030: 5e; 2031: 5e; 2034: 2; 2060: 5e; 2247: 2; 2372: 2; 2376: 5e; 2525: 5e; 2684: 5e; 3083-a: 5e; 3107: 5e; 3395: 2; 3396: 2; 3459: 5a; 3463: 5b; 3574: 5e; 3645: 2; 3657: 5e; 3727: 5a; 3881: 5a; 3936: 5a; 3943: 2; 3954: 5e; 4052: 5a; 4147: 5f; 4220: 5a; 4273: 5b; Okamoto 28: 5a/b; Ooststroom 13336: 5h.

Palmer & Bryant 959: 5h; Paijmans 1292: 1; 1370: 1; PNH 7919 (Celestinó): 5a; Price 805: 5e; 994: 5a; 1004: 5a; Pulle 1048: 5h; 4197: 5h; Pullen 327: 1; 337: 5h; 362: 1; 2705: 5h; 2862: 5h; 5094: 5h; 5131: 5h; 6076: 5h; Pijl 767d: (5a).

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