Arundinella (Gramineae) in Malesia with notes on other taxa and on aluminium accumulation

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Key words
aluminium accumulation
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Abstract
Arundinella Raddi (Gramineae) is revised for Malesia. There are seven species. A survey of the complicated taxonomic and nomenclatural history of the genus is given. A new species for Taiwan is described and notes are provided on sundry other ones. There is a key to the Malesian and some non-Malesian species. Some species are aluminium accumulators.

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HISTORY
The genus Arundinella Raddi (Gramineae) is a pan(sub) tropical genus with c. 50 species of which seven occur in Malesia. The first two species were described by Thunberg (1784a, b); Agrostis ciliata Thunb. and Poa hirta Thunb. Both are from Japan and belong to A. hirta (Thunb.) Tanaka.

Clearly, for a long time authors were at a loss about its taxonomic position. Arundinella species have been identified with at least Acratherum, Agrostis L., Aira L., Andropogon L., Anemagrostis Trin. (= Apera L.), Arundinaria Michx., Brandtia Kunth, Danthonia DC., Festuca L., Garnotia Brongn. (incl. Berghausia Endl., Miquelia Am. & Nees), Goldbachia Trin. (= Calamochloë Rchb.), Ischaemum L., Muhlenbergia Schreb. (incl. Trichochloa P.Beauv.), Orthopogon R.Br. (= Oplismenus P.Beauv.), Panicum L., Paspalum L., Piptatherum P.Beauv., Poa L., Thyssanachne C.Presl, Triquetum Pers., and possibly others, presently members of a wide array of subfamilies and tribes.

Willemow (1806: 908) described Andropogon hispidus Humb. & Bonpl. from Cumana (Venezuela), now Ar. hispida. Kunth (1822) called it with some doubt Ischaemum hispidum (Willd.) Kunth, where reference is made to ‘I. p. 194’, presumably an error for Kunth (1816: 165).

Trinius (Jan. 1821) was the first to distinguish it as a distinct genus, Goldbachia, followed by an assortment of species of Panicum L. The only species was G. mikanii Trin. from Brazil (= A. mikanii (Trin.) Nees = A. brasilienensis Raddi), which is an earlier homonym of Goldbachia DC. (20 Apr. 1821a, late May 1821b) (Cruciferae), but because the latter name was better known it has been conserved. The genera were named after Karl Ludwig Goldbach (1793–1824), student of Crocus L. and medicinal plants in Russia (Backer 1936: 238). Trinius apparently corrected his G. mikanii to Riedelia mikanii Trin. in letters to Nees (1829: 465) and Kunth (1833: 515). Nees cited it under A. mikanii, a superfluous name, as he also cited Ischaemum hispidum (Willd.) Kunth (1816: 165), now A. hispida (Humb. & Bonpl. ex Willd.) Kunthte. However, in 1826 (p. 62) Trinius already had reduced it to Ar. brasilienensis. Erroinously so, as he also cited the older Andropogon hispidus Willd., which epithet he should have used. Here he described four species between the panicoids Melinis P.Beauv. and Pennisetum Rich.

Raddi (1823) proposed Arundinella, based on A. brasiliensis Raddi (= A. hispida), a S American species, but a name much applied to Old World taxa, in Malesia for instance to A. filiformis Janowski and A. goerigii Steud.

Schultes (Jan.–Apr. 1824: 209) described Trichochloa beteroniana from Santo Domingo. The generic name is a synonym of Muhlenbergia, the species is now A. beteroniana (Schult.) Hitchc. & Chase (1917: 290, Janowski & Mez 1921: 85, isonym). Synonyms are Muhlenbergia beteroniana (Schult.) Kunth (1830: 209), Ischaemum peruvianum (J.Presl) Kunth (1834: xii), and Thyssanachne peruviana J.Presl (in Presl 1830: 253).

Sprengel (late 1824: 278, 287) added some additional confusion by transferring Raddi’s Arundinella brasiliensis to Aira brasiliensis (non A. brasiliensis Raddi 1823 = Sporobolus brasiliensis (Raddi) Hack.) and described a new one as Andropogon virens, respectively. Both are synonmys of Ar. hispida.

Link (1827) created Acratherum based on Ac. milieum Link (= Ar. nepalensis Trin.) from Nepal. Acratherum is ‘οξπος’, api cal, ‘οηδης, awo: the awned upper lemma (Backer 1936: 5). He included this in an ambiguously defined ‘subordo’ (= 7 tribe) Triesteogineae. See note below.

Reichenbach (1828) also was aware of the homonymy of Goldbachia, but not of the exact dates and he proposed Calamo chloë without specific combinations (καλαμος, reed, χλωρος, grass). He included it in the Saccharineae – Triandrae, which contained many andropogonoid genera. Not so bad an idea, as it has turned out.

Nees (< 21 Mar. 1829) regarded Arundinella as close to Gy nerium P.Beauv. of the ‘Arundinaceae’.

Thysanachne C. Presl (30 May 1829) was based on T. scoparia from Martinique, which is a synonym of A. hispida. Thysanachne (θυσανος, brush, ‘αχνη, chaff) refers to the hairy glumes (Backer 1936: 585). It was included in the ‘Bromaceae’.

Agrostis ciliata was renamed to Festuca thebangerii by Kunth (Oct. 1829: 133), a name change required because of the earlier use of Ag. ciliata by Goüan (1762: 48, 547). The later description by Kunth (1833: 412) was based on a Burman specimen (now in G?) and mentioned 3-flowered spikelets, suggesting that it could not have been an Arundinella.

Brandtia Kunth (1831) was based on B. holocoides Kunth (= A. holcoide (Kunth) Trin.) from Pegu, Burma, and honoured...
Johann Friedrich (von) Brandt (1802–1879), co-author of a work on German poisonous plants. Kunth regarded Brandtia as close to Eriachne R.Br. and in 1833 as part of the ‘Avenaceae’ between Danthonia DC. and Eriachne. He expressed doubt, however, whether it belonged to this ‘section’. In 1833 he had Goldbachia as a synonym of Ischaemum hispidum of the Andropogonaceae.

Steudel (1854a: 114–116) using a manuscript by Nees enumerated 30 spp. of Arundinella and one of Brandtia in the Paniceae. Pfiiffer (1870) included Arundinella and Brandtia in the Paniceae.

Debeaux’s Chalynochlamis Franch. (1879) was a nomen nudum. Keng (May 1936: 12) reduced it to Arundinella subg. Chalynochlamis, but this is invalid as there was no Latin description. The only species cited is Ch. anomala Franch., in synonymy under A. anomala Steud. (= A. hirta). The derivation was not explained, possibly it is from χαλινος, bridle or bit, and χαλινος, mantle, but this allusion I do not understand. Debeaux also cited as a synonym Paspalum mandschuricum Maxim. which is a new (invalid) combination, perhaps a slip of the pen for Panicum mandschuricum Maxim. (1859: 328) (‘une excellente description’).

Bentham (1881: 85) included the genus in the Tristeginae and regarded Nees’s ‘sections’ as ‘not well defined’. He repeated this in 1883.

Hackel (1887, 1896) gave a better circumscription of the Tristeginae, but still included genera that we now consider to belong to several other (sub)tribes. This was more or less followed by Bentham (1883).

Stapf (1898), without any explanation, erected the tribe Arundinelleae with Arundinella, Trichopteryx Nees, and Tristachya Nees, next to the Aveneae Dumort. in the Pooidae and this tribe has been generally accepted since, but with varying contents and position.

Janowski & Mez (1921) gave no indication that Stapf had done so and created the Arundinelleae again. Mez is cited as the author by Janowski (1922: 21). She recognised 50 species and five uncertain ones worldwide. According to Mez’s manuscript of the Panicaceae in B for the Pflanzenreich (photocopy in L) he did not consider it to belong there.

The problem with Janowski’s treatment is that she based it mainly on material available in Königsberg (now Kaliningrad, KLGU, destroyed), B (destroyed, Dr. H. Scholz, in litt.) and only a few specimens in M that I have seen.

Hubbard (1936: 317) noted that the Tristeginae ‘should not include Arundinella and its allies. The latter form a very natural group which may be distinguished from Melinis related genera, etc.’.

Keng (1936) in a very important revision for Asia described 32+ species in the Panicoideae.

Herter (1940: 136) proposed the Arundinelleae (Stapf) Herter and Tristeginae (Link) Herter. These are not alternative names as they have different types (Arundinella, Tristegis Nees, respectively) but are not validly published under Art. 34.2. It may be argued that according to the ICN (McNeill et al. 2012) Art. 34.1(a) and perhaps (c) apply as it would seem that he did not accept his own Tristeginae referring it (‘v.’ for ‘vidé’, ‘see’, and not ‘vel’, ‘or’) to the Arundinelleae.

Pilger (1954: 326) included the Arundinelleae in the Festucoideae between the Arundineae Rchb. and Thysanolaenae C.E.Hubb. This position seems to have been accepted by Bor (1955: 378, 1960: 417). In 1955 the Arundinelleae are in the Pooidae (the correct name for the Festucoideae), but because in 1960 the sequence of the tribes is alphabetical, no further affinity can be deduced. He here revised the 23 species of India, Burma, and Sri Lanka and this is the most recent important work for that area. It was more or less extracted and copied by Moulik for India (1997: 54–62), who had 21 species.

Bor did mention Keng’s publication, but did not comment on his classification, nor provided one of his own.

Conert (1957) in a purported world revision saw material from B and K, apparently very little judging from the specimens he cited, and he had only 23 species, not because he reduced so many of the ones that Bor (1955) had recognised for India (also 23, but not the same ones!). Remarkably, he did not refer to Janowski (1922), nor to Keng (1936).

Phipps started a revision of the Arundinelleae (1964–1972, see also Li et al. 1966, Correira et al. 1967, Li & Phipps 1973) but unfortunately had to direct his attentions elsewhere. He (1966b: 241–244) gave a survey based in literature with 48+ species, and an infrageneric classification (1967a) with 47.

Clayton & Renvoize’s (1986; repeated in Clayton 1989) comments on the Arundinelleae are noteworthy: “The tribe suffers from an overabundance of potentially significant generic characters which occur in a bewildering number of different combinations. Consequently there is considerable disagreement over generic limits, and a variety of alternative treatments may be found.”

Of importance to the Malesian region is also the account of the four species in Australia by Simon (1983). Two are endemics of Queensland, A. grevellensis B.K.Simon (1983) and A. montana S.Blake (1941), and one is A. nepalensis Trin., which would then be one of very few species that have ‘jumped over’ Malesia. Ominous is his remark: “All three species are almost identical in their spikelet morphology, and differ only by vegetative characters.” The fourth species is A. setosa Trin., also found in West Australia and the Northern Territory.

For Thailand Nanakorn & Norsangsri (2001) enumerated 9 species; A. kokutensis Teerawat. & Sungkaew (in Teerawatanon et al. 2010) and A. kerrii Teerawat. & Sungkaew (in Teerawatanon et al. 2011) have been added since.


Recent chemical / molecular research has been summarised by Teerawatanon et al. (2011). They concluded that Arundinella was best regarded as the sole genus of the subtribe Arundinelinae (Stapf) Honda, sister to or basal in the Andropogonae Dumort.

The nomenclatural status of Tristeginae

Link (1827: 230) described the ‘subordo’ (= ? tribe) Tristeginae (‘Tristegiae’). Nees (1837: 237) is usually cited as the author of the tribe, but he did attribute the name to Link and it is merely a literature reference and not a nomen nudum as is often stated. The name has been widely used in agrostological literature of the 19th to the mid 20th centuries, if it was not rejected because Tristegis (Nees 1820: 47, 54) was included in the Paniceae R.Br. (1814: 582). Yet, all suprageneric names derived from Tristegis Nees are illegitimate, as this is a superfluous name for Saurdia Schrank (1820: t. 58) (Art. 19.5). This is considered to be a synonym of Melinis, and so, taxonomically, the correct tribal place for it is in the Melinideae Hitchc. (1920: 18). This seems to have been noted only by Clayton & Renvoize (1986: 295) and Soreng & Pennington (2003: 628).

Bor (1955: 378) regarded Link’s circumscription of the tribe as “sufficiently nebulous as to embrace genera which did not easily fall into tribes or groups already described”. But this is a taxonomic complaint, the type method makes the application clear.
Clayton (1981) proposed to reject all suprageneric names published by Link as they would be “wholly interpretable as to the category intended”. An example is the attribution by Soreng & Pennington (2003: 628) of the tribe Tristeginae to Bentham (1883: 1075, 1080, 1118) and the subfamily Tristeginoideae to Link.

Harvey (1868: 428) described the subtribe Tristegininae (‘Tristeginae’) in the Paniceae.

The Tristeginaceae Herter has been mentioned above.

**Infrageneric classification**

Nees (1837) without any elucidation recognised two subgenera: subg. Acratherum (Link) Nees (for Ar. glabra Nees), a species without setae lateral to the awn, typified by Ac. milicaceum Link (= Ar. nepalensis), and subg. Miliosaccharum Nees (with Ar. nervosa (Roxb.) Nees) for species with them.

Bentham (1881, 1883) commented that these were “not well defined”.

Janowski (1922) did not give any infrageneric classification.

Keng (May 1936) in a study of Asian species recognised 4 subgenera. Their diagnostic characters were given in a key:

2. Subg. Chalynochlamis (Franch. ex Debeaux) Keng. Awn of fertile lemma absent or minute, callus hairs 0.33—0.67 times as long as the lemma. — Described on p. 12, but the basionym originally was mentioned in synonymy, and here there is no Latin diagnosis as is required after 1 Jan. 1935, hence it is invalidly published. — Voucher: A. anomala (= A. hirta).
3. Subg. Arundinella. Awn of fertile lemma present, goniulate, if absent, callus hairs less than 0.25 times as long as the lemma, without lateral setae (sometimes present in A. hookeri Munro ex Keng). — Further description absent. — Type: Arundinella brasilienis was not treated by Keng as it is an American species. Arundinella glabra, the type of subg. Acratherum, is cited under A. nepalensis, but the autonym has precedence.

Conert (1957: 332) remarked “A subdivision of the genus in sections according to the characters of the lemma of the upper flower (awn and lateral lobes) can equally not be realised.”

Phipps (1967a) distinguished 15 series and observed that none is very distinct from the one most similar to it. He judged that Keng’s subgenera were based on too few characters, yet that they were useful for main divisions in a key. Although subgeneric epithets were available, he used new ones, which, as they are on the series level, is permissible. Only ser. Nepalenses J.B.Phipps must be rejected, as the autonym Arundinella is required here.

It is of course beyond the limited scope of this paper to comment pro or contra an infrageneric classification.

**Variability**

Bor (1955: 406) exclaimed “the variation exhibited by this species is so fantastic that one would, in despair, give up hope of dealing with it in a rational matter”, and elsewhere (p. 409) “as with most species of Arundinella the search for stable characters, whereby some of the forms could be separated as good varieties, has been in vain.”

Conert (1957: 331) observed “The species of Arundinella are—with few exceptions—difficult to delimitate against one another. The morphology of the spikelets is identical in many species and the other characters ... are very variable”.

Phipps (1966b: 240—241) wrote “The complex of A. hispida-A. nepalensis and allies is in a state of serious taxonomic confusion. At the level of spikelet morphology, at least, Arundinella is a genus with little diversity. The taxonomy is weakest for South-East Asia.”

Simon (1983: 463—464) in a similar vein remarked about the species of Australia “All three [of the four, incl. A. setosa] species are almost identical in their spikelet morphology, and differ only by vegetative characters.”

These cries of despair, frustration, impotence, and irritation came to mind during the present study. When in the beginning I was dealing with forms of what I initially called the A. holcoides group it appeared that there were a number of local populations more or less quite distinct and differed from each other sufficiently to be called ‘species’. However, when studying the Burmese A. birmanica and A. holcoides which Bor (1955: 385, 1960: 421) had kept separate, but apparently with some doubt, even with the few specimens available these two turned out to be indistinguishable, as he already had predicted (1955: 413). When the resulting description was analysed with DELTA another ‘species’, now from Celebes, showed no significant differences, only some extension of ranges in variability of some parts, and when that one was added, one after another fell into a veritable botanical black hole, whereby in this treatment A. holcoides is regarded as a species with a disjunct distribution in W Bengal and C and S Burma, then in S Vietnam, and in Malesia in the Philippines (Luzon, Mindoro, Palawan) and SW Celebes. The only one that remained unscathed is the new A. taiwanica Veldk.

**Aluminium accumulation**

*by B.J. van Heuven & J.F. Veldkamp*

Aluminium accumulators are apparently very exceptional in grasses. Yoshii & Jimbo (1932) tested 31 species, mentioning only Miscanthus sinensis Andersson by name. Chenery (1949) sampled 15 and Webb (1954: 16) from New Guinea and Australia. Unfortunately, because they had no positive results they all omitted to mention which species had been studied. A rather recent general survey of Al-accumulation is by Metali et al. (2012).

The first positive report for a grass was by Chenery in Bor (1955: 414) for A. fusca Nees ex Buse (as A. purpurea Hochst.). A few other species have become known since, e.g. *Paspalum notatum* Flüggé (Huang et al. 2009), *Sporobolus indicus* L. (Br. var. capensis Engl. (as S. africanus (Poir.) Robyns & Tourna) (Anonymous on the internet). Chysopogon zizanioides (L.) Roberty (Luque et al. 2006) apparently takes up Al relative to the amount present in the substrate. On the internet a Setaria species is mentioned, but we failed to find out which one.

Curiously, Chenery noted that A. fusca auct. (? = A. goeringii), which Bor cited as a synonym, is not an accumulator. This is another example of the confusion around the application of A. fusca.

We tested a number of Arundinella specimens for accumulation of aluminium using the procedure of Chenery (1948). Specimens and results are listed in Table 1. The degree of discoloration was assessed by several people independently. Discolouration occurred in nearly all samples and may be due to the extraction of other substances. Only a few samples were decidedly positive (++ in Table 1).
There is no obvious correlation between aluminium accumulation and the taxonomic groups distinguished by Keng (1936) and Phipps (1967a). Obviously, because the sample is so small while it is unknown how variable Al-accumulation is, this is only a pilot project inviting more extensive study both in Arundinella as well as in other grasses. Causes for variable results may be due to climate, season, soil, genetic inclination, part of the plant sampled, etc.: some species are active accumulators (e.g. Symplocos spp., Symplacaceae, or Xanthophyllum spp., Polygalaceae), but others may be passive, e.g. Chrysopogon zizanioides.

**ARUNDINELLA** Raddi, nom. cons.

Arundinella Raddi (1823) 63, t. 1, f. 3; Janowski (1922) 21; Keng (1936) 1; Bor (1955) 377; Phipps (1966b) 235; 1047 [incl. ser. Nepalenses J.B.Phipps: 1048, nom inval.]. — Type: Arundinella brasiliensis Raddi (= Arundinella hispida (Humb. & Bonpl. ex Willd.) Kunz).

Goldbachia Trin. (Jan. 1821) 81, nom. rej.; J.B.Phipps: A. setosa (Davidse & Sumithraarachchi 8597) Arundinella brasiliensis (Raddi ser.) +

Acathrum Link (1827) 230. — Arundinella Raddi subg. Acathrum Nees (1837) 237. — Type: Acathrum miliaecum Link (= Arundinella nepalensis Trin.).

Brandtia Kunth (1831) 511, t. 170. — Type: Brandtia holocoides Kunth (= Arundinella holcoides (Kunth) Trin.).


Annuals or perennials. Culms hollow. Ligule a membranous truncate collar, margin ciliolate to glabrescent. Blades linear-lanceolate to linear. Inflorescence paniculate. Pedicels distinctly unequal. Spikelets quaquaversal, paired, laterally compressed, 2-flowered, lower floret sterile, male, female, or bisexual, upper floret (usually bisexual) dehiscent. Glumes unequal, longer and thinner than the upper lemma; lower glume 1–5-nerved; upper glume as long as the spikelet, 1–7-nerved. Rachilla process absent. First lemma 1–7-nerved, similar to the upper glume, epaleate or paleate, sterile, male, female, bisexual; second lemma indurated at maturity, deciduous, callus glabrous or puberulous, apex entire or 2-dentate, awned from the acumen or sinus, smooth to scaberulous or papillose, very inconspicuously 3-nerved. Anthers 3, rarely 2. Styles 2. Hilum punctiform; embryo 0.33–0.5 times as long as the carpogynium. × = 6, 7, 8, 9, 10, 12, 17, 27.

Distribution — Pan(sub)ropical, c. 50 spp., 7 in Malesia; remarkably, it has only been seen once (A. goeringii) from Borneo and never from the Moluccas.

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### Table 1 Reaction with Alumino (− = no visible reaction; + slight reddish discoloration, ++ strong red discoloration). Taxonomic groups according to Keng (1936) and Phipps (1967a). All vouchers from L.

<table>
<thead>
<tr>
<th>Specimen</th>
<th>Discolouration</th>
<th>Taxonomic groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. filiformis (BS 1926)</td>
<td>–</td>
<td>Arundinella s.str.</td>
</tr>
<tr>
<td>A. furva (Marsden et al. 165)</td>
<td>++</td>
<td>Arundinella s.str.</td>
</tr>
<tr>
<td>A. fusca (Perrolet 1231)</td>
<td>++</td>
<td>Arundinella s.str.</td>
</tr>
<tr>
<td>A. goeringii (Backer 10546)</td>
<td>+</td>
<td>Arundinella s.str.</td>
</tr>
<tr>
<td>A. grandiflora (Delevay s.n.)</td>
<td>+</td>
<td>Arundinella s.str.</td>
</tr>
<tr>
<td>A. grevillensis (Telford 3240)</td>
<td>+</td>
<td>Arundinella s.str.</td>
</tr>
<tr>
<td>A. nepalensis (Thakur Rup Chand 8136)</td>
<td>–</td>
<td>Arundinella s.str.</td>
</tr>
<tr>
<td>A. bengalensis (Waltich 8669-8)</td>
<td>+</td>
<td>Arundinella / Bengalesenses</td>
</tr>
<tr>
<td>A. holocida (Veldkamp 8913)</td>
<td>+</td>
<td>Arundinella / Ciliatae</td>
</tr>
<tr>
<td>A. laxiflora (Koepermann 27559)</td>
<td>++</td>
<td>Arundinella / Laxiflora</td>
</tr>
<tr>
<td>A. leptochloa (McCann 1023, 1913)</td>
<td>++</td>
<td>Palachne = Leptochloa</td>
</tr>
<tr>
<td>A. thwaitesi (Davide &amp; Sumithraarachchi 8597)</td>
<td>++</td>
<td>Palachne = Leptochloa</td>
</tr>
<tr>
<td>A. pumila (Veldkamp 8927)</td>
<td>++</td>
<td>Arundinella / Pumilae</td>
</tr>
<tr>
<td>A. setosa (Backer 25009)</td>
<td>+</td>
<td>Arundinella / Setosae</td>
</tr>
</tbody>
</table>

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**KEY TO THE MALESIAN TAXA**

1. Blade margins smooth, scaberulous, sthiffly ciliate, or pilose. Panicle branches smooth, scaberulous or puberulous. Pedicels smooth, scaberulous, puberulous, or sparsely pilose. Lower glume distinctly shorter to slightly longer than the lower lemma. Upper lemma apex without lateral setae .


— Plants perennial. Panicle loosely contracted, branches angular. Lower lemma 3.2–4.5 mm long .

2. Panicle densely contracted to lax, branches angular. Lower lemma 1.5–4.8 mm long .

3. Panicle effuse, not interrupted at base, branches terete. Lower lemma 1.3–1.4 mm long. — Plants annual. Spikelets 1.5–2.2 mm long. Upper lemma callus puberulous .

6. A. pumila

3. Upper lemma callus puberulous .


2. A. furva

4. Ligule glabrous or ciliolate .


3. A. goeringii

5. Plants perennial .

6. Plants annual. — Sheaths glabrous, margins hairy or pilose with bb hairs, glabrescent. Ligule glabrous or ciliolate. Blades flaccid, margins smooth, pilose. Panicle loosely contracted to fairly lax, interrupted at base, 1–8 cm wide, branches angular. Spikelets whitish with green nerves, greenish, yellowish, or purple suffused. Lower glume slightly shorter to slightly longer than the lower lemma. Lower lemma 1.5–4 mm long, apex acute .

4. A. holocidae

6. Blades 0.5–3 mm wide. Panicle 1–4 cm wide. — Blades rather stiff to rigid, margins smooth or scaberulous or sparsely pilose. Panicle not interrupted at base. Upper glume apex long-acuminate. Lower lemma apex acute to acuminate. Malesia .

5. A. filiformis


5. A. nepalensis
1. Arundinella filiformis Janowski


Arundinella miliacea (Link) Nees 'forma minor' Nees (1850) 102, see note. — Voucher: Cuming 667 (CGE, K, L, US, W).


Arundinella caespitosa (Janowski) (in Janowski & Mez 1921) 85; (1922) 26. — Lectotype: BS 30 (Foxworthy) (holo W; fragm. in L; B, K), designated here. [Arundinella montalbanica Elmer (1939) 3807, nom. nud. in syn. — Voucher: Elmer 17433 (PNNH; K, L, UJ).

Arundinella agrostoides auct. non Trin.

Arundinella ciliata auct. non Miq.

Arundinella hispida auct. non Kuntze.

Arundinella miliacea auct. non Nees.

Arundinella nepalensis auct. non Trin.

Arundinella pubescens auct. non Hack. & Merr.

Plants perennial. Culms tufted, 0.14—0.7 m long. Nodes glabrous to pubescent. Sheaths glabrous to margins hairy to sparsely pilose with bb hairs. Throat glabrous to hairy. Ligule 0.3—0.7 mm high. Blades rather stiff or rigid, flat or involute, linear, 3.5—16 cm by 0.5—1(—3) mm (when flattened out), glabrous, exceptionally pilose on both sides, margins smooth or scaberulous or sparsely pilose. Peduncle glabrous under the panicle. Panicle loosely contracted, exceptionally lax, not interrupted at base, 5—16 by 1—2(—4) cm, lowermost branch solitary, rarely paired, longest branch 1.5—10 cm long, angular, smooth to scaberulous or puberulous, not pilose, rarely sparsely pilose. Pedicels smooth to scaberulous to puberulous. Spikelets 3.2—5 mm long, greenish or yellowish or brownish or purple suffused. Glumes glabrous; lower glume 2.3—3.8 mm long, 0.55—0.84 (1—1) times as long as the spikelet, distinctly shorter to slightly longer than the lower lemma, apex acute to mucronate, 3- or 5-nerved; upper glume 5-nerved, apex long-acuminate. Lower lemma neater (paleate) or male, 2.6—3.8 mm long, 3- or 5-nerved, apex acute to acuminate; upper lemma 1—2.5 mm long, castaneous in fruit, microscopically scaberulous (40×!), 0-nerved, callus hairs 0.3—0.6 mm long, 0.19—0.43 times as long as the lemma, apex acute, without lateral setae, awn distinctly exserted beyond the glumes, geniculate, 3.5—9.5 mm long when dry, column 0.4—2.5 mm long when dry. Anthers 3, 0.8—1.5 mm long.

Distribution — Taiwan (no locality: Faurie 756, W), Malesia: Lesser Sunda isl. (Flores, Sumba), Philippines (Luzon, Palaen, Panay, Samar, New Guinea (Irian Jaya: Idenburg R.).

Habitat — On (lime)stone near or in running water, sometimes partly submerged, along forest edge, 125—780 m altitude.

Few collections are provided with details; when there is, it is often said to have been found near or even submerged in water. Kneucker Gram. Exsicc. 606 (Merrill) (K, L, etc.) has an extensive label, where it is stated to have been found immediately above the level of high tides in the shade of Syzygium mimicum (Merr.) Merr. (Myrtaceae), a facultative rheophyte, the rheophytic Atlantia linearis (Blanco) Merr. (Rutaceae), and Homomonia riparia Lor. (Euphorbiaceae), while other herbaceous plants were absent in the neighbourhood. The dense root system also suggests that this species is a rheophyte.

Notes — The holotype (Faurie 756) of Arundinella hispida f. humilior is also a syntype of A. caespitosa. It is the only collection from Taiwan that has come to my attention. Perhaps Ohwi 1424 (US) not seen by me, but mentioned by Phipps (1967a: 1047) belongs here or to A. taiwanica.

Arundinella caespitosa, A. filiformis, and A. hispida subsp. humilior have often been regarded as synonyms with A. miliacea.

However, the latter combination was mentioned only by Nees (1840) and doubtfully validly made by Nees (1850) as he merely cited Acratherum which has been regarded as an indirect reference to Acratherum miliacum Link. Even when accepted, the combination is not applicable to Malesian material, as it is a synonym of A. nepalensis which does not occur in that region.

The so-called ‘forma minor’ Nees’ is not a name, but a diagnose. Sun & Phillips (2006: 569) reduced this to A. pubescens Merr. & Hack.

The Sumba collection by Monod de Froideville (1775, K, L) is an exceptionally large specimen, both in the vegetative and the generative parts. The measurements in brackets given above refer to this one. It is distinctly perennial with sterile shoots and cataphylls. There are no ripe spikelets, so it can not be seen whether the upper florets will turn cataphyse, as in the others. Without additional material this collection is best maintained as a giant A. filiformis. The K specimen was sampled by Teerawanatana for molecular research (Jodrell Lab. no. 22521).

2. Arundinella furva Chase

Arundinella furva Chase (1943) 85, t. 4. — Type: Clemens 5826-A (holo US; B, L, NY).


Arundinella nepalensis Trin. var. contracta Ohwi (1942) 4. — Type: Kanehira & Hatusima 13506 (holo FU; A).

Arundinella nepalensis auct. non Trin.

Tristem latifolium auct. non Ridl.

Plants perennial (new shoots sometimes from decumbent culms). Culms tufted, erect to geniculate at base, 0.5—1.5 m long. Nodes glabrous or puberulous, rarely bearded. Sheaths pilose with bb hairs to margins hairy to glabrous. Throat hairy. Ligule 0.4—0.5 mm high. Blades rigid, flat, linear-lanceolate to linear, 3.5—24 cm by 5—13 mm, glabrous or pilose above or pilose on both sides, margins smooth or scaberulous or stiff ciliate. Peduncle glabrous under the panicle. Panicle densely contracted to fairly lax, interrupted at base or not, 7—25 by 0.8—7.5 cm, lowermost branch solitary or paired, longest one 2.5—8.5 times as long, branches angular, scaberulous or puberulous, not pilose. Pedicels scaberulous or puberulous. Spikelets 4.2—6 mm long, yellowish or purple with green nerves. Glumes glabrous; lower glume 2.9—5.5 mm long, 0.6—0.82 times as long as the spikelet, distinctly shorter than the lower lemma, apex mucronate or mucronate, 3- or 5-nerved, apex acute acuminate. Lower lemma neuter (paleate or epeate), 3.5—4.8 mm long, 3- or 5-nerved, apex acuminate; upper lemma 2.5—3.2 mm long, castaneous in fruit, microscopically scaberulous (40×!), 0-nerved, callus hairs 0.3—0.5 mm long, 0.16—0.29 times as long as the lemma, apex acute, without lateral setae, awn distinctly exserted beyond the glumes, geniculate, 3.5—4.5 mm long when dry, column (0—)0.5—1.2 mm long when dry. Anthers 3, 1.2—1.5 mm long.

Distribution — Malesia: Philippines (Sibuyan, Mayos Peak), apparently disjunct within New Guinea as well: Irian Jaya (Arafak, Baliem, Carstensz), Papua New Guinea (Enggah, W Highlands, E Highlands, S Highlands, and then Central, Northern, Milne Bay Prov.).

Habitat — Open grassland (usually fire induced), e.g. with tree ferns, Burmannia sp., Cyperaceae (e.g. Schoenus sp.), Dimeria chloridiformis (Gaudich.), K. Schum. & Lauterb., Ericaulon sp., Eulalia leptostachys (Pilg.) Henrard, Miscanthus floridus (Labill.) Warb., Xyris sp., landslides, marshy soil, mid montane forest, along stream edges, among limestone, granitic sand, dominant, (1500—)1850—2895—3375 m altitude.

Collector’s notes — Stoloniferous (i.e. decumbent culms) or small tussocks. Culms upright to trailing, geniculate, purple.
Nodes brown, brownish purple, swollen. Leaves green, yellow green, dull mid green, tough. Peduncles purplish. Flowers brown, reddish, purplish brown, dark red, purple, later straw-coloured; awns yellowish brown, whitish red.

Uses — Not eaten by wallabies, disliked by cattle.

Notes — Although the species was described on Cemens collections from the Saruwaged, I have not seen any other collection from the Morobe Province. Remarkable is the apparent absence in some other areas, e.g. Mt Wilhelmina (Mangen 1993). Star Mts (pers. obs.), Mt Wilhelm (Johns & Stevens 1971).

Most remarkable is the single record (Argent & Reynoso 89127 (L, PNH)) from the Mayos Peak, Sibuyan in the middle of the Philippines at c. 1550 m altitude.

Chase described the upper lemma (‘fruit’) as bidentate. I have only seen acute apices.

The column is sometimes virtually absent, there is only a sharp bend at the expected place.

### 3. Arundinella goeringii Steud.


Arundinella agrostoides Trin. var. intermedia Kuntze (1891) 761. — Type: Kuntze ‘Java, Megamendong’ (NY not found; K).

Arundinella procumbens Janowski (in Janowski & Mez 1921) 84; (1922) 25. — Type: Warburg 1648 (h0lo B1), perhaps in A, BM, E, K, NY. Error for 16483?

Arundinella agrostoides Trin. var. ciliata auct. non Kuntze: Kuntze (1891) 761, pro Kuntze 4805 (K, NY) from Java.

Arundinella fusca auct. non Buse.

Arundinella hispida auct. non Kuntze.

Arundinella nepalensis auct. non Trin.

Plants annual or perennial. Culms tufted or more or less solitary, erect, 0.15–0.6 m long. Nodes bearded. Sheaths sparsely pilose with bb hairs. Thrash hairy. Ligule 0.3–1 mm high, pilose. Blades flaccid to rather stiff, flat, linear-lanceolate to linear, 4.5–25 cm by 4.5–17 mm, pilose on both sides, margins pilose. Peduncle under the panicle glabrous. Panicle contracted, often interrupted at base, 6.5–30 by 1–6 cm, lowermost branch 1–3 together, the longest one 2–4 cm long, branches angular, smooth to scaberulous, glabrous. Pedicels smooth to scaberulous. Spikelets 4.2–6.6 mm long, greenish to purple suffused. Glumes glabrous; lower glume 2.4–4 mm long, 0.6–0.86 times as long as the spikelet, distinctly shorter to slightly longer than the lower lemma, apex acuminate to ciliate on mucronate, 3- or 5-nerved; upper glume 5-nerved, apex long-acuminate. Lower lemma male or bisexual, 2.8–3.5 mm long, nerves 5, rarely 3, not anastomosing, apex acuminate; upper lemma 1.8–2.3 mm long, whitish to brown or castaneous (at maturity), microscopically scaberulous (40x!), 0-nerved, callus hairs 0.4–0.7 mm long, 0.2–0.37 times as long as the lemma, apex acute, without lateral setae, awn distinctly exserted beyond the glumes, geniculate, 3.3–5 mm long when dry, column 1–1.9 mm long when dry. Anthers 3, 0.8–1 mm long.

Distribution — Malesia: Sumatra (W Coast), Java (wide-spread, especially in the W), Celebes (Malino), Philippines (Palawan), ? Sumbawa (Ploem s.n., sh. 926.140-174, sterile). Habitat — Poor soil; 40–1600 m altitude.

Notes — Nees apparently around 1834 sent around lists of names and descriptions to a.o. Buse, Steudel, Trinuis, and Wight, who attributing them to Nees used them in their publications. Only Wight (Cat. Indian Pl. (1834)) specifically acknowl-
edged Nees’s contribution, so the names there are to be cited ‘Nees in Wight’. Unfortunately the majority are nomina nuda.

In the other cases there is only external evidence of the source of this information. Thus Art. 46.6 applies and the names must be cited as ‘Nees ex ...’.

In Wight’s catalogue there appear several species of Arundinell-
la, some of which have Acratherum as an infrageneric indica-
tion. These were cited by Steudel (1840: 21, 143) as synonyms of Arundinella spp. One of these is Arundinella (Acratherum) fusca auct. Nees (Wight Cat. 1667, probably the same as the Wight Herb. Propr. 183 cited by Janowski (1922: 26). A duplicate of this is in the Trinius Herbarium 405.1.

The validation of Arundinella fusca auct. Nees was by Buse (1854, preprint: 19). However, no specimens or provenance were given, only a var. β, ‘angustiore’, which word from the typography is not a name, but a remark. The specimens mentioned for this (in L) are all marked β on their labels. One (sh. 908.83-1332) has the combination in what appears to be Nees’s handwriting.

Steudel, very shortly afterwards (1854a: 114), used Arundinella fusca auct. again, merely stating ‘Penins. Ind. or.’, but because of the above obviously meaning the Wight collection.

Note that Buse’s and Steudel’s A. fusca auct. are not true isonyms, as they are heterotypic, being based on different specimens in different institutes, but according to Art. 9. Note 2(c) they would be.

Hooker (1896: 74) correctly attributed the combination to Buse, and now we see that Wight Cat. 1667 came from the Nilgiris of S India. Bor (1955: 406, 1960: 424, as A. purpurea Hochst. ex Steud.), wrote that it is an endemic of that area.

Obviously, it has been thought that a name used in a Male-
esian account could not be applied to a Nilgiri endemic, hence Hooker’s use is cited as ‘non Nees ex Buse’, and another com-
bination is used. I hope to have now shown that it is actually the other way around: Buse used a description for an Indian species and applied it to what he thought was an aberrant form from Java. Anyway, Buse validated Arundinella fusca, whereby Hooker’s use of it for the Indian species was correct (as so often) and must replace the later A. purpurea.

Arundinella fusca auct. can therefore not be used for our Malesian endemic. The specimens of Buse’s β belong to a species for which the oldest name is A. goeringii Steud., which has been rarely used (e.g. in Boldingh 1916: 94, Janowski 1922: 23, 26, Keng 1936: 5, 37, t. 17). There is often some confusion about the provenance of Goering collections: Japan or Java? But the type of this one is the Malesian species and came from Java.

### 4. Arundinella holcoides (Kunth) Trin.

Arundinella holcoides (Kunth) Trin. (1836) 107. — Brandtia holcoides Kunth (1831) 511, t. 170. — Type: Raynaud A’ 1828 (? B or P, not found, cf. Bor (1955: 414); L).


Arundinella birmanica Hook.f. (1896) 73. — Lectotype: Kurz 3161 (holo K), designated by Bor (1955: 413). Arundinella pubescens Merr. &Hack. in Hack. (1907b) 419; ex Janowski (1922) 23, 27. — Type: BS 856 (Foxworthy) (h0lo W, L, NY, US; PNH).

Arundinella fusca auct. var. ciliata Jansen (1953) 233. — Type: Bünnejemier 11718 (holo BO; K, L).

Arundinella ciliata auct. non Möll. Arundinella hispida auct. non Kuntze.

Arundinella holcoides (Kunth) Trin. var. ciliata auct. non Jansen.

Arundinella setosa auct. non Trin.
Plants annual. *Culms* tufted to more or less solitary, erect to ascending, 0.06–0.65 m long. *Nodes* bearded, rarely glabrous. *Sheaths* pilose with bb hairs to glabrescent to glabrous, or margins hairy (in *A. agrostoides*). *Throat* glabrous or hairy. *Ligule* 0.2–0.8 mm high. *Blades* flaccid, flat, lanceolate to linear, 1.5–26 cm by 2.25–14 mm, pilose on both sides or glabrescent or glabrous (in *A. agrostoides*), margins pilose or smooth (in *A. agrostoides*). *Pedicels* pilose to glabrous under the panicle. *Panicle* loosely contracted to fairly lax, interrupted at base, 1.5–32 by 1–8 cm, lowestmost branches 1–3 together, longest one 0.5–9 cm long, angular, scaberulous, rarely smooth, sparsely pilose, rarely glabrous. *Pedicles* smooth to scaberulous to sparsely pilose. *Spikelets* (2.2–)7.5–6.5 mm long, whitish with green nerves, greenish, yellowish, or purple suffused. *Glumes* sparsely pilose or glabrous (in *A. agrostoides*); lower glume 1.2–3.8 mm long, 0.44–0.8 times as long as the spikelet, slightly shorter to slightly longer than the lower lemma, apex acuminate or mucronate, 3- or 5-nerved; upper glume 5- or 7-nerved, apex long-acuminate. Lower lemma neater, male, female, or bisexual, 1.5–4 mm long, 3- or 5-nerved, apex acute; upper lemma 1–2.3 mm long, castaneous in fruit, microscopically scaberulous (40 x!), 0-nerved, callus puberulous, hairs 0.1–0.6 mm long, 0.1–0.4 times as long as the lemma, apex acute, without lateral setae, awn distinctly exerted beyond the glumes, geniculate, 2.5–6.5 mm long when dry, column 1.2–3 mm long when dry. *Anthers* 3, 0.3–1 mm long.


**Habitat** — Steep slopes, grass land, logged over pine forest, degraded thicket and weed area, poor soils, 25–1890 m altitude. According to Rhind (1945: 41) frequent in Burma in the moister parts all over the plains. Collector’s notes — Culms tufted, blades green above, light green underneath, inflorescence axes dull green, spikelets pale light green to violet with green nerves, awns violet.

Notes — *Trinius* (1830) implied the presence of at least two syntypes: ‘*Manila*’ and ‘*wahovensi*’. I presume the latter is derived from ‘wahov’ = *Oahu* = *Hawaii*, which then is a mislabeling, as *Arundinella* does not occur there. The combination is sometimes cited as ‘*non Hochst.*’. The latter is a *nomen nudum* originally cited in the synonymy of *A. setifera* Steud., which is a synonym of *A. setosa*.

In vain have I tried to find distinctions between the Burmese, Vietnamese, and Central Malesian populations and in the end was forced to unite them, which results in a curiously disjunct distribution. Although Touraine and Nha Trang were well-known locations in her time, apparently no material was available to Camus & Camus for their treatment in the Flore de l’Indo-Chine (1922).

Moulik (1997: 57) mentioned the presence of *A. holcoides* also for Madhya Pradesh, Maharashtra, Karnataka, Tamil Nadu, Kerala. The latter three no doubt are a confusion with *A. ciliata*, the first two I cannot explain.

*Arundinella agrostoides* differs mainly by the glabrous sheaths and leaf blades with smooth margins, and rather small spikelets (2–3.2 mm long) and seems to be a local form of Luzon.

*Arundinella hisruta* is based on a mixture of things: the lectotype came from Tavoy (now Dawei) in Burma, and unnamed collections from the Himalaya and Courtallum (which is in SW Tamil Nadu). No form of the *A. ciliata*-complex is known to me from the Himalayas, while Courtallum suggests *A. ciliata* s.str., with which e.g. Bor has equated it.

*Arundinella hisruta* sensu Hohenacker 920 from the Nilgiris (Steudel 1854a; 115, in syn. sub # 16, *A. setifera*) is *A. setosa*. The type specimens of *A. pubescens* in W and the original description differ in some details, e.g. I have seen no male first lemmas, only sterile ones. As in *A. agrostoides* the glumes are glabrous. It is said to occur in Taiwan as well (Kuo & Chen 2002: 443, Sun & Phillips 2006: 569), but the collections seen belong to *A. filiformis*.

Jansen described *Arundinella fuscata var. celebica* on two collections: *Bünnemeijer 11718* from Celebes, and *Kuntze 4805* from Java. *Bünnemeijer*’s specimens (BO, K, L, U) are stout examples of *A. holcoides*, *Kuntze*’s specimens (K, NY) belong to *A. goeringii*. For Timor only known by *Teijsmann 8947* (BO), while in L (incl. fragm. in Herb. Hackel) there is a specimen in the Herb. Balansa (L 908.93-24) which may be a duplicate of this.

5. *Arundinella nepalensis* Trin.

*Arundinella nepalensis* Trin. (1826) 62; (1830) 175. — *Type: Wallich ex Herb. Lindley in Herb. Trin. 402.1* (holo LE, IDC microfiche BT-16/1; very likely the same as 8666-A, CGE, K, IDC microfiche 7394).

Acrathemera milacea Link (1827) 230. — *Arundinella milacea* (Link) Nees (1840: 417, 447, in passim), (1850) 102; *Druce* (1917) 605, synonym. — *Type: Nepal* (BT, Scholz in litt.); K, LE, Herb. Trin. 402.2, IDC microfiche BT-16/1). For further synonymy see Bor (1955: 404).

Plants perennial. *Culms* tufted, erect, 0.6–2.5 (–3) m long. *Nodes* glabrous to bearded. *Sheaths* usually glabrous and margins hairy. *Throat* hairy. *Ligule* 0.2–1 mm high, ciliolate. *Blades* flaccid to rather stiff, flat to involute, linear, 8–50 cm by 3–18 mm, glabrous to pilose on both sides, margins scaberulous. *Pedicule* under the panicle usually glabrous, sometimes with a few hairs. *Panicle* densely contracted to fairly lax, interrupted at base or not, 10–60 by 5–7(–13) cm wide, lowermost branch solitary, 3.5–16 cm long, angular, smooth to scaberulous, not pilose. *Pedicels* smooth to scaberulous. *Spikelets* (3.4–)4–6 mm long, greyish green or purple. *Glumes* glabrous, rarely se-tose: lower glume 2.6–5 mm long, 0.64–0.86 times as long as the spikelet, distinctly shorter than the lower lemma, apex acute, acuminate, or mucronate, 3-nerved; upper glume 5-nerved, apex acuminate to long-acuminate. Lower lemma neater or male, (2.3–)2.7–3.6 mm long, 5-nerved, apex acute; upper lemma 1.7–2.5 mm long, castaneous in fruit (whitish in flower), smooth or microscopically scaberulous (40 x!), 0-nerved, callus hairs 0.3–0.5 mm long, 0.16–0.33 times as long as the lemma, apex acute, without lateral setae, apex of the pedicels not setose, awn distinctly exerted beyond the glumes, geniculate, 2.7–6 mm long when dry, column 0.7–3.2 mm long when dry. *Anthers* 3, 0.7–1.7 mm long. 2n = 20, 40, 54, 60.

**Distribution** — Because of all the misapplications not quite certain. Very variable: see remarks by Bor (1955: 406): Africa (widespread), Madagascar, Arabia, N Pakistan, Bhutan, Nepal, Sikkim, India (widespread), Burma, Thailand (Chiang Mai).
Vietnam, China (widespread), Australia (W Australia, N Territory, New South Wales, Queensland).

Note — Although occurring north and south of Malesia, it has so far not yet been found there. All reports have turned out to be misapplications to A. filiformis, A. furva, or A. goingii.

Arundinella pumila (Hoehst. ex A.Rich.) Steud. (1854a) 114. — Acorus nonulatum (Hochst. ex Lam.) Blume, 1828, syn. nov. 1851, 8(5): 241, non Acorus pumila (Hochst. ex Lam.) Blume, 1828 (as A. pumila).— Type: ex A. Barlaeus s.n. (holo MICH).


Plants annual. Culms more or less solitary, erect, geniculate at base, 0.04–0.45 m long. Nodes puberulous. Sheaths glabrous to margins hairy to pilose with bg hairs. Throat glabrous. Ligule 0.8–1 mm high. Blades flaccid, flat, oblong to linear, 1.7–20 cm by 2–20 mm, glabrous to sparsely pilose on both sides, margins smooth to scaberulous. Peduncle glabrous under the panicle, rarely with a few hairs under the panicle. Panicle effuse, not interrupted at base, 2–33 by 1–22 cm, lowermost branches 1–6 together, longest one 3–20 cm long, terete (filiform), smooth, or pilose, rarely or sparsely pilose. Pedicels smooth. Spikelets 1.5–2.2 mm long, whitish with green nerves. Glumes glabrous, or the upper one with a few hairs; lower glume 1–1.6 mm long, 0.55–0.76 times as long as the spikelet, slightly shorter than to about as long as the lower lemma, 1- or 3-nerved apex acuminate or mucronate; upper glume 1–5-nerved, apex acuminate to long-acuminate. Lower lemma neutral, male, or bisexual, 1.3–1.4 mm long, 1–5-nerved, apex acute; upper lemma 0.8–1 mm long, castaneous in fruit, minutely scaberiesul (40x!), 0-nerved, callus hairs 0.1–0.2 mm long, 0.13–0.28 times as long as the lemma, apex acute, without lateral setae, awn distinctly excised beyond the glumes, geniculate, 2–3.4 mm long when dry, column 0.7–1.4 mm long when dry. Anthers 3, 0.3–0.5 mm long. 2n = 24.

Distribution — W to E Africa, Oman, India to Malesia: Java (very rare in Pasuruan, once in W Java, Fayer A.1900, B, L), SW Celebes, Lesser Sunda Isl. (Flores, Lombok, Sumbawa).

Habitat — Shady, humid places, steep roadsides, moist stones, base of waterfall, locally common, 700–1350 m altitude.

Note — Distribution disjunct. Technically very close to A. holcoidea, but usually easily recognised by the effuse panicle that has the base still inside the sheath of the flag leaf.

7. Arundinella setosa Trin. — Fig. 1


Arundinella tricospiculata Buse in Miq. (Feb. 1854) preprint: 20; (Aug. 1854) 360; Janowski (1922) 27 (tricospiculata).— Type: Horner s.n. Sumatra, Padang Lawas (holo L, sh. 902.23–97).


Arundinella stricta Nees (1850) 102. — Danthonia luzonensis Steud. (Apr. 1854a) 245, nom. superfl. — Type: Arundinella setosa Trin. var. stricata Pilg. (1904) 140. — Type: Cuming 1415 (holo CGE; K, P).

468. — Type: T. Thomson s.n. (holo K).

Plants perennial. Culms tufted, erect, 0.6–1.5–2.1 m long. Nodes glabrous. Sheaths glabrous or margins hairy (see note). Throat glabrous or hairy. Ligule 0.3–1 mm high. Blades flaccid or rather stiff, flat or involute, linear, 16–42 cm by 3–9 mm, glabrous, margins scabrous. Peduncle glabrous under the panicle. Panicle loosely contracted, not interrupted at base, 10–45 by 1–9 cm, lowermost branch solitary, 6–25 cm long, angular, scabrous, not pilose. Pedicels scabrous, apically setose. Spikelets 4.5–7 mm long, greenish, yellowish, or purple suffused with green nerves. Glumes glabrous; lower glume 3.5–6 mm long, 0.67–0.89 times as long as the spikelet, distinctly longer than the lower lemma, apex acuminate to mucronate, 3-nerved; upper glume 5-nerved, apex long-acuminate. Lower lemma neutral (paleate) or male, 3.2–4.5 mm long, 3(–7)-nerved, apex acute; upper lemma 2.2–3.25 mm long, castaneous in fruit, microscopically scaberiesul (40x!), 0(–3)-nerved, callus hairs 0.5–0.8 mm long, 0.23–0.32 times as long as the lemma, apex acute, apex with lateral setae (up to 3 mm long), rarely without, awn distinctly excised beyond the glumes, geniculate, 5.2–9.1 mm long when dry, column 1–3 mm long when dry. Anthers 3, 1.3–1.7 mm long. 2n = 20, also 16, 32, 48, 54, 80.

Distribution — India (Kerala to NE) to China (widespread), Taiwan, N Australia (W Australia, N Territory, Queensland), Malesia: Sumatra, Malay Pen. (Kedah, Kelantan), Java, Borneo (S Kalimantan, Kab. Banjar, Soekisman 52, BIOT), Celebes (Lombasang, Masamba), Kabaena, Philipuss (Bausanga, C. Loxon, Manamoc Isl., Mindanino), Lesser Sunda Isl. (Bali, Flores, Timor), New Guinea: Irian Jaya (Baliem, Jayapura), Papua New Guinea (Central, Chimbu, Enga, E, W Highlands, Madang, Milne Bay, Morobe, W Sepik Prov.).

Habitat — Sunny, dry, often less fertile soils (clay, granite, laterite, peat, sand stone, volcanic), fire-damaged areas. Mixed deciduous or evergreen Dipterocarp-Oak, Pine, Casuarina, Eucalyptus, sclerophyllous (with e.g. Actinodaphne, Calamus, Daphniphyllum, Melastoma, Meliosma) forests, secondary grasslands with e.g. Crotalaria anagroides Kunth, Mimosa diplotricha Sauvalle, Tephrosia vogelii Hook.f., Chloris barbata, Sprengelia tortus (L.) Roem. & Schult., Imperata cylindrica (L.) Raeusch., Meliosma minutilflora P.Beauv., Paspalum conjugatum P.J. Bergius, P. paniculatum L., Pennisetum polystachion (L.) Schult., Themeda triandra Forsk., Urochloa maxima (Jacq.) R.D.Webster. Locally numerous, sometimes vegetation forming. 0–2030 m altitude.
Collector’s notes — Tufted perennial. Roots pale brown. Culms green. Sheaths pale brown. Blades flat, green to somewhat dull violet above, pale green beneath. Inflorescence axes pale to medium green, often dull dark violet. Glumes pale green, often with dark pink, brown, dull maroon, purple, with green or black nerves, turning tan. Lemmas, paleas white. Columns brown, dull maroon, setae pale green, tan. Filaments white, anthers yellow, dark violet. Stigmas dark purple.

Notes — Immediately recognisable by the coronula under the spikelet and the two setae at the base of the awn. However, the latter are very variable in length and sometimes minute (var. esetosa) and if not immediately found several spikelets should be inspected. In Malesia, too, specimens with microscopic or no setae were seen, so it would appear that this form is merely an extreme in a range and not worth of recognition.

Miquelia barbulata is tentatively included here, as no authentic material has been seen, while it must be noted that Merrill (1918) equated it with Garnotia patula. Jansen (1953: 235) erroneously regarded Schlechter 18422 as the type of A. lasiostoma. Indeed, as he said, the differences with the typical form are inessential for the recognition at any rank.

Plants are usually quite glabrous, LAE 72431 (Henty) (BRI, L, LAE) is except for the inflorescence exceptionally hairy.

OTHER SPECIES

Other species had to be studied in the revision because they had been mentioned for Malesia or have been confused with Malesian taxa. One seems to be undescribed. It seemed a waste not to include the information gleaned in this way.

1. **Arundinella ciliata** Nees ex Miq.


*Arundinella pilosa* Hochst. ex Miq. (1851) 30 (in syn. sub A. *ciliata*) Steud. (1854a) 116. — *Arundinella anomala* Steud. var. *pilosa* Honda (1922) 111. — Type: Hohenacker (Metz) 647 (holo P; K, L, U (now L)).

*Arundinella agrostoides* auct. non Trin. *Arundinella holcoides* auct. non Trin.

Plants annual. Culms tufted, erect, 0.15–0.42 m long. Nodes bearded. Sheepth's pilose with bb hairs. *Throat* glabrous. *Ligule* 0.3–0.7 mm high. *Blades* flaccid, flat or infolded, linear, 4–19 cm by 3–10 mm, pilose on both sides, base rounded, margins pilose. *Peduncle* under the panicle glabrous to pilose. *Panicle* densely contracted to contracted, 6–18 by 1–3 cm, lowermost branch solitary, 1–4.5 cm long, angular, scaberulous, glabrous to sparsely pilose. *Pedicel* scaberulous, apex not setose. *Spikelets* 2.8–3.8 mm long, greenish, yellowish, or purple suffused. *Glumes* sparsely pilose; lower glume 1.8–3.3 mm long, 0.53–0.94 times as long as the spikelet, distinctly longer than the lower lemma, apex mucronate, 3- or 5-nerved; upper lemma 1–1.4 mm long, brownish (mature?), smooth to scaberulous, 0-nerved, callus hairs 0.3–0.5 mm long, 0.21–0.42 times as long as the lemma, apex acute, without lateral setae, awn distinctly exserted beyond the glumes, geniculate, 3.6–4.3 mm long when dry, column 1.4–1.7 mm long when dry. *Anthers* 3, 0.3–0.5 mm long. 2n = 18, 20.
Distribution — S India: Annamalais and Nilgiri Hills of Karnataka, Kerala, and Tamil Nadu.
Habitat — Roadsides, moist rocky places, slopes, 1050–1800 m altitude.

Notes — Miquel (1851) and Kunze (1891) only referred to Nees in Wight (1834) and not to Roxburgh (1814, 1820), therefore the combinations Arundinella ciliata Nees ex Miq. and Holcus ciliatus Roxb. are heterotypic. Nees cited Wight 1666, Hochstetter (Metz) 647, Miquel cited both and explicitly (in a footnote) stated that names proposed by Nees had priority over those by Hochstetter. Wight 1666 therefore is the lectotype with the holotype in U (now L), and Hochstetter (Metz) 647 a syntype.

Moulis (1997: 56) mentioned the presence of this species also in Maharashtra. I do not know on what this was based.

2. Arundinella fuscata Nees ex Buse

Arundinella fuscata Nees ex Buse in Miq. (Feb. 1854) preprint: 19 (Aug. 1854) 359; Nees ex Steud. (1854a) 114, isonym. — (Acramotila (Acramotila) fuscata Nees in Wight 1834 97, nom. nud. — (Acramotila fuscata (Nees ex Steud.) Hochstetter: B.D.Jacks. (1895) 32, nom. inval., in syn.). — Type: Wight Cat. 1667 = Wight Herb. Propr. 183 (holo U (now L); K; LE (Herb. Trin. 405 f, IDC microfiche BT-16/1; P). Both not in B (Scholz, 16 July 2003, pers. comm.).

Arundinella purpurea Hochst. ex Steud. (1854a) 115. — Type: Hohenacker 928 (holo P; G, K; L, M, U (now L)), US.

Arundinella purpurea Hochst ex Steud. var. laxa Bor (1955) 407. — Synotypes: Gamble 13365, 20617 (K), Madras, Nilgiri, Sispara.

Plants perennial. Culms tufted, erect to geniculate at base, 0.35–0.85 m long. Nodes glabrous, puberulous, or bearded. Sheaths puberulous to densely pilose with bb hairs, glabrescent. Throat hairy. Ligule 0.4–1 mm high, glabrous or ciliolate. Blades flaccid to rather stiff, flat or involute, linear, 4.5–30 cm, as 3–15 mm wide, usually pilose on both sides, margins scaberulous. Peduncle pilose under the panicle. Panicle densely contracted, rarely fairly lax, not interrupted at base, 3–20 by 1.5–2.5 cm, lowermost branch solitary, 1–4 cm long, angular, scabrous to puberulous, not pilose. Pedicels scaberulous and puberulous. Spikelets 3–4.5(–5.5) mm long, purple suffused. Glumes glabrous; lower glume 2.2–4 mm long, 0.59–0.75 times as long as the spikelet, slightly shorter than the lower lemma, apex acute, 3- or 5-nerved; upper glume 3–7-nerved, apex long-acuminate. Lower lemma neater (palate) or male, 1.5–2.8 mm long, 3- or 5-nerved, apex acute; upper lemma 1.5–2 mm long, castaneous in fruit, microscopically scaberulous (40×1), O-nerved, callus hairs 0.3–0.6 mm long, 0.2–0.37 times as long as the lemma, apex acute, without lateral setae, awn distinctly exserted beyond the glumes, geniculate, 1.7–6 mm long when dry, column 0.6–1.8 mm long when dry. Anthers 3, 0.5–0.9 mm long.

Distribution — Mexico to Paraguay, Argentine.
Habitat — Lowland savannahs to montane forest edges, edges of fields, 300–2000 m altitude.

Note — Records for Asia are misidentifications.

4. Arundinella taiwanica Veldk., sp. nov.

Culmi caespitosi. Folia paulo rigida glabra. Panicleae laxe contractae ramis puberulos. Speculae bruneole ad purpurea suffuseae. Lemmata inferiors 3.8–5 mm longa, superiores laevia aristis 2–3.1 mm longis (s.s.). — Typus: Van Steenis 20656 (holo L), Taiwan, Hualien Co., Hosioulin Hsiang, Tayu Lin (locally now converted to a vegetable farm).


Plants perennial (cataphylls). Culms tufted, erect, 0.25–more than 0.6 m long. Nodes glabrous. Sheaths glabrous, or margins hairy, or pilose with bb hairs. Throat hairy. Ligule 0.3–0.5 mm long. Blades rather stiff, flat to involute (ultimately articulating at base), linear, 5.5–15.5 cm by 0.8–5 mm, glabrous, margins smooth or scaberulous or pilose. Peduncle under the panicle glabrous. Panicle loosely contracted, 3.5–11.5 by 1–2 cm, lowermost branch solitary, 1.5–6.5 cm long, angular, puberulous, not pilose. Pedicels scaberulous or puberulous. Spikelets 4–5.7 mm long, purple suffused to brownish (when dry). Glumes glabrous; lower glume 2.8–4.7 mm long, 0.7–0.9 times as long as the spikelet, distinctly shorter than to about as long as the lower lemma, apex acuminate to mucronate, 3–
5-nerved; upper glume 3–5-nerved, apex acuminate. Lower lemma male (not always seen, but paleate; anthers c. 1 mm long, black, abortive?), 3.8–5 mm long. 3- or 5-nerfed, apex acute; upper lemma 2.4–3 mm long, castaneous in fruit, smooth, 3-nerved, callus hairs 0.5–1.4 mm long, 0.35–0.47 times as long as the lemma, apex acute, without lateral setae, awn distinctly exerted beyond the glumes, geniculate, 2–3.1 mm long when dry, column 0–1.1 mm long when dry. *Anthers* 3, 1.5–2 mm long.

*Distribution* — Taiwan, Hualien Co., Ta-yu-ling (N24°11′0" E121°18′0", type); Nantou, Jenai Hsiang, Yunhai (N24°3′0" E121°16′0"), Taitung Co., Hsiao-kuei Hu (N22°44′04" E120°53′44""). Perhaps also S.-Y. Ku 20410 (TAI, phoco in L). Perhaps *Ohwi 1424 (US)* not seen by me, but mentioned by Phipps (1967a: 1047) belongs there.

**Acknowledgements**

Most of this study was based on specimens available in L and U, and some seen in BO, K, M, P, SING, and W. Loans of crucial importance from K, M, and W are gratefully acknowledged. Dr. R.J. Soreng (C.-S. Kuoh (NCKU)) provided material and data for the study of *A. taiwanica*.

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<td>hol = A. holocides</td>
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ANU 2165 (Flenley): fur; 5816 (Wheeler): set – Argent & Reynoso 89127. 7: fur.

Backer 1171: goe; 5186: set; 8549: goe; 10546: goe; 13936: goe; 21478: (fil).


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ANU 2165 (Flenley): fur; 5816 (Wheeler): set; 6007 (Wheeler): set – Argent & Reynoso 89127. 7: fur.

Backer 1171: goe; 5186: set; 8549: goe; 10546: goe; 13936: goe; 21478: (fil).
