*Agrostis* L.

Including *Agraulus* P. Beauv., *Agrestis* Bub., *Anomalotis* Steud., *Bromidium* Nees, *Candollea* Steud., *Chaetotropis* Kunth, *Decandolea* Batard, *Didymochaeta* Steud., *Lachnagrostis* Trin., *Neoschischkinia* Tsvelev, *Notonema* Raf., *Pentatherum* Nabelek, *Podagrostis* (Griseb.) Scribn., *Senisetum* Koidz., *Trichodium* Michaux, *Vilfa* Adans.

**Habit, vegetative morphology.** Annual, or perennial. Culms mostly (3–)5–100 cm high; herbaceous; unbranched above. Culm nodes glabrous. Leaf blades linear; 0.2–10 mm wide. **Ligule** **an unfringed membrane**.

**Inflorescence.** Plants bisexual, with bisexual spikelets. Inflorescence paniculate; open, or contracted (e.g., *Bromidium*); not comprising ‘partial inflorescences’ and foliar organs. Spikelet-bearing axes persistent. Spikelets not secund.

**Female-fertile spikelets, florets, fruit. Spikelets** 0.8–4 mm long; compressed laterally; **disarticulating above the glumes**. Rachilla prolonged beyond the uppermost female-fertile floret, or terminated by a female-fertile floret. Hairy callus present (the hairs less than 0.5 mm long), or absent. ***Glumes*** two; more or less equal; **long relative to the adjacent lemmas**; awnless; carinate, or non-carinate. Upper glume 1 nerved. **Spikelets** **with female-fertile florets only**. *Female-fertile florets* 1. **Lemmas** **entire to incised (usually truncate or emarginate, sometimes toothed via excurrent veins)**; awnless, or mucronate, or awned. Awns when present, 1, or 3 (*Bromidium*), or 5 (rarely); dorsal; geniculate; much shorter than the body of the lemma to about as long as the body of the lemma, or much longer than the body of the lemma (rarely). **Lemmas** **non-carinate**; without a germination flap; 3–5 nerved. Palea nearly always present; relatively long, or conspicuous but relatively short, or very reduced. *Lodicules* present; membranous; glabrous. Stamens 3. Ovary glabrous. Stigmas 2; white. *Fruit* small. **Hilum** **short**.

**Photosynthetic pathway, leaf blade anatomy.** C3; XyMS+. Midrib conspicuous, or not readily distinguishable; with one bundle only. Many of the smallest vascular bundles unaccompanied by sclerenchyma, or all the vascular bundles accompanied by sclerenchyma.

**Taxonomy, distribution.** Pooideae; Poodae; Aveneae. About 220 species. Holarctic, Paleotropical, Neotropical, Cape, Australian, and Antarctic.

**Anatomical references.** Metcalfe 1960; this project.

*Andropogon* L.

Including *Anatherum* P. Beauv., *Arthrostachys* Desv., *Arthrolophis* (Trin.) Chiov., *Dimeiostemon* Raf., *Eriopodium* Hochst., *Heterochloa* Desv., *Homoeatherum* Nees, *Leptopogon* Roberty

**Habit, vegetative morphology.** Annual, or perennial. Culms 8–250(–430) cm high; herbaceous; branched above, or unbranched above. Leaf blades linear; pseudopetiolate, or not pseudopetiolate. **Ligule** **an unfringed membrane to a fringed membrane**.

**Inflorescence.** Plants bisexual, with bisexual spikelets. Inflorescence of spicate main branches, or paniculate (usually with paired or digitate ‘racemes’, these often spatheate and aggregated into false panicles); a complex of ‘partial inflorescences’ and intervening foliar organs (often), or not comprising ‘partial inflorescences’ and foliar organs. **Spikelet-bearing axes** **disarticulating**; disarticulating at the joints. **Spikelets** paired; **consistently in ‘long-and-short’ combinations**; in pedicellate/sessile combinations. Pedicels of the ‘pedicellate’ spikelets free of the rachis. The ‘shorter’ spikelets hermaphrodite. The ‘longer’ spikelets male-only, or sterile (sometimes reduced to their pedicels).

**Female-sterile spikelets. The pedicelled spikelets male or barren, usually awnless, occasionally suppressed**.

**Female-fertile spikelets, florets, fruit. Spikelets** compressed laterally, or not noticeably compressed, or compressed dorsiventrally; **falling with the glumes**. Rachilla terminated by a female-fertile floret. Hairy callus present. *Glumes* two; more or less equal; long relative to the adjacent lemmas; awned, or awnless (G2 sometimes aristate). Upper glume 1–3 nerved. Spikelets with incomplete florets. The incomplete florets proximal to the female-fertile florets. The proximal incomplete florets 1; sterile. The proximal lemmas awnless. *Female-fertile florets* 1. Lemmas incised (usually bifid); awned. Awns 1; from a sinus; geniculate; about as long as the body of the lemma to much longer than the body of the lemma. Lemmas non-carinate; 1–3 nerved. Palea present; very reduced (hyaline). *Lodicules* present (tiny); fleshy; ciliate, or glabrous. Stamens 1–3. Ovary glabrous. Stigmas 2. *Fruit* small. Hilum short.

**Photosynthetic pathway, leaf blade anatomy.** C4; biochemical type NADP–ME (3 species); XyMS–. Midrib conspicuous; having a conventional arc of bundles; with colourless tissue adaxially. Many of the smallest vascular bundles unaccompanied by sclerenchyma, or all the vascular bundles accompanied by sclerenchyma.

**Taxonomy, distribution.** Panicoideae; Andropogonodae; Andropogoneae. About 100 species. Holarctic, Paleotropical, Neotropical, and Cape.

**Anatomical references.** Metcalfe 1960; this project.

*Anisopogon* R.Br.

**Habit, vegetative morphology. Oat-like perennial**. **Culms** **60–110 cm high**; herbaceous. Culm nodes glabrous. Leaf blades linear-lanceolate; 2–3 mm wide. **Ligule** **a fringed membrane (the membrane short to relatively long, hairy on the back)**.

**Inflorescence.** Plants bisexual, with bisexual spikelets. Inflorescence paniculate; open; not comprising ‘partial inflorescences’ and foliar organs. Spikelet-bearing axes persistent. Spikelets not secund.

**Female-fertile spikelets, florets, fruit. Spikelets** **40–60 mm long**; compressed laterally; disarticulating above the glumes. **Rachilla** **prolonged beyond the uppermost female-fertile floret (the slender prolongation 6–8 mm long, in the palea groove)**. **Hairy callus** **present (about 6 mm long, with dense, white hairs)**. *Glumes* two; more or less equal (the upper slightly longer); long relative to the adjacent lemmas; awnless; non-carinate. Upper glume 7–9 nerved. Spikelets with female-fertile florets only, or with incomplete florets (usually with a single, abortive floret). The incomplete florets distal to the female-fertile florets. *Female-fertile florets* 1. Lemmas incised; awned. Awns 3; from a sinus; geniculate; much longer than the body of the lemma (up to 8 cm long). Lemmas non-carinate (rounded on the back); without a germination flap; 3 nerved. Palea present; relatively long (narrow, lanceolate). *Lodicules* present; membranous (two ‘stipoid’ and larger, the third smaller and flimsier); glabrous. Stamens 3. Ovary hairy (sparingly so, towards the apex). Stigmas 2, or 3; white. *Fruit* medium sized. **Hilum** **long-linear**. **Pericarp** **free, or loosely adherent**.

**Photosynthetic pathway, leaf blade anatomy.** C3; XyMS+. Midrib not readily distinguishable; with one bundle only. All the vascular bundles accompanied by sclerenchyma.

**Taxonomy, distribution.** Arundinoideae; Stipeae. 1 species. Australian.

**Anatomical references.** This project.

*Bambusa* Schreber

Including *Arundarbor* Kuntze, *Bonia* Balansa, *Criciuma* Soderstrom & Londoño, *Dendrocalamopsis* (Chia & Fung) Keng f., *Eremocaulon* Soderstrom & Londoño, *Guadua* Kunth, *Ischurochloa* Büse, *Leleba* Nakai, *Lingnania* McClure, *Tetragonocalamus* Nakai – cf. Clayton and Renvoize (1986). Soderstrom and Ellis (1987) refer *Criciuma*, *Eremocaulon* and *Guadua* to their subtribe Guaduinae, along with *Olmeca*, and place *Tetragonocalamus* in the Arundinariinae, but revised generic descriptions adequate for the present purpose are not available.

**Habit, vegetative morphology.** Perennial. **Culms** (200–)500–3500 cm high; **woody and persistent**; branched above. Culm nodes glabrous. Leaf blades pseudopetiolate. **Ligule** **an unfringed membrane to a fringed membrane**.

**Inflorescence.** Plants bisexual, with bisexual spikelets. **Inflorescence** **of pseudospikelets, these solitary or in tufts, fascicles or capitula on leafless branches**; open; **a complex of ‘partial inflorescences’ and intervening foliar organs**. Spikelet-bearing axes persistent. Spikelets not secund.

**Female-fertile spikelets, florets, fruit. Spikelets** 10–80 mm long; **compressed laterally to not noticeably compressed**; disarticulating above the glumes; disarticulating between the florets. Rachilla prolonged beyond the uppermost female-fertile floret. Hairy callus absent. *Glumes* two; more or less equal; shorter than the adjacent lemmas; awnless; carinate. Upper glume 7–18 nerved. Spikelets with incomplete florets. The incomplete florets distal to the female-fertile florets, or both distal and proximal to the female-fertile florets. The proximal incomplete florets 0–3 (? – fewer than 4); sterile. The proximal lemmas awnless. *Female-fertile florets* 1–20 (–‘many’). Lemmas entire; blunt; awnless (usually), or mucronate (*Guadua*); carinate to non-carinate; 9–22 nerved. Palea present; relatively long. *Lodicules* present; membranous; ciliate. Stamens 6. Ovary hairy. Stigmas 3 (usually?). **Hilum** **long-linear**.

**Photosynthetic pathway, leaf blade anatomy.** C3; XyMS+. Mesophyll with arm cells; with fusoids. Midrib conspicuous; having complex vascularization. All the vascular bundles accompanied by sclerenchyma.

**Taxonomy, distribution.** Bambusoideae; Bambusodae; Bambuseae. About 120 species. Holarctic, Paleotropical, Neotropical, and Australian.

**Anatomical references.** Metcalfe 1960; this project.

*Chloris* O. Swartz

Including *Actinochloris* Steud., *Agrostomia* Cerv., *Apogon* Steud., *Chloridopsis* Hack., *Chloropsis* Kuntze, *Chlorostis* Raf., *Geopogon* Steud., *Heterolepis* Boiss., *Leptochloris* Kuntze, *Phacellaria* Steud., *Trichloris* Benth.

**Habit, vegetative morphology.** Annual, or perennial. Culms 10–300 cm high; herbaceous. Culm nodes glabrous. Leaf blades linear. **Ligule** **a fringed membrane to a fringe of hairs**.

**Inflorescence.** Plants bisexual, with bisexual spikelets. Inflorescence of spicate main branches (rarely a single raceme); not comprising ‘partial inflorescences’ and foliar organs. **Spikelet-bearing axes** **persistent**. **Spikelets** solitary, or paired; **secund (on the dorsiventral rachis)**; not in distinct ‘long-and-short’ combinations.

**Female-fertile spikelets, florets, fruit.** Spikelets 1.8–5.5 mm long; compressed laterally; disarticulating above the glumes (the glumes usually persistent). Rachilla prolonged beyond the uppermost female-fertile floret. **Hairy callus** **present (usually minute)**. *Glumes* two; very unequal (divergent); (the longer) usually shorter than the adjacent lemmas; awnless. Upper glume 1–4 nerved. Spikelets with incomplete florets. The incomplete florets distal to the female-fertile florets (at least one of these conspicuous – the spikelet ‘with two florets’). *Female-fertile florets* 1 (rarely 2). **Lemmas** entire (truncate), or incised; **awned**. Awns 1 (usually), or 3; from a sinus, or apical; non-geniculate. **Lemmas** **carinate**; without a germination flap; 1–7 nerved. Palea present; relatively long. *Lodicules* present; fleshy; glabrous. Stamens 3. Ovary glabrous. Stigmas 2; white, or red pigmented. *Fruit* small. Hilum short. Pericarp free to fused.

**Photosynthetic pathway, leaf blade anatomy.** C4; biochemical type PCK (6 species); XyMS+. Midrib conspicuous; with one bundle only, or having a conventional arc of bundles; with colourless tissue adaxially, or without colourless tissue adaxially. Many of the smallest vascular bundles unaccompanied by sclerenchyma, or all the vascular bundles accompanied by sclerenchyma.

**Taxonomy, distribution.** Chloridoideae; main chloridoid assemblage. About 55 species. Holarctic, Paleotropical, Neotropical, and Australian.

**Anatomical references.** Metcalfe 1960; this project.

*Cynodon* Rich.

Including *Capriola* Adans., *Dactilon* Vill., *Fibichia* Koel.

**Habit, vegetative morphology.** Perennial. Culms 4–60(–100) cm high; herbaceous. Culm nodes glabrous. Leaf blades linear. **Ligule** present; **a fringed membrane (very short), or a fringe of hairs**.

**Inflorescence.** Plants bisexual, with bisexual spikelets. **Inflorescence** **of spicate main branches**; not comprising ‘partial inflorescences’ and foliar organs. Spikelet-bearing axes persistent. **Spikelets** solitary; **secund**.

**Female-fertile spikelets, florets, fruit. Spikelets** **1.7–3 mm long**; **compressed laterally**; **disarticulating above the glumes, or disarticulating between the glumes**. Rachilla prolonged beyond the uppermost female-fertile floret, or terminated by a female-fertile floret (*C. incompletus*). **Hairy callus** **absent**. *Glumes* two; very unequal to more or less equal; shorter than the adjacent lemmas; awnless; carinate. Upper glume 1 nerved, or 1–3 nerved. Spikelets with female-fertile florets only (normally), or with incomplete florets. The incomplete florets (when present) distal to the female-fertile florets. ***Female-fertile florets*** **1**. **Lemmas** entire; pointed, or blunt; **awnless**; carinate; 1–4 nerved. Palea present; relatively long. *Lodicules* present; fleshy; glabrous. Stamens 3. Ovary glabrous. Stigmas 2; red pigmented. *Fruit* small. Hilum short. Pericarp fused.

**Photosynthetic pathway, leaf blade anatomy.** C4; biochemical type NAD–ME (2 species); XyMS+. Midrib conspicuous; with one bundle only, or having a conventional arc of bundles. All the vascular bundles accompanied by sclerenchyma.

**Taxonomy, distribution.** Chloridoideae; main chloridoid assemblage. 10 species. Holarctic, Paleotropical, Neotropical, Cape, Australian, and Antarctic.

**Anatomical references.** This project.

*Echinochloa* P. Beauv.

Including *Ornithospermum* Dumoulin, *Tema* Adans.

**Habit, vegetative morphology.** Annual, or perennial. Culms 40–360 cm high; herbaceous; branched above, or unbranched above. Culm nodes glabrous. **Ligule** present, or absent; **when present, a fringe of hairs**.

**Inflorescence.** Plants bisexual, with bisexual spikelets. **Inflorescence** **of spicate main branches (the spikelets often hispid)**; not comprising ‘partial inflorescences’ and foliar organs. Spikelet-bearing axes persistent. **Spikelets** **paired, or clustered in little secondary racemelets**; **secund**.

**Female-fertile spikelets, florets, fruit. Spikelets** 2.3–7 mm long; **compressed dorsiventrally**; falling with the glumes. Rachilla terminated by a female-fertile floret. Hairy callus absent. *Glumes* two; very unequal; (the upper) shorter than the adjacent lemmas to long relative to the adjacent lemmas; awned, or awnless. **Upper glume** **5 nerved, or 7 nerved**. Spikelets with incomplete florets. The incomplete florets proximal to the female-fertile florets. The proximal incomplete florets 1; male (rarely), or sterile. The proximal lemmas awned, or awnless. *Female-fertile florets* 1. Lemmas entire; awnless (obtuse to apiculate); non-carinate; with a clear germination flap; 5 nerved. **Palea** **present (the tip reflexed)**; relatively long. *Lodicules* present; fleshy; glabrous. Stamens 3. Ovary glabrous. Stigmas 2; red pigmented. *Fruit* small. Hilum short.

**Photosynthetic pathway, leaf blade anatomy.** C4; biochemical type NADP–ME (3 species); XyMS–. Midrib conspicuous; having a conventional arc of bundles; with colourless tissue adaxially. Many of the smallest vascular bundles unaccompanied by sclerenchyma.

**Taxonomy, distribution.** Panicoideae; Panicodae; Paniceae. 30–40 species. Holarctic, Paleotropical, Neotropical, and Australian.

**Anatomical references.** Metcalfe 1960; this project.

*Eleusine* Gaertn.

**Habit, vegetative morphology. Annual, or perennial (the culms flattened)**. Culms 10–150 cm high; herbaceous. Culm nodes glabrous. Leaf blades linear. **Ligule** **a fringed membrane**.

**Inflorescence.** Plants bisexual, with bisexual spikelets. Inflorescence of spicate main branches; open, or contracted (sometimes forming a capitulum); not comprising ‘partial inflorescences’ and foliar organs. Spikelet-bearing axes persistent. **Spikelets** **secund**.

**Female-fertile spikelets, florets, fruit.** Spikelets 3.5–11 mm long; compressed laterally; disarticulating above the glumes, or not disarticulating (*E. coracana*); disarticulating between the florets (except in *E. coracana*). Rachilla prolonged beyond the uppermost female-fertile floret. Hairy callus absent. *Glumes* two; very unequal; shorter than the adjacent lemmas; awnless; carinate. Upper glume 3–5(–7) nerved. Spikelets with female-fertile florets only, or with incomplete florets. The incomplete florets distal to the female-fertile florets. ***Female-fertile florets*** **3–15**. Lemmas entire; pointed, or blunt; awnless to mucronate; carinate; 3 nerved. Palea present. *Lodicules* present; fleshy, or membranous; glabrous. Stamens 3. Ovary glabrous. Stigmas 2; white, or brown. ***Fruit*** small (0.9–2 mm long); **sculptured**. Hilum short. Pericarp free.

**Photosynthetic pathway, leaf blade anatomy.** C4; biochemical type NAD–ME (2 species); XyMS+. Midrib conspicuous; with one bundle only. All the vascular bundles accompanied by sclerenchyma.

**Taxonomy, distribution.** Chloridoideae; main chloridoid assemblage. 9 species. Holarctic, Paleotropical, Neotropical, Cape, and Antarctic.

**Anatomical references.** Metcalfe 1960; this project.

*Festuca* L.

Including *Amphigenes* Janka, *Anatherum* Nabelek, *Argillochloa* Weber, *Bucetum* Parnell, *Drymochloa* Holub, *Drymonaetes* Fourr., *Festucaria* Fabric., *Gnomonia* Lunell, *Gramen* Krause, *Hellerochloa* Rauschert, *Leiopoa* Ohwi, *Lojaconoa* Gand., *Nabelekia* Roshev., *Wasatchia* M. E. Jones

**Habit, vegetative morphology.** Perennial. **Culms** 2–200 cm high; **herbaceous**; unbranched above. Culm nodes glabrous. Leaf blades linear to linear-lanceolate; 0.2–15 mm wide. **Ligule** **an unfringed membrane (sometimes ciliolate)**.

**Inflorescence.** Plants bisexual, with bisexual spikelets (*Leucopoa* being excluded). Inflorescence paniculate; open (usually), or contracted (rarely); not comprising ‘partial inflorescences’ and foliar organs. Spikelet-bearing axes persistent. Spikelets not secund.

**Female-fertile spikelets, florets, fruit.** Spikelets 3–20 mm long; compressed laterally; disarticulating above the glumes; disarticulating between the florets. Rachilla prolonged beyond the uppermost female-fertile floret. Hairy callus absent. ***Glumes*** two; **very unequal**; shorter than the adjacent lemmas; awnless; carinate to non-carinate. Upper glume (1–)3–5 nerved. Spikelets with incomplete florets. The incomplete florets distal to the female-fertile florets. ***Female-fertile florets*** **2–14 (rarely 1)**. Lemmas entire, or incised; when entire pointed, or blunt; awnless, or mucronate, or awned. Awns when present, 1; from a sinus, or apical; non-geniculate; much shorter than the body of the lemma (usually), or about as long as the body of the lemma (sometimes, rarely somewhat longer). **Lemmas** **non-carinate**; 3–7 nerved. Palea present; relatively long. *Lodicules* present; membranous; ciliate, or glabrous. Stamens 3. Ovary glabrous, or hairy. Stigmas 2; white. *Fruit* small, or medium sized, or large. **Hilum** **long-linear (usually about as long as the grain, but sometimes elliptical and only half as long)**.

**Photosynthetic pathway, leaf blade anatomy.** C3; XyMS+. Midrib conspicuous, or not readily distinguishable; with one bundle only. Many of the smallest vascular bundles unaccompanied by sclerenchyma, or all the vascular bundles accompanied by sclerenchyma.

**Taxonomy, distribution.** Pooideae; Poodae; Poeae. 360 species (or more). Holarctic, Paleotropical, Neotropical, Cape, Australian, and Antarctic.

**Anatomical references.** Metcalfe 1960; this project; Aiken *et al.* 1985.

*Oryza* L.

Including *Padia* Moritzi

**Habit, vegetative morphology.** Annual, or perennial. **Culms** 30–300 cm high; **herbaceous**. Culm nodes glabrous. Leaf blades linear to linear-lanceolate; pseudopetiolate, or not pseudopetiolate. **Ligule** **an unfringed membrane**.

**Inflorescence.** Plants bisexual, with bisexual spikelets. **Inflorescence** **paniculate (axes usually wavy, the spikelets appressed), or of spicate main branches (the primary branches often reduced to racemes)**; open; not comprising ‘partial inflorescences’ and foliar organs. Spikelet-bearing axes persistent. Spikelets not secund.

**Female-fertile spikelets, florets, fruit.** Spikelets 4–12 mm long; strongly compressed laterally; disarticulating above the glumes (i.e. above the pedicel cup representing them). Rachilla terminated by a female-fertile floret. Hairy callus absent. **Glumes** **present to absent (represented only by a small 2-lobed cupule)**; if present, two; more or less equal; shorter than the adjacent lemmas; awnless. **Upper glume** **0 nerved**. Spikelets with incomplete florets. The incomplete florets proximal to the female-fertile florets. **The proximal incomplete florets** **2 (small, vestigial, no more than half the spikelet length, sometimes only bristles)**; sterile. The proximal lemmas awnless. *Female-fertile florets* 1. Lemmas entire; pointed; awnless, or mucronate, or awned. Awns when present, 1; apical; non-geniculate; much shorter than the body of the lemma to much longer than the body of the lemma. Lemmas strongly carinate; 3–9 nerved. Palea present; relatively long (but narrower than the lemma). *Lodicules* present; membranous (but the membranous flange may be narrow); glabrous. **Stamens** **6**. Ovary glabrous. Stigmas 2. *Fruit* small, or medium sized, or large. Hilum long-linear.

**Photosynthetic pathway, leaf blade anatomy.** C3; XyMS+. Mesophyll with arm cells; without fusoids. Midrib conspicuous; having complex vascularization. All the vascular bundles accompanied by sclerenchyma.

**Taxonomy, distribution.** Bambusoideae; Oryzodae; Oryzeae. 25 species. Holarctic, Paleotropical, and Neotropical.

**Anatomical references.** Metcalfe 1960; this project.

*Panicum* L.

Including *Chasea* Nieuw., *Coleataenia* Griseb., *Dileucaden* (Raf.) Steud., *Eatonia* Raf., *Eriolytrum* Kunth, *Milium* Adans., *Monachne* P. Beauv., *Phanopyrum* (Raf.) Nash, *Polyneura* Peter, *Psilochloa* Launert, *Setiacis* S.L. Chen and Y.X. Jin (? – original description inadequate)

**Habit, vegetative morphology. Annual, or perennial (but no overwintering rosette – by contrast with *Dichanthelium*)**. Culms 20–400 cm high; woody and persistent, or herbaceous; branched above, or unbranched above. Culm nodes hairy, or glabrous. Leaf blades pseudopetiolate (rarely), or not pseudopetiolate. **Ligule** **an unfringed membrane, or a fringed membrane to a fringe of hairs**.

**Inflorescence. Plants** **bisexual, with bisexual spikelets**. **Inflorescence** **paniculate (except in the *Stolonifera* group, where it consists of racemes and the distinction from *Brachiaria* breaks down)**; open, or contracted; not comprising ‘partial inflorescences’ and foliar organs. **Spikelet-bearing axes** **persistent**. **Spikelets** **not secund (except the American Agrostoidea group, ‘*Psilochloa*’, etc.)**.

**Female-fertile spikelets, florets, fruit. Spikelets** 1.4–6 mm long; **compressed dorsiventrally (with very few exceptions: e.g. *P. hemitomum*)**; **falling with the glumes, or not disarticulating**. Rachilla terminated by a female-fertile floret (very rarely prolonged, e.g. occasionally in *P. heliophilum*: Zuloaga and Morone 1991). Hairy callus absent. ***Glumes*** two; **nearly always very unequal**; (the longer) long relative to the adjacent lemmas; nearly always awnless (the G2 truncate to pointed, very rarely shortly awn-tipped). Upper glume 3–9 nerved. Spikelets nearly always with incomplete florets. The incomplete florets proximal to the female-fertile florets. The proximal incomplete florets 1, or 2 (rarely); male, or sterile. The proximal lemmas awnless. *Female-fertile florets* 1. Lemmas entire; pointed, or blunt; awnless (rarely minutely apiculate); non-carinate; with a clear germination flap; 3–11 nerved. Palea present; relatively long. *Lodicules* present; fleshy; glabrous. Stamens 3. Ovary glabrous. Stigmas 2; red pigmented. *Fruit* small. Hilum short (linear in (e.g.) *P. glutinosum*, *P. macranthum*, *P. pilgerianum* = *Psilochloa*).

**Photosynthetic pathway, leaf blade anatomy.** C4, or C3; biochemical type PCK (5 species), or NAD–ME (14 species), or NADP–ME (4 species); when biochemically tested, XyMS+ (C3, or C4 NAD-ME or PCK), or XyMS– (NADP-ME). Midrib conspicuous, or not readily distinguishable; with one bundle only, or having a conventional arc of bundles; with colourless tissue adaxially, or without colourless tissue adaxially. Many of the smallest vascular bundles unaccompanied by sclerenchyma, or all the vascular bundles accompanied by sclerenchyma (rarely).

**Taxonomy, distribution.** Panicoideae; Panicodae; Paniceae. About 370 species. Holarctic, Paleotropical, Neotropical, Australian, and Antarctic.

**Anatomical references.** Mainly Metcalfe 1960 and this project.

*Phragmites* Adans.

Including *Czernya* Presl, *Miphragtes* Nieuwland, *Oxyanthe* Steud., *Trichoon* Roth, *Xenochloa* Roem. & Schult.

**Habit, vegetative morphology.** Perennial. Culms 60–400 cm high (–1000 cm); woody and persistent to herbaceous (often somewhat persistent); branched above (especially when main culm damaged), or unbranched above. Culm nodes glabrous. Leaf blades linear-lanceolate to lanceolate; 6–50 mm wide; not pseudopetiolate. **Ligule** **a fringe of hairs**.

**Inflorescence.** Plants bisexual, with bisexual spikelets. **Inflorescence** paniculate; **open (20–60 cm long, plumose, the fertile lemmas surrounded by long white silky hairs)**; not comprising ‘partial inflorescences’ and foliar organs. Spikelet-bearing axes persistent. Spikelets not secund.

**Female-fertile spikelets, florets, fruit.** Spikelets 9–16 mm long; compressed laterally; disarticulating above the glumes (at least above the L1); disarticulating between the florets. Rachilla prolonged beyond the uppermost female-fertile floret. Hairy callus present (with long fine silky hairs). *Glumes* two; very unequal; shorter than the adjacent lemmas; awnless; non-carinate (rounded on the back). Upper glume 3–5 nerved. Spikelets with incomplete florets. **The incomplete florets** **both distal and proximal to the female-fertile florets**. The proximal incomplete florets 1; male (the stamens often 2), or sterile. The proximal lemmas awnless. ***Female-fertile florets*** **(2–)3–10**. Lemmas entire; pointed (acute to acuminate or aristulate); awnless, or awned (narrow-attenuate, muticous to aristulate). Awns (if lemmas aristulate) 1; apical; non-geniculate; much shorter than the body of the lemma. Lemmas non-carinate; 1–3 nerved. Palea present; conspicuous but relatively short. *Lodicules* present; fleshy; ciliate, or glabrous. Stamens 3. Ovary glabrous. Stigmas 2; brown. *Fruit* small. **Hilum** **short**.

**Photosynthetic pathway, leaf blade anatomy.** C3; XyMS+. Mesophyll with arm cells. Midrib conspicuous; having a conventional arc of bundles. All the vascular bundles accompanied by sclerenchyma.

**Taxonomy, distribution.** Arundinoideae; Arundineae. 3 species. Holarctic, Paleotropical, Neotropical, Australian, and Antarctic.

**Anatomical references.** Metcalfe 1960; this project.

*Poa* L.

Including *Arctopoa* (Griseb.) Probat., *Neuropoa* Clayton, *Oreopoa* Grand., *Paneion* Lunell, *Parodiochloa* C.E. Hubb., *Poagrostis* Raf.

**Habit, vegetative morphology.** Annual, or perennial. **Culms** **(1–)4–150 cm high**; herbaceous; unbranched above. Leaf blades linear, or linear-lanceolate (often ending in a boat-shaped tip); 0.2–12 mm wide (rarely wider). **Ligule** **an unfringed membrane, or a fringed membrane (rarely)**.

**Inflorescence.** Plants bisexual, with bisexual spikelets, or dioecious (or gynodioecious, in subgenus *Andinae*). **Inflorescence** **paniculate**; open, or contracted; not comprising ‘partial inflorescences’ and foliar organs. Spikelet-bearing axes persistent. **Spikelets** **not secund**.

**Female-fertile spikelets, florets, fruit.** Spikelets 2–11 mm long; compressed laterally; disarticulating above the glumes; disarticulating between the florets. **Rachilla** **prolonged beyond the uppermost female-fertile floret**. Hairy callus present, or absent. ***Glumes*** two; more or less equal, or very unequal to more or less equal (nearly always ‘subequal’, with the G1 somewhat shorter); **shorter than the adjacent lemmas**; awnless; carinate. Upper glume (1–)3(–5) nerved. Spikelets with female-fertile florets only, or with incomplete florets. The incomplete florets distal to the female-fertile florets. *Female-fertile florets* (1–)2–13(–15) (the one-floreted species very unusual, perhaps restricted to Malesia). **Lemmas** nearly always entire (very rarely tridenticulate); pointed; awnless, or mucronate (2–3 mm terminal ‘awns’ in a very few species, e.g. in the southern South American *P. flabellata*); **carinate**; without a germination flap; (3–)5 nerved, or 7–11 nerved (rarely, e.g. in the Australian *Neuropoa*). Palea present; relatively long, or conspicuous but relatively short. *Lodicules* present; membranous; nearly always glabrous (occasionally ciliolate). Stamens 3. Ovary glabrous. Stigmas 2; white. *Fruit* small. **Hilum** **short**.

**Photosynthetic pathway, leaf blade anatomy.** C3; XyMS+. Midrib conspicuous; with one bundle only. Many of the smallest vascular bundles unaccompanied by sclerenchyma, or all the vascular bundles accompanied by sclerenchyma.

**Taxonomy, distribution.** Pooideae; Poodae; Poeae. About 500 species. Holarctic, Paleotropical, Neotropical, Australian, and Antarctic.

**Anatomical references.** Mainly Metcalfe 1960; this project.

*Zea* L.

Including *Mays* Miller, *Mayzea* Raf., *Reana* Brignoli, *Thalysia* Kuntze. = *Zea mays* subsp. *mays*

**Habit, vegetative morphology.** Robust annual. Culms 200–450 cm high; herbaceous. Culm nodes glabrous. **Ligule** **a fringed membrane**.

**Inflorescence. Plants** **monoecious with all the fertile spikelets unisexual**. **Inflorescence** **peculiar: the female axillary, comprising a stout, spicate spadix with spikelets in few to several longitudinal rows, terminating in a tuft of long pendulous styles (‘silks’); the male spikelets in terminal panicles of spiciform ‘tassels’**; not comprising ‘partial inflorescences’ and foliar organs. Spikelet-bearing axes persistent. Spikelets paired; not secund; consistently in ‘long-and-short’ combinations (male), or not in distinct ‘long-and-short’ combinations (female).

**Female-sterile spikelets. Male spikelets in pairs, two-flowered, with many-nerved, membranous glumes. Lemmas and paleas hyaline, the florets with three stamens and two cuneate lodicules**.

**Female-fertile spikelets, florets, fruit.** Spikelets not noticeably compressed to compressed dorsiventrally; not disarticulating. Rachilla terminated by a female-fertile floret. Hairy callus absent. *Glumes* two; more or less equal; long relative to the adjacent lemmas; awnless. Upper glume 0 nerved. Spikelets with incomplete florets. The incomplete florets proximal to the female-fertile florets. The proximal incomplete florets 1; sterile. The proximal lemmas awnless. *Female-fertile florets* 1. Lemmas awnless; non-carinate; 3 nerved. Palea present; relatively long. *Lodicules* absent. Stamens 0. Ovary glabrous. Stigmas 2 (at tip of style); white to red pigmented (or green). *Fruit* medium sized. Hilum short.

**Photosynthetic pathway, leaf blade anatomy.** C4; biochemical type NADP–ME; XyMS–. Midrib conspicuous; having a conventional arc of bundles; with colourless tissue adaxially. Many of the smallest vascular bundles unaccompanied by sclerenchyma.

**Special diagnostic feature. Fruiting inflorescence a massive, spatheate cob, the fruits in many rows**.

**Taxonomy, distribution.** Panicoideae; Andropogonodae; Maydeae. 1 species. Neotropical.

**Anatomical references.** Metcalfe 1960; this project.