

Grasses of James Cook University, Townsville Campus

Part A: A 'pictorial' key to grass genera in North Queensland

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School of Marine and Tropical Biology.

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COMMONWEALTH OF AUSTRALIA

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The grass family (Poaceae) is one of the largest and most widespread families of flowering plants.

The key in this book is based mainly on the type of inflorescence, and certain features of the spikelet. Based on similarities of these characters, grass genera are placed in one or more of the ten groups. This is not a natural key, therefore closely related grasses may key out in different groups.

The key is designed to be used in the field, however, grass flowers are usually very small and must therefore be viewed with magnification. A x10 hand lens is recommended.

For any terminology not covered here, please refer to the "Flora of Australia" glossary available online: <http://www.environment.gov.au/biodiversity/abrs/online-resources/glossaries/vascular/index.html>

Grasses of New South Wales, Wheeler *et al.* (2002) has an excellent, well-illustrated glossary.

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1. How to identify a grass

Make sure you have a grass and not a grass-like plant. The chief families that can be easily confused with grasses, and their distinguishing features, are shown in the table.

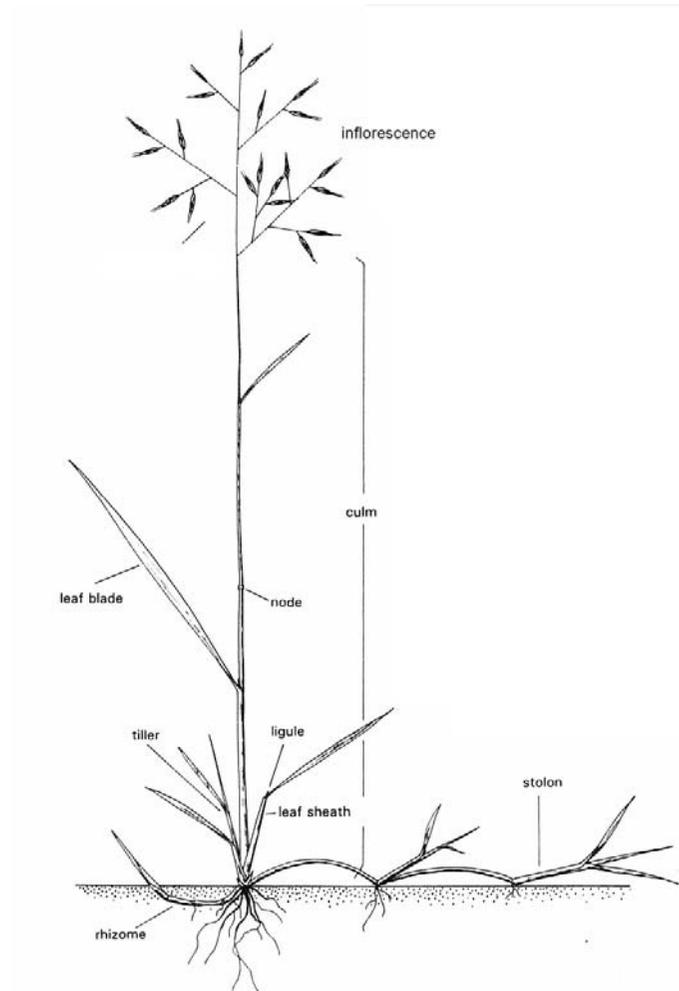
	Poaceae (grasses)	Cyperaceae (sedges)	Liliaceae sensu lato
Stems	Hollow or solid Round	Solid Triangular or round	Hollow or solid Round to flat
Leaf sheaths	Open	Closed	Open
Leaves	2-ranked	3-ranked	
Ligules	Present	Absent	Absent
Flowers	Commonly bisexual Enclosed by a lemma and palea and subtended by sterile glumes	Bisexual or unisexual and monoecious Enclosed by a single bract (glume)	Bisexual Petaloid perianth present (often showy)
Floral Formula	P0 A3 G(2)	P0 A3 G(2-3)	P3+3 or 6 A6 G(3)

N.B. As with most aspects of the biological world, there are exceptions to these characters.

2. Grass terminology.

Familiarise yourself with the basic structures of a grass.

2.1. The Grass Plant



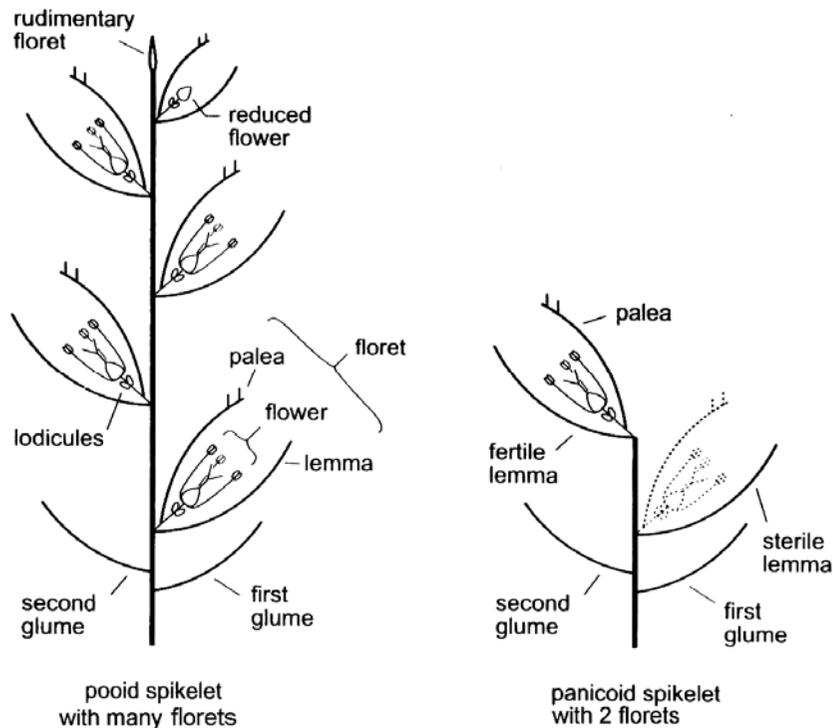
Drawing from Tothill and Hacker (1983).

Terminology:

- Inflorescence - flowers.
- Culm - stem.
- Node - the part of the stem (usually jointed) from which the leaf arises.
- Ligule - a membranous or hairy appendage at the junction between sheath and blade.
- Tiller - new shoot.
- Stolon - a trailing stem that produces roots at the nodes.
- Rhizome - an underground stem, usually growing horizontally, producing roots at the nodes

2.2. The Grass Spikelet

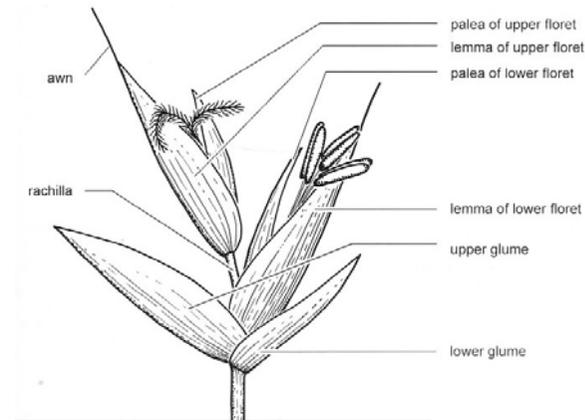
The basic floral unit of a grass inflorescence is the spikelet. Each spikelet consists of a number of florets (flowers), arranged alternately on either side of a central axis (rachilla) with one or two glumes below them. Florets per spikelet can range from 1 to 145. Below are two diagrams showing the morphology of two common types of grass spikelets in Australia.



First glume = lower glume; second glume = upper glume. Dotted lines indicate structures that are usually absent. Diagram from Clark (2004).

The Panicoid Grass Spikelet

In North Queensland, many of the grass genera belong to the subfamily Panicoideae. Most members of this group have two florets per spikelet, with the lower one sterile (reduced) or male. The drawing below is typical of the tribe Paniceae.



Drawing from Mallett and Orchard (2002).

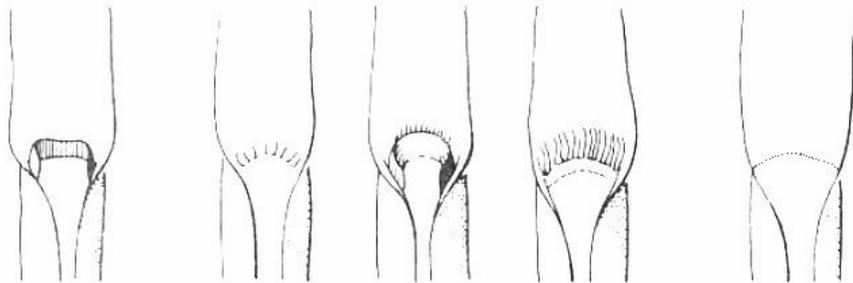


The parts of a bisexual flower. Lodicules are considered to represent the perianth, but are often absent or difficult to see.

Photograph (© D. Sharp, Qld Herbarium) adapted from Sharp and Simon (2002), drawing from Mallett and Orchard (2002).

2.3. Types of Ligules

A ligule is an outgrowth on the inner surface of the surface of a leaf, at the junction between sheath and blade.



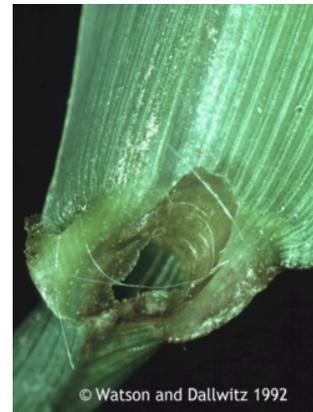
an eciliate membrane (hairs absent)

a fringe of hairs (membrane absent or obscure)

a fringed membrane which may be described further as:
 ciliate (hairs shorter than membrane) ciliate (hairs as long or longer than membrane)

no ligule

Drawing from Simon (1980).



An eciliate membrane (i.e. hairs absent)



A fringe of hairs



A fringed membrane

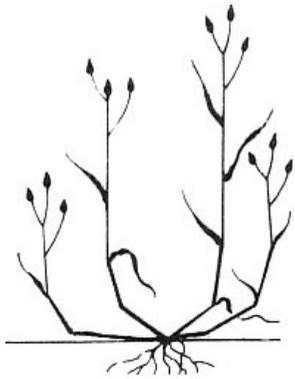


No ligule

Photographs from Sharp and Simon (2002) and Watson and Dallwitz (1992 onwards)

2.4. Grass Habit

Examine the whole plant and note habit and height.



Erect: upright, not bending or leaning

Decumbent: growing horizontally, then turning upwards.



Prostrate: lying flat on the ground

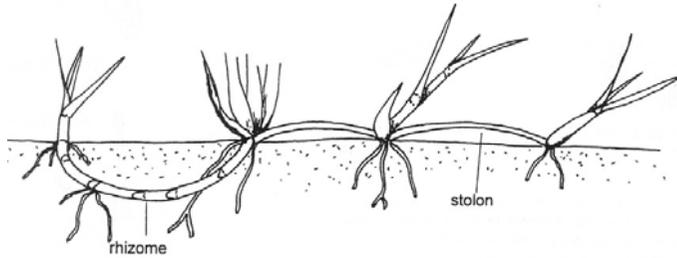
Ascending: growing erect after an oblique or semi-horizontal beginning

Drawings from Mallett and Orchard (2002), Sharp and Simon (2002).

2.5. Distinctive Features

Do you notice the presence of any distinctive features, e.g.

- rhizomes and/or stolons.

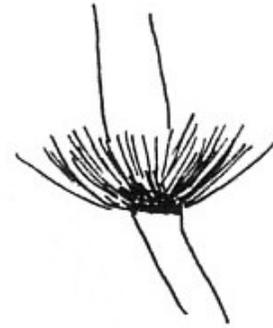


Drawing from Wheeler *et al.* (2002).

- distinctly curly leaves or distinctly hairy leaves or culms.



- bearded culm nodes.



- smell when crushed:
e.g. lemon, aromatic, kerosene, ginger, etc
- colour of culms, nodes, leaves, etc.



Drawing from Wheeler *et al.* (2002).

With a hand lens, examine spikelets for the presence of awns, bristles, long hairs, etc.

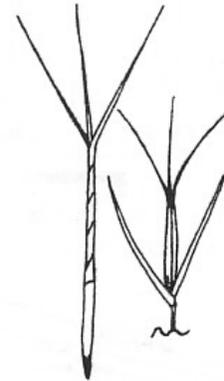
Awn: an elongated bristle-like appendage usually attached to, or near the apex of a lemma, palea, or glume.



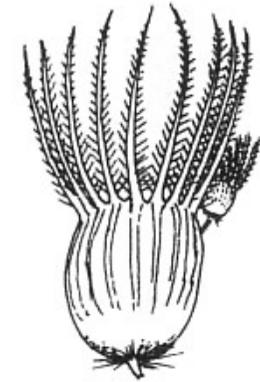
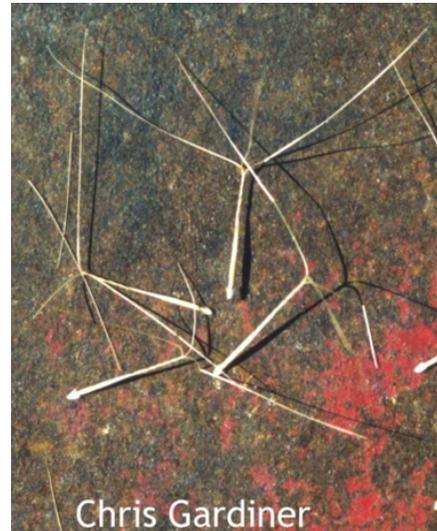
1 awn per spikelet
(1 awn per floret)



2 awns per spikelet
(1 awn per floret)



3 awns per spikelet

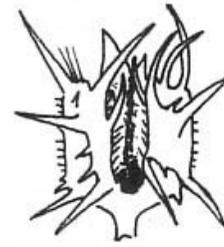
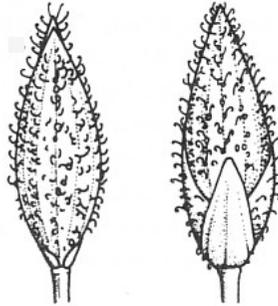
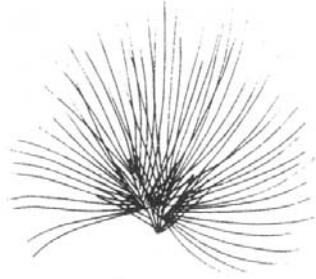
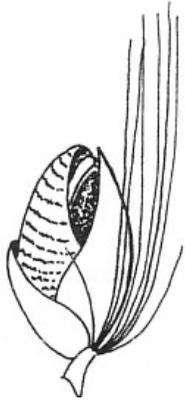


9 awns per floret



Drawings from Wheeler *et al.* (2002), photographs from Sharp and Simon (2002) and C.P. Gardiner.

Spikelets with bristles, long hairs, or spine-like structures

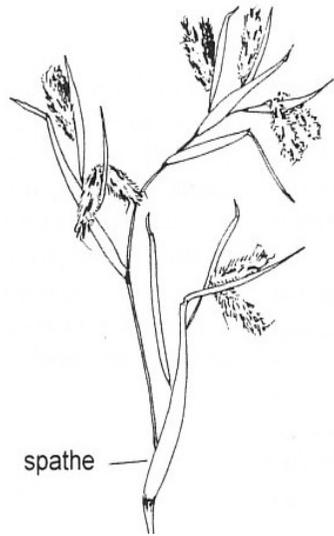


Drawings from Wheeler *et al.* (2002); photographs from Sharp and Simon (2002) and C.P. Gardiner.

3. Types of grass inflorescence

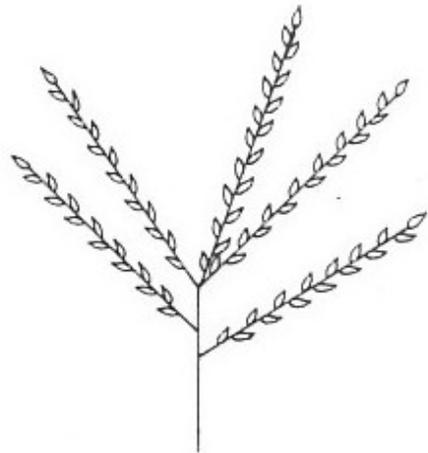
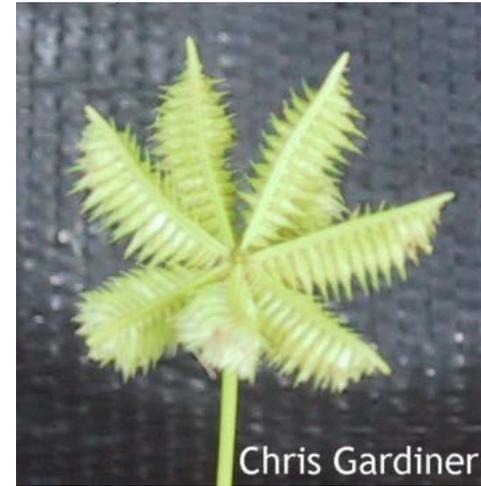
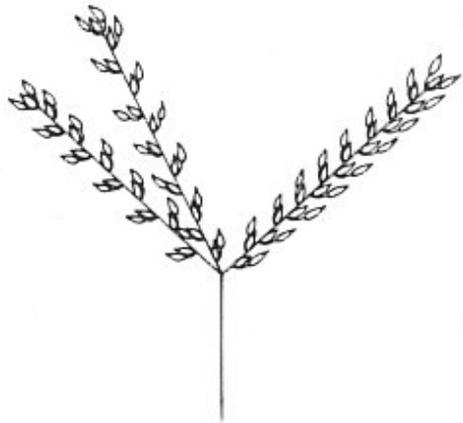
Spatheate inflorescence

A spatheate inflorescence - where the branches of the inflorescence are subtended by spathes (enlarged leaf-like bracts).



Drawing from Wheeler *et al.* (2002).

Digitate and sub-digitate inflorescence

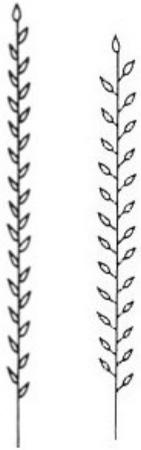


Drawing from Tothill and Hacker (1983).

Inflorescence a spike or raceme

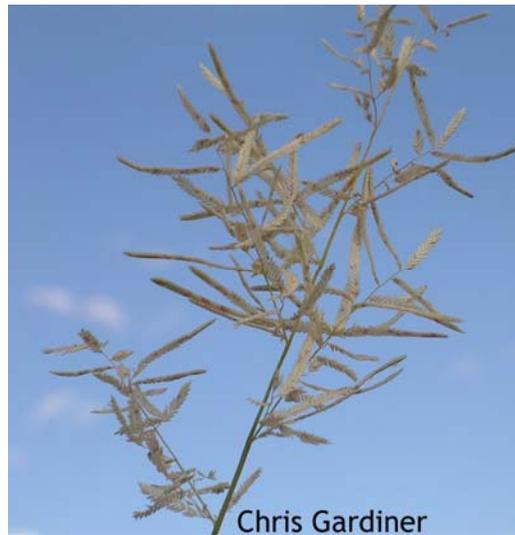
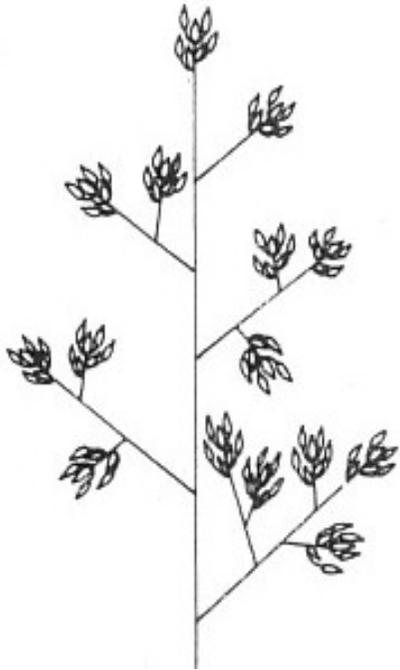
A spike is an unbranched inflorescence bearing sessile spikelets.

A raceme is an unbranched inflorescence bearing pedicelled spikelets.



Drawing from Tothill and Hacker (1983); photographs from Sharp and Simon (2002) and C.P. Gardiner.

Inflorescence an open panicle



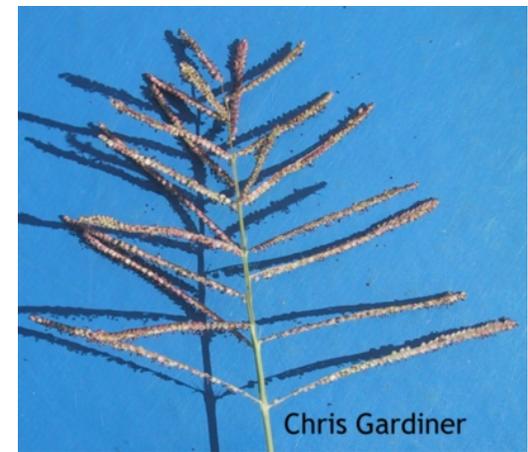
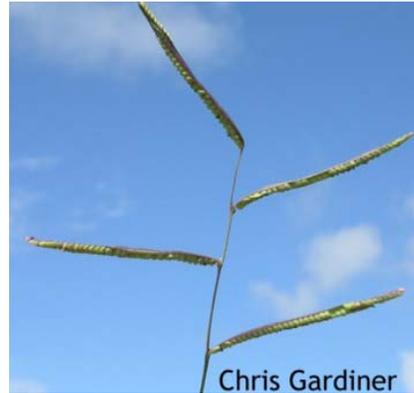
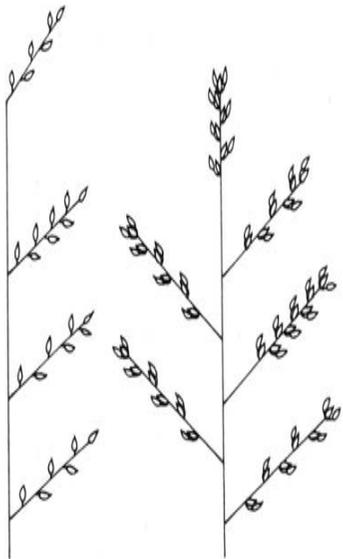
Drawing from Tothill and Hacker (1983).

Inflorescence a contracted panicle



Drawing from Tothill and Hacker (1983); photographs from Sharp and Simon (2002) and C.P. Gardiner.

Inflorescence a once-branched panicle



Drawing from Tothill and Hacker (1983).

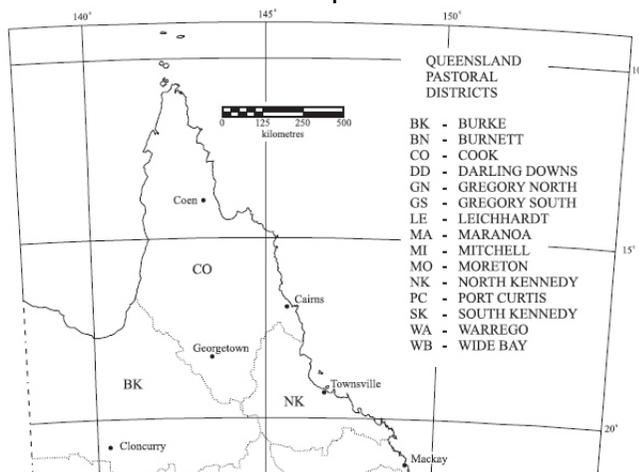
4. Keys to grass genera in North Queensland (Pastoral Districts: NK, CO and BK) - many occur in other districts

Note 1. This key is designed to highlight obvious features that can be readily be identified using the naked eye or a hand lens.

Note 2. In this key, some of the genera will appear several times because of the variation that occurs within genera.

Note 3. Read each couplet carefully before deciding the direction to follow.

Note 4. Three steps are involved in plant identification, the first two are mandatory and the last optional. The first step involves a preliminary identification using a key. Secondly, the unknown plant is compared with a published description of the plant it is presumed to be. Thirdly, as a further check, it is compared with a previously identified specimen, i.e. with a herbarium specimen.



North Queensland Pastoral Districts, taken from Bostock and Holland (2007)

The Dichotomous Key

1a Inflorescence with leaf-like structures (spathe) present within and/or below each inflorescence (spatheate inflorescence) **GROUP 1**

- | | |
|--------------------|-----------------------|
| <i>Andropogon</i> | <i>Rottboellia</i> |
| <i>Apluda</i> | <i>Schizachyrium</i> |
| <i>Chionachne</i> | <i>Spathia</i> |
| <i>Coix</i> | <i>Spinifex</i> |
| <i>Cymbopogon</i> | <i>Thaumastochloa</i> |
| <i>Elionurus</i> | <i>Themeda</i> |
| <i>Hemarthria</i> | <i>Thuarea</i> |
| <i>Hyparrhenia</i> | <i>Xerochloa</i> |
| <i>Iseilema</i> | <i>Zea</i> |
| <i>Mnesithea</i> | <i>Zygochloa</i> |
| <i>Ophiuros</i> | |

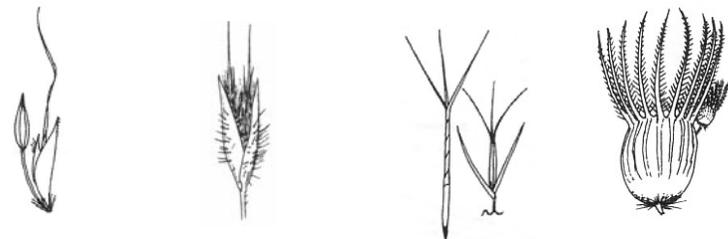


1b Inflorescence lacks a spathe, i.e. not as above
 go to 2

2a Inflorescence with two or more branches arising from the same point or almost i.e. digitate or subdigitate

GROUP 2

- | | |
|-----------------------|---------------------------|
| <i>Acrachne</i> | <i>Dimeria</i> |
| <i>Alloteropsis</i> | <i>Eleusine</i> |
| <i>Arthraxon</i> | <i>Enteropogon</i> |
| <i>Austrochloris</i> | <i>Eulalia</i> |
| <i>Axonopus</i> | <i>Germainia</i> |
| <i>Bothriochloa</i> | <i>Ischaemum</i> |
| <i>Brachyachne</i> | <i>Leptochloa</i> |
| <i>Chloris</i> | <i>Microstegium</i> |
| <i>Cynodon</i> | <i>Oxychloris</i> |
| <i>Dactyloctenium</i> | <i>Paspalum</i> |
| <i>Dichanthium</i> | <i>Pseudopogonatherum</i> |
| <i>Digitaria</i> | <i>Thelepogon</i> |



Drawings from Wheeler *et al.* (2002).

3b Awns absent, or if present, short and less than half the length of the lemma. Bristles, spines, long hairs may be present go to 7

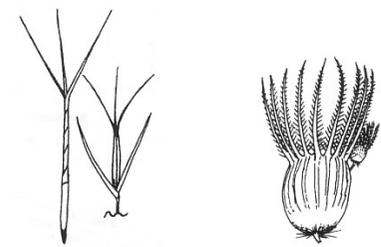


2b Inflorescence not as above go to 3

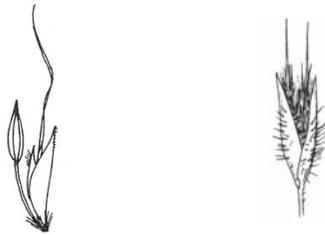
3a Awns present, obvious, more than half the length of the lemma. Bristles, long hairs and spines rarely obvious go to 4

4a Three or more awns per floret or awns branched GROUP 3

- Amphipogon*
- Aristida*
- Enneapogon*
- Triodia*
- Triraphis*

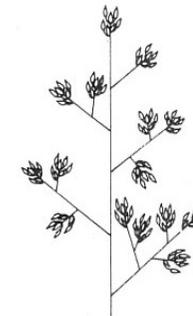
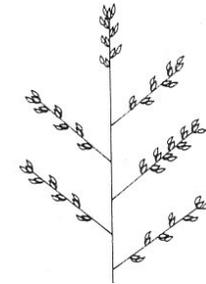


4b Awns; one or two per floret , not branchedgot to 5



6a Inflorescence with open branched..... GROUP 5

- Aristida*
- Arundinella*
- Austrostipa*
- Avena*
- Bothriochloa*
- Capillipedium*
- Chrysopogon*
- Dichelachne*
- Echinochloa*
- Eriachne*
- Lachnagrostis*
- Lophatherum*
- Oplismenus*
- Oryza*
- Pheidochloa*
- Sarga*
- Sorghum*
- Triodia*
- Vacoparis*



5a Inflorescence unbranched (spike or raceme)
..... GROUP 4

- | | |
|---------------------|--------------------|
| <i>Arthraxon</i> | <i>Heteropogon</i> |
| <i>Astrebla</i> | <i>Lepturus</i> |
| <i>Calyptochloa</i> | <i>Lolium</i> |
| <i>Dichanthium</i> | <i>Microlaena</i> |
| <i>Elionurus</i> | <i>Perotis</i> |
| <i>Elymus</i> | <i>Sehima</i> |
| <i>Germainia</i> | |



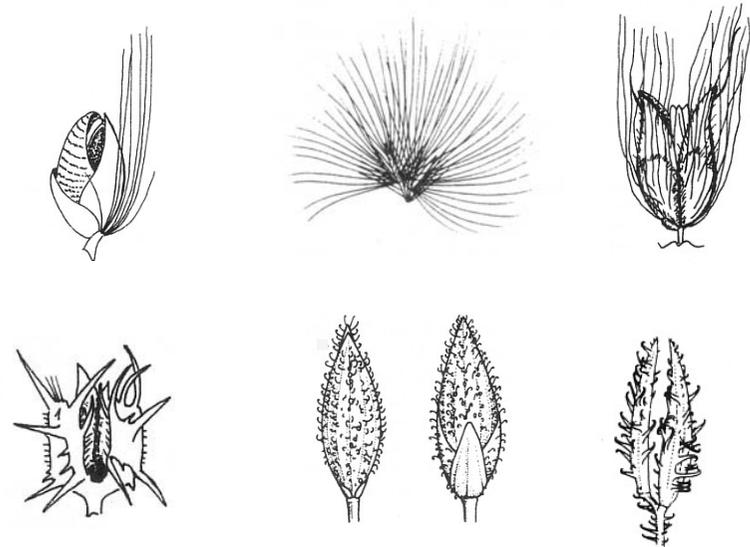
5b Inflorescence variously branchedgo to 6

6b Inflorescence variously branched, but not open as above - a contracted panicle GROUP 6

- Bothriochloa*
- Dichanthium*
- Dichelachne*
- Echinochloa*
- Echinopogon*
- Ectrosia*
- Eriachne*
- Garnotia*
- Hordeum*
- Ischaemum*
- Microlaena*
- Oplismenus*
- Paraneurachne*
- Pogonatherum*
- Thelepogon*



7a Bristles, long hairs subtending spikelets or spine-like structures present GROUP 7

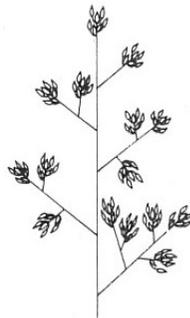


- Ancistrachne*
- Arundo*
- Cenchrus*
- Chamaeraphis*
- Eremochloa*
- Imperata*
- Melinis*
- Pennisetum*
- Phragmites*
- Setaria*
- Thyridolepis*
- Tragus*

7b Bristles, etc. absentgo to 8

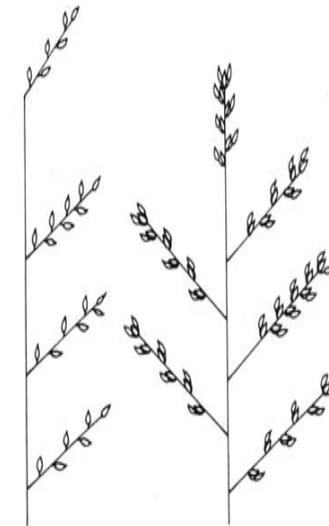
8a Inflorescence with open branches (secondary branches obvious) GROUP 8

- | | |
|-----------------------|---------------------|
| <i>Arthrargrostis</i> | <i>Melinis</i> |
| <i>Arundo</i> | <i>Micraira</i> |
| <i>Centotheca</i> | <i>Ottochloa</i> |
| <i>Coelachne</i> | <i>Panicum</i> |
| <i>Cyrtococcum</i> | <i>Poa</i> |
| <i>Dallwatsonia</i> | <i>Pseudoraphis</i> |
| <i>Eragrostis</i> | <i>Saccharum</i> |
| <i>Eriachne</i> | <i>Scrotochloa</i> |
| <i>Holcolemma</i> | <i>Sporobolus</i> |
| <i>Isachne</i> | <i>Steinchisma</i> |
| <i>Leersia</i> | <i>Triodia</i> |
| <i>Leptaspis</i> | <i>Whiteochloa</i> |
| <i>Lophatherum</i> | <i>Yakirra</i> |
| <i>Megathyrsus</i> | |



9a Inflorescence with obvious branches (once branched) GROUP 9

- | |
|---------------------|
| <i>Acrachne</i> |
| <i>Ancistrachne</i> |
| <i>Centotheca</i> |
| <i>Coelachne</i> |
| <i>Dallwatsonia</i> |
| <i>Digitaria</i> |
| <i>Echinochloa</i> |
| <i>Entolasia</i> |
| <i>Eriochloa</i> |
| <i>Holcolemma</i> |
| <i>Ichnanthus</i> |
| <i>Leptochloa</i> |
| <i>Ottochloa</i> |
| <i>Paspalidium</i> |
| <i>Paspalum</i> |
| <i>Pseudoraphis</i> |
| <i>Urochloa</i> |
| <i>Whiteochloa</i> |



8b Inflorescence appears unbranched, often compact or if branched then not as above, not open as in Group 8go to 9

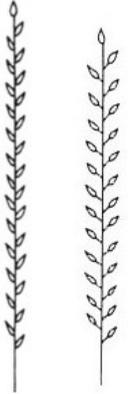
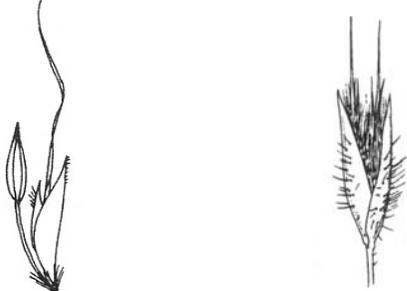
9b Inflorescence unbranched (racemes or spikes) or compact and appearing unbranched or tightly clustered (contracted panicles).....GROUP 10

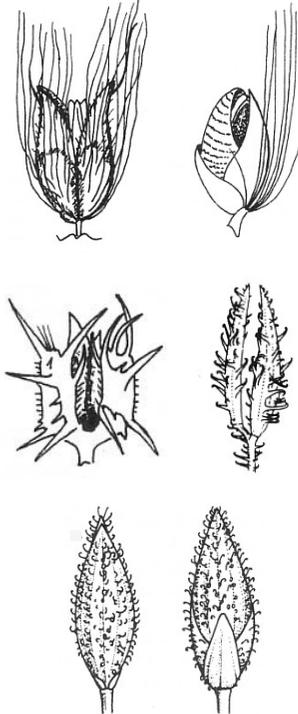
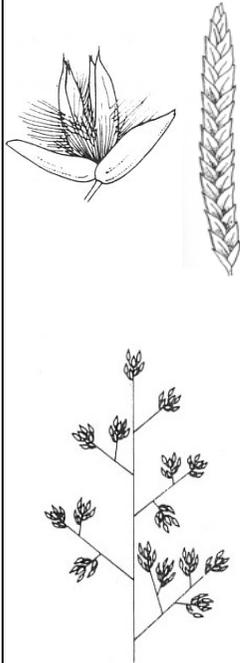
- | | |
|----------------------|-----------------------|
| <i>Astrebla</i> | <i>Lolium</i> |
| <i>Cleistochloa</i> | <i>Neurachne</i> |
| <i>Cyrtococcum</i> | <i>Panicum</i> |
| <i>Dactylis</i> | <i>Paraneurachne</i> |
| <i>Dallwatsonia</i> | <i>Paspalidium</i> |
| <i>Echinochloa</i> | <i>Phalaris</i> |
| <i>Elionurus</i> | <i>Polytrias</i> |
| <i>Elytrophorus</i> | <i>Rottboellia</i> |
| <i>Entolasia</i> | <i>Sacciolepis</i> |
| <i>Eragrostiella</i> | <i>Sporobolus</i> |
| <i>Eragrostis</i> | <i>Stenotaphrum</i> |
| <i>Eremochloa</i> | <i>Thaumastochloa</i> |
| <i>Hemarthria</i> | <i>Thellungia</i> |
| <i>Heterachne</i> | <i>Triodia</i> |
| <i>Holcolemma</i> | <i>Tripogon</i> |
| <i>Hymenachne</i> | <i>Uranthoecium</i> |
| <i>Lepturus</i> | <i>Zoysia</i> |

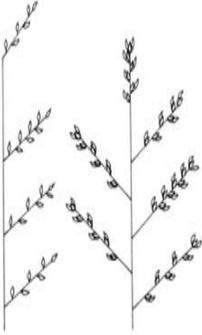
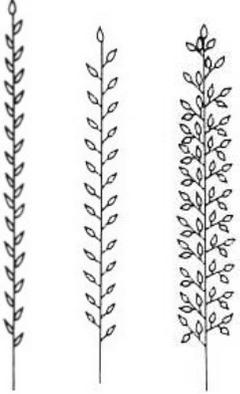
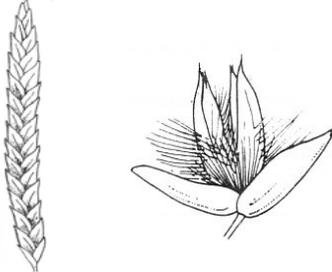


The Quick Reference Key

GROUP 1	GROUP 2	GROUP 3
Spatheate inflorescence	Digitate or subdigitate inflorescence	Lemma with 3 or more awns
<p>spathe</p>		

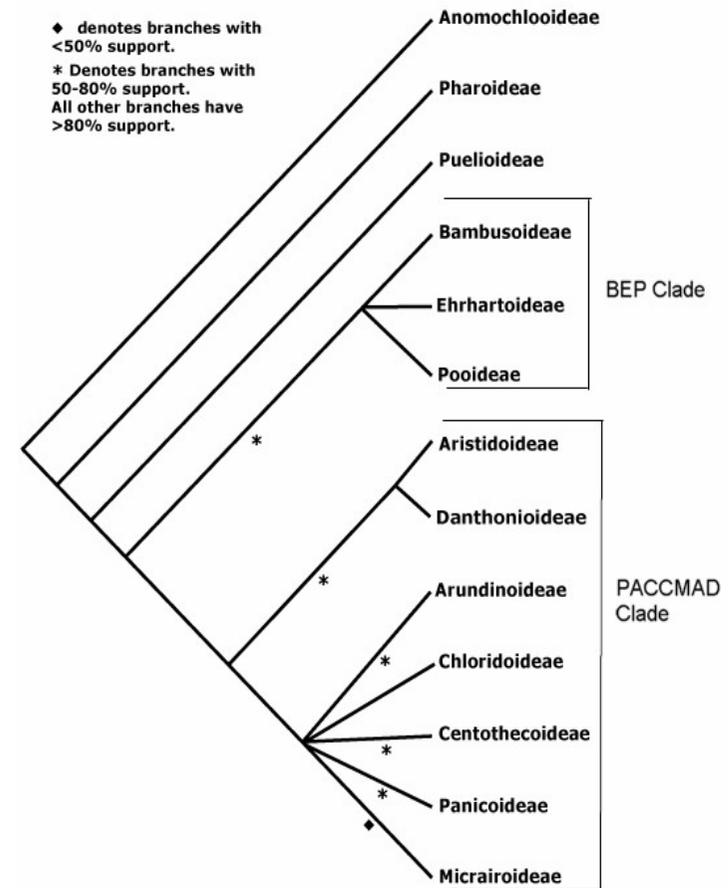
GROUP 4	GROUP 5	GROUP 6
<p>Inflorescence a spike or raceme, spikelets with 1 or 2 awns</p>	<p>Inflorescence an open panicle, spikelets with 1 or 2 awns</p>	<p>Inflorescence a contracted panicle, spikelets with 1 or 2 awns</p>
		
		

GROUP 7	GROUP 8
<p>Inflorescence variable, spikelets with bristles, long hairs subtending spikelets or spine-like structures present, spikelets awnless or shortly awned</p>	<p>Inflorescence an open panicle with secondary branching, spikelets awnless or shortly awned</p>
	

GROUP 9	GROUP 10
<p>Inflorescence an once-branched panicle, spikelets awnless or shortly awned</p>	<p>Inflorescence a spike, raceme or contracted panicle spikelets awnless or shortly awned</p>
	
	

5. Grass Classification

There are 13 sub-families



Phylogenetic tree adapted from Stevens (2001 onwards).

- I. **Anomochlooideae**
 1. Non-Australian; Central America to S.E. Brazil
 2. Spikelets unconventional, one-flowered, bisexual
 3. Leaf anatomy bamboo-like, leaves pseudopetiolate with an apical pulvinus, leaf blades with cross-nerves
 Genera: *Anomochloa* (A=4, Stigma 1), *Streptochaeta* (A=6, Stigmas 3)

- II. **Pharoidaeae**
Tribe Phareae
 1. Plants monoecious with all fertile spikelets unisexual, male and female-fertile spikelets mixed in inflorescence; A=6, stigmas 3
 2. Uncinate (hooked) hairs on female lemmas
 3. Leaf blades resupinate (upside-down), broad, pinnately veined (the laterals slanting obliquely from the midrib)
 Australian Genera: *Leptaspis*, *Scrotochloa*

- III. **Puelioideae**
 1. Non-Australian; tropical Africa
 2. Stamens 6
 2. Broad-leaved, pseudopetiolate
 3. Grasses of shaded rainforest understories
 Genera: *Puelia* (Stigmas 2-3), *Guaduella* (Stigmas 2)

BEP clade (3 sub-families)

- Bambusoideae**
Ehrhartoideae
Pooideae

BEP grasses generally occur in cooler climates and/or flower early in the season. All BEP grasses employ the C₃ photosynthetic pathway. Many BEP grasses have hollow stems (though this is not universal).

- IV. **Bambusoideae**
Tribe Bambuseae
 1. Woody culms
 2. Leaves pseudopetiolate
 3. Disarticulation above the glumes and between the florets
 Australian Genera: *Bambusa*, *Mullerochloa*, *Neololeba*, **Phyllostachys*

- V. **Ehrhartoideae**
Tribe Oryzeae
 1. Spikelets without glumes
 2. Spikelets one-flowered or three-flowered with the two lower florets reduced to sterile lemmas
 3. Aquatic or wetland grasses
 4. Disarticulation at the base of the lemmas
 Australian Genera: *Leersia* (A=6 or 1-3), *Oryza* (A=6), *Potamophila* (A=6)

Tribe Ehrharteae

1. Spikelets three-flowered, with the two lower florets reduced to sterile lemmas

2. Sterile lemmas large and often coriaceous
Australian Genera: **Ehrharta* (A=3,4or6), **Microlaena* (A=2-6), **Tetrarrhena* (4or2).

VI. Pooideae

Tribe Poeae

Very diverse tribe that is difficult to characterize

1. Spikelets with one or more florets
2. Glumes shorter than or as tall as all florets of spikelet
3. Disarticulation usually above the glumes and between the florets

Australian Genera: **Puccinellia*, **Austrofestuca*, **Festuca*, **Lolium*, **Vulpia*, **Catapodium*, **Sclerochloa*, **Dryopoa*, **Poa*, **Sphenopus*, **Briza*, **Dactylis*, **Cynosurus*, **Lamarckia*, **Psilurus*, **Parapholis*, **Hainardia*

Tribe Stipeae

1. Spikelets usually with a solitary floret
2. Lemma not keeled, indurate and lustrous
3. Lemma awn articulated (i.e., not continuous with lemma)
4. Disarticulation above the glumes

Australian Genera: **Achnatherum*, **Anisopogon*, **Austrostipa*, **Jarava*, **Nassella*, **Piptatherum*, **Piptochaetium*

Tribe Triticeae

1. Inflorescence a spike with nodes alternating on each side of the rachis
2. Spikelets set flat side to rachis

3. Glumes in some species displaced or bowed out
4. Disarticulation usually above the glumes and between the florets

Australian Genera: **Leymus*, **Elymus*, **Elytrigia*, **Thinopyrum*, **Secale*, **Triticum*, **Australopyrum*, **Hordeum*, **Taeniatherum*

Tribe Nardeae

1. Spikelets with a solitary floret
 2. Inflorescence a spike, with spikelets arising from hollows in the rachis on two sides of the three-sided rachis
 3. Only one reduced glume present
 4. Disarticulation above the glume
- Australian Genus: **Nardus*

Tribe Bromeae

1. Spikelets with two or more florets
 2. Lemmas usually ± pubescent, with an awn emerging from between two apical teeth
 3. Leaf sheaths closed
 4. Disarticulation above the glumes and between the florets, dispersal unit the floret attached to palea
- Australian Genera: **Bromus*

Tribe Meliceae

Australian Genera: **Melica*, **Glyceria*

Tribe Brachypodieae

Australian Genera: **Brachypodium*

Tribe Aveneae

Australian Genera: **Avena*, **Arrhenatherum*, **Amphibromus*, **Holcus*, **Hierochloe*, **Anthoxanthum*, **Phalaris*, **Molineriella*, **Avellinia*, **Gaudinia*, **Koeleria*, **Rostraria*, **Trisetum*, **Agrostis*, **Lachnagrostis*, **Deyeuxia*, **Dichelachne*, **Echinopogon*, **Polypogon*, **Pentapogon*, **Calamagrostis*, **Ammophila*, **Gastridium*, **Lagurus*, **Apera*, **Phleum*, **Alopecurus*, **Deschampsia*, **Corhnephorus*, **Aira*

PACCMAD Grasses (7 sub-families)

P Panicoideae

A Aristidoideae

C Centothecoideae

C Chloridoideae

M Micrairoidea

A Arundinoideae

D Danthonioideae

PACCMAD grasses generally occur in warm climates and/or flower later in the season; they form a very defined group based on DNA sequences. All C₄ grasses are members of the PACCMAD clade. Many PACCMAD grasses have solid stems (though this is not universal).

VII. Panicoideae

Tribe Paniceae

1. Spikelets 2-flowered, the lower floret sterile or staminate
2. Spikelets usually not paired, all alike
3. Only 1 glume usually concealing the florets

4. Upper lemma and palea of spikelet usually indurate

5. Inflorescence usually a panicle

6. Disarticulation beneath the glumes

Australian Genera: **Steinchisma*, **Panicum*, **Megathyrsus*, **Paspalidium*, **Holcolemma*, **Whiteochloa*, **Yakirra*, **Moorochloa* (*Brachiaria*), **Urochloa*, **Paspalum*, **Axonopus*, **Echinochloa*, **Setaria*, **Eriochloa*, **Alloteropsis*, **Ottochloa*, **Oplismenus*, **Ichnanthus*, **Hymenachne*, **Entolasia*, **Arthrargrostis*, **Sacciolepis*, **Paractaenum*, **Uranthoecium*, **Hygrochloa*, **Stenotaphrum*, **Ancistrachne*, **Calyptochloa*, **Cleistochloa*, **Thuarea*, **Digitaria*, **Homopholis*, **Walwhalleya* *ined.*, **Cenchrus*, **Pennisetum*, **Chamaeraphis*, **Pseudoraphis*, **Pseudochaetochloa*, **Melinis*, **Alexfloydia*, **Dallwatsonia*, **Spinifex*, **Xerochloa*, **Zygochloa*

Tribe Andropogoneae

1. Spikelets 2-flowered, the lower floret sterile or staminate

2. Spikelets paired, one sessile the other pedicelled, usually dissimilar

3. Both glumes usually concealing the florets

4. Upper lemma and palea of spikelet usually of weak texture

5. Inflorescence a collection of rames

6. Disarticulation usually in the branch axes beneath the sessile or short-pedicelled spikelet

Australian Genera: **Saccharum*, **Miscanthus*, **Imperata*, **Eulalia*, **Pseudopogonatherum*, **Microstegium*, **Pogonatherum*, **Polytrias*, **Germainia*,

*Vacoparis, Sorghum, Sarga, Clausospicula, *Sorghastrum, Chrysopogon, Bothriochloa, Capillipedium, Dichanthium, Spathia, *Andropogon, Cymbopogon, Schizachyrium, Arthraxon, Hyparrhenia, Heteropogon, Themeda, Iseilema, Thelepogon, Ischaemum, Sehima, Apluda, Coix, Dimeria, Elionurus, Hemarthria, Mnesithea, Rottboellia, *Zea, Eremochloa, Thaumastochloa, Ophiuros, Chionachne*

Tribe Neurachneae

1. Spikelets 2-flowered, the lower floret sterile or staminate
 2. Spikelets usually not paired, all alike
 3. Glumes both as long as spikelet, at least the upper indurated
 4. Inflorescence a spiciform or capitate panicle
 5. Disarticulation beneath the glumes
- Australian Genera: *Thedachloa, Neurachne, Paraneurachne, Thyridolepis*

Tribe Arundinelleae

Australian Genera: *Arundinella, Garnotia*

VIII. Aristidoideae

Tribe Aristideae

1. Spikelets with a single floret
2. Lemma with a 3-branched awn at the apex (though the 2 lateral awns may be reduced)
3. Callus of lemma well developed
4. Ligule a fringed-membrane or a fringe of hairs
5. Disarticulation above the glumes

Australian Genera: *Aristida*

IX. Centothecoideae

Tribe Centotheceae

1. Spikelets with 1 or more florets
 2. Lemmas usually with 5-9 nerves
 3. Leaf blades broad usually with cross-nerves and sometimes with a false petiole
 4. Mostly tropical plants of forest shade
- Australian Genera: *Centotheca, Lophatherum*

Tribe 'Cyperochloae'

Australian Genera: *Cyperochloa, Spartochloa*

X. Chloridoideae

Tribe Pappophoreae

1. Lemmas with 5-13 veins, all of which extend into apical awns
 2. Ligule a fringe of hairs
 3. Spikelets with 3 or more florets
 4. Disarticulation above the glumes but not between the florets
- Australian Genera: *Enneapogon*

Tribe Triodieae

1. Spikelets with 1 or more florets
 2. Lemmas rounded on back, with 3-9 nerves
 3. Leaf blades rigid, needle-like
- Australian Genera: *Triodia, Symplectrodia, Monodia*

Tribe Cynodonteae

Most members of the tribe possess 2 or more of the following characteristics:

1. Laterally compressed spikelets
2. Lemmas with 1-3 veins or 7-13 veins
3. Spike-like branches of the inflorescence
4. Coarse hairs near the junction of the sheath and blade
5. Disarticulation variable (e.g., beneath fertile florets, beneath the glumes, at base of branches)

Australian Genera: *Zoysia*, *Perotis*, *Tragus*, *Chloris*, *Austrochloris*, *Oxychloris*, **Eustachys*, *Enteropogon*, *Brachyachne*, *xCynochloris*, *Cynodon*, **Spartina*, *Microchloa*, *Acrachne*, *Dactyloctenium*, **Dinebra*, *Distichlis*, **Crypsis*, *Sporobolus*, *Eragrostis*, *Eragrostiella*, *Psammagrostis*, *Heterachne*, **Eleusine*, *Lepturus*, *Tripogon*, *Triraphis*, *Ectrosia*, *Leptochloa*, *Astrebala*

XI. Micrairoideae

Tribe Micraireae

1. Spikelets 2-flowered, usually both fertile
2. Leaves spirally arranged

Australian Genera: *Micraria*

Tribe Eriachneae

1. Spikelets, usually with two bisexual florets, awned or unawned

Australian Genera: *Eriachne*, *Pheidochloa*

Tribe Isachneae

1. Spikelets 1 or 2-flowered, both fertile, awnless

2. Specialised in aquatic and forest shade environments

Australian Genera: *Isachne*, *Coelachne*, *Cyrtococcum*

XII. Arundinoideae (C₃ grasses)

1. Common members of this taxa are robust, "reed-like" grasses with plumose panicles
2. Stems usually hollow
3. Disarticulation above the glumes and between the florets

Tribe Arundineae

Australian Genera: *Phragmites*, **Arundo*

Tribe Amphipogoneae

Australian Genera: *Amphipogon*

XIII. Danthonioideae (C₃ grasses)

1. Spikelets with multiple florets
2. Lemmas bifid at apex, an awn emerging from between the lobes
3. Glume usually ± equal and as long as column of florets
4. Ligule of hairs
5. Disarticulation above the glumes and between the florets

Australian Genera: *Monachather*, *Elytrophorus*, **Cortaderia*, *Chionochloa*, **Pentaschistis*, *Danthonia*, *Plinthanthesis*, *Notochloë*, **Schismus*, **Tribolium*, *Joycea*, *Notodanthonia*, *Austrodanthonia*, *Rytidosperma*

Genera marked with an asterisk (*) refers to all the species being non-native in Australia.

Phylogeny information taken from Aliscioni *et al.* (2003), Barker *et al.* (2001), Clark *et al.* (2000), Clayton and Renvoize (1986), Clayton and Williamson (2003), Doust and Kellogg (2002), Doust *et al.* (2007), Giussani *et al.* (2001), Hilu (2004), Hilu *et al.* (1999), Hsiao *et al.* (1999), Jacobs and Everett (2000), Kellogg (2001), Mallett (2005), Mallett and Orchard (2002), Sanchez-Ken *et al.* (2007), Sharp and Simon (2002), Stevens (2001 onwards), Watson and Dallwitz (1992 onwards), Widjaja (1997), Wilson (2009).

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