

Grasses and bamboos are part of the same botanical group, the grass family, also called Poaceae, a family with an estimated 12,000 species. Grasses occur throughout the world with similar diversity in the tropical and temperate regions, in all climates, and at all elevations. Madagascar is no exception, and the grass family is the most economically important group of plants which has always been closely involved in people's lives.

Madagascar's grasses are still poorly known and many endemic species have only been recorded once or twice, and more collections and records are necessary to understand the true diversity and species distribution. This guide hopes to encourage study and collecting of grasses by showing how beautiful and interesting these plants can be, and by providing a practical means of identification at the generic level. This book compiles and summarises the current available knowledge on the genera of Madagascar Poaceae, with an emphasis on easily visible characters to verify generic identity. 144 grass genera are described with colour scans to aid recognition.



Identification Guide to GRASSES and BAMBOOS in Madagascar

Maria Vorontsova et al.

Kew

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CONTENTS

Acknowledgements	iv
INTRODUCTION	1
Madagascar grasses	1
Grasses in Tsimbazaza	1
How to use this guide	1
How this guide was compiled	2
The grass plant	2
Glossary for grass morphology	3
Key to genera of grasses	4
Woody bamboos	10
Glossary for bamboo morphology	11
Key to genera of woody bamboos	12
List of Poaceae genera in Madagascar	13
Genera arranged phylogenetically	14
Quick identification using inflorescence shape and presence of awns	16
DESCRIPTIONS OF GENERA	19
REFERENCES AND FURTHER READING	164
INDEX TO GENERIC NAMES	165
INDEX TO MALAGASY NAMES	167

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INTRODUCTION

Madagascar grasses

Grasses (bozaka) and bamboos (volo) are part of the same botanical group, the grass family, also called Poaceae. Poaceae is a family with an estimated 12,000 species. In spite of its comparatively late origin in evolutionary history, the family is remarkably successful. Grasses occur throughout the world with similar diversity in tropical and temperate regions, in all climates, and at all elevations. Madagascar is no exception. The grass family is the most economically important group of plants and has always been closely involved in people's lives. Grasses provide food: rice (*Oryza sativa*), maize (*Zea mays*), sugarcane (*Saccharum officinarum*), and breadwheat (*Triticum aestivum*) are all members of the grass family. Grasses also provide food for cattle and shelter, built from bamboo (e.g. *Bambusa vulgaris*) or bararata (*Phragmites mauritianus*), while the valiha (*Valiha diffusa*) is used to make musical instruments. Grasses are planted as lawns (e.g. *Cynodon dactylon*), planted to prevent erosion (e.g. *Chrysopogon zizanioides*), and planted as decorative hedges (e.g. *Phyllostachys aurea*, *Pogonatherum paniceum*).

When first observed, the bozaka (grasses) may appear all the same. Nevertheless we believe there are around 550 species in Madagascar, frequently overlooked by people who do not examine them closely. Where is all this diversity? Grasses that look the same are often a mixture of many different species and genera, with tiny differences hidden in the reproductive structures and only visible with a strong hand lens or a microscope. Forests are home to a different range of species than the savanna, coastal areas, and mountains. Many Malagasy species are also found in Africa, whereas others are unique endemics.

Madagascar's grasses are still poorly known and many endemic species have only been recorded once or twice. More collections and records are necessary to reveal the true diversity and species distribution. This guide hopes to encourage study and collecting of grasses by showing how beautiful and interesting these plants can be, and by providing a practical means of identification at the generic level. The currently available knowledge on the genera of Poaceae in Madagascar has been compiled and summarised, with an emphasis on easily visible characters that can be used to verify generic identity.

Grasses in Tsimbazaza

The Parc Zoologique et Botanique de Tsimbazaza (PBZT) in Antananarivo, Madagascar, is one of the eight national research centres directed by the Ministry for Higher Education and Scientific Research. It is the organisation responsible for documenting Madagascar's flora and fauna, and for advising on its conservation. PBZT is home to the largest herbarium in the Indian Ocean, known under the acronym TAN, which houses 250,000 herbarium specimens of flowering plants and ferns. Poaceae is the largest family in the Monocot Section of TAN with 4,500 herbarium specimens from 180 genera. The herbarium collection focuses on the plants of Madagascar and also holds some material from other countries. It has been fully digitised and will be available online. Most collections of grasses were made prior to 1970, with only a few collections from 1970–2010. In addition to herbarium specimens, a living collection of Madagascar's Poaceae recently established at PBZT could serve as an important knowledge resource.

How to use this guide

This guide is for all botanists, naturalists, students, and other people interested in the grass family. It may be of use to Poaceae specialists but its primary aim is to broaden the appeal of the group to collectors and field workers. The best way to use this guide is to look through the pictures, so that you become familiar with the general appearance associated with each genus.

In order to use this guide to identify a specimen, it is best to begin by looking through all the illustrations, searching for one that best resembles the specimen. Accuracy of the identification can then be improved by comparing the plant to the particularly important parts of the description highlighted in bold, and reviewing the "lookalikes" section

which explains how to distinguish between genera of similar appearance. Explanation of the botanical terminology specific to grasses and bamboos can be found after the introduction. Species-level taxonomy has not yet been completed for many of the Malagasy grass genera and this guide focuses on the genera only. This guide includes all Poaceae with herbarium specimens recorded from Madagascar only. Poaceae from the Comoros, La Réunion, and Mauritius are not included. The section “distribution” lists the major provinces of Madagascar where specimens were collected.

Traditional Poaceae floras are full of specialist terminology accompanied by black and white line drawings of spikelet parts. Considerable experience and a good microscope are needed to use these correctly, and even Poaceae specialists frequently have difficulty making the correct connection between a living plant and the botanical description. It is true to say that serious study of grasses is not possible without dissecting spikelet parts at high magnification. Identification of common species and appreciation of Poaceae diversity is nevertheless very much possible without specialist study. We hope this book will encourage greater appreciation of the Poaceae diversity in Madagascar.

How this guide was compiled

Generic concepts follow Kellogg (2015) with some updates. Descriptions are simplified from Bosser (1969), Clayton (1970), Clayton *et al.* (1974), Clayton & Renvoize (1982, 1986), and Renvoize (in press), and have been modified to reflect the material known from Madagascar only. Unpublished material from Emmet Judziewicz was used, as well as revisionary taxonomic work on non-bambusoid grasses by the first author (Vorontsova 2013, 2014; Vorontsova *et al.* 2013, 2014, 2015, 2016; Vorontsova & Rakotoarisoa 2014); and on woody bamboos by Soejatmi Dransfield (Dransfield 1994, 1997, 1998, 2002, 2003, 2016). Definitions of morphological terms were modified from Cope & Gray (2009) and Beentje (2010). Information on occurrence and distribution has been compiled from specimens at the Muséum National d'Histoire Naturelle, Paris. Living plants were scanned in the field using an Epson 10000XL scanner. Genera that could not be scanned in the field are illustrated using herbarium specimens. All specimens pictured were collected in Madagascar except for the following: *Briza media* (cultivated at Kew), *Coix lacrymajobi* (cultivated at Kew), *Cortaderia selloana* (cultivated at Kew), *Diplachne fusca* (South Africa), *Enneapogon cenchroides* (Kenya), *Gigantochloa pseudoarundinacea* (Indonesia), *Hordeum vulgare* (cultivated at Kew), *Leptaspis cochleata* female spikelet (Ethiopia), *Oxyrachis gracillima* (Sierra Leone), *Tragus racemosus* (cultivated at Kew), *Tripsacum andersonii* (cultivated at Kew), and *Triticum aestivum* (cultivated at Kew). Data on Malagasy names and plant uses are from Bosser (1969), Boiteau *et al.* (1997), and herbarium specimen labels.

Soejatmi Dransfield prepared the material concerning the bamboos. Steve Renvoize prepared the dichotomous key to genera. Guillaume Besnard gathered field data and edited generic descriptions. Andrew McRobb established the method for obtaining illustrations by scanning living plants in the field. Jacqueline Razanatoa carried out field work and specimen work at the Parc Zoologique et Botanique Tsimbazaza, and wrote the passage on grasses at Tsimbazaza. Nanjarisoa Olinirina Prisca, Solofo Eric Rakotoarisoa, and Hélène Ralimanana compiled information on Malagasy names and uses. Bakolinantenaina Andrianalvoravelona and Solofo Eric Rakotoarisoa compiled distribution data. Maria Vorontsova designed the guide, prepared the main text, and obtained the images.

The grass plant

Members of the grass family have uniform reproductive structures (called spikelets) composed largely of modified bracts enclosing the flowers. Distinguishing between these bracts is critical for accurate identification, but standard botanical terminology is not convenient for their description. A specialised vocabulary for the study of grasses has emerged to facilitate communication between agrostologists, including terms such as “glumes”, “lemmas”, “paleas”, and “awns”. Unfortunately the specialist vocabulary requires extra study and can become a barrier to accurate identification. This guide uses the traditional botanical terminology but seeks to do so in the simplest way possible, with minimum specialist words (except for the more complex terminology used in the dichotomous key, the use of which is optional). Essential grass terminology is listed below. Explanations of botanical terms with a broader application can be found in Beentje (2010).

Glossary for grass morphology

Auricle is a part of the grass leaf, a small lobe at the base of the leaf blade. The majority of grasses and bamboos do not have auricles.

Awn is a long thin structure which arises from glumes or lemmas and is usually used for seed dispersal. It is a special kind of bristle only found in grasses. A "geniculate" awn has a bend like a knee.

Bract is a modified and specialised leaf in the inflorescence. Glumes, lemmas, and paleas are bracts.

Bristle is a long thin structure, like a hair but thicker. In grasses the word bristle is used for many different structures: bristles that arise below the spikelet (e.g. *Setaria*), short bristles on the glumes (e.g. *Centotheca*), and long thick hairs on leaf sheaths of bamboos (e.g. *Sirochloa*). It is important to be able to distinguish between a bristle and an awn: awns are special kinds of bristles that arise from glumes or lemmas, and are usually large and necessary for seed dispersal.

Callus is a thick hard extension at the base of a spikelet or a floret. It is often sharp, e.g. in *Heteropogon contortus*.

Caryopsis is the grass fruit, including the seed and the fruit wall it is fused to. It looks like a seed and is often called "grass seed" but technically it is the whole fruit which includes the seed within it.

Culm is the main stem. Usually only parts of the culms are visible, and other parts are hidden inside leaf sheaths.

Floret is flower + lemma + palea. It is part of the spikelet.

Glume is a sterile bract at the base of the spikelet. There are usually two glumes at the base of each spikelet.

Homogamous pair (part of the inflorescence in Panicoideae) is two sterile spikelets with no large awns, one spikelet sessile and one spikelet pedicelled. These are found at the base of a raceme.

Internode (part of the culm) is a part of the culm between two nodes, usually hollow inside.

Internode (part of the inflorescence in Panicoideae) is part of the raceme axis between two sessile spikelets. It often looks similar to the pedicel under the pedicelled spikelet.

Keel is a sharp fold. A palea usually has two keels.

Lemma is one of the two bracts enclosing the flower, usually the bract which is easy to see on the outside of the spikelet.

Leaf is leaf sheath + ligule + leaf blade.

Leaf blade is the apical part of the leaf, above the sheath, which is separate from the culm. It looks like the leaf in dicotyledons.

Leaf sheath is the basal part of the leaf which is wrapped around the culm.

Ligule is a small structure on the inside of the leaf, between the leaf sheath and the leaf blade. It can be a membrane or a line of hairs. To see the ligule, the leaf usually needs to be pulled away from the culm.

Lodicules are small transparent structures inside the floret, situated at the base of the ovary and stamens. They are usually difficult to see.

Node is part of the stem where the leaf sheath is attached, usually thicker than the rest of the culm.

Palea is one of the two bracts enclosing the flower, usually the bract which is difficult to see hidden inside the spikelet.

Panicle is an inflorescence which is branched more than once, and spikelets are usually all separate.

Raceme is part of an inflorescence where spikelets are densely arranged together in a linear structure.

Rhachilla is the axis of the spikelet. It is inside the spikelet, and glumes and florets are attached to it.

Rhachis is the axis of the inflorescence. It is outside the spikelet, and spikelets are attached to it.

Rhizome is an underground stem of some perennial grasses. It can be difficult to distinguish between a rhizome and a stolon: a rhizome grows deeper than a stolon, and it does not have leaves.

Spikelet is glumes + rhachilla + one of more florets. It is the basic unit of the grass inflorescence. The first part of the grass identification process is to find the spikelet.

Sterile usually means without functional flowers, but sometimes "sterile spikelet" means a spikelet that does not produce seed, with either no functioning flowers or with male flowers only.

Stolon is a horizontal stem of some perennial grasses. It can be difficult to distinguish between a stolon and a rhizome: a stolon grows on the surface, and has leaves.

Key to genera of grasses (by Steve Renvoize)

The characters used in this dichotomous key are often difficult to see without high magnification, may not be present on all specimens, and are expected to be challenging to interpret for users not familiar with grasses. The authors recommend beginning the process of identification by looking through images. Genera in single quotation marks (e.g. '*Panicum*') are not monophyletic.

1. Stems woody, small to large shrubs, trees or lianas (woody bamboos) see key to woody bamboos (page 12)
1. Stems herbaceous, soft or firm (woody and branched in *Pseudolasia* and *Olyra*) 2
2. Spikelets predominantly unisexual 3
3. Nerves of leaf blade oblique, cross nerves present *Leptaspis zeylanica*
3. Nerves of leaf blade parallel 4
4. Inflorescence a panicle 5
5. Spikelets 1-flowered, male or female *Olyra latifolia*
5. Spikelets 2-flowered 6
6. Spikelets all male *Zea mays*
6. Spikelets mostly male, apical spikelet of each branch bisexual *Lecomtella madagascariensis*
4. Inflorescence a raceme 7
7. Racemes enclosed by leafy margins of primary axis 8
8. Lower lemma coriaceous *Humbertochloa bambusiuscula*
8. Lower lemma membranous *Thuarea*
7. Racemes exerted or enclosed by subtending bracts or a utricle 9
9. Female spikelets in separate axillary raceme (maize cob) *Zea mays*
9. Female spikelets in same raceme as male spikelets or in a separate raceme subtending a male raceme 10
10. Female spikelets in basal part of raceme, male spikelets in upper part *Tripsacum andersonii*
10. Female spikelets enclosed in a globose hard bead-like utricle, male spikelets in an exerted raceme *Coix lacryma-jobi*
2. Spikelets bisexual 11
11. Spikelets 1- to many-flowered, if 2-flowered then both florets bisexual or the upper sterile or staminate (if lower floret male or hermaphrodite and upper floret female or hermaphrodite see *Isachne*) 12
12. Leaf blades with cross nerves 13
13. Spikelets 8-18(-31)-flowered *Megastachya*
13. Spikelets 2-4-flowered with rudimentary florets at the apex *Centotheca lappacea*
12. Leaf blades without cross nerves 14
14. Spikelets with one bisexual floret with or without additional staminate or sterile florets 15
15. Lemma terete, 3-awned, the 3 awns fused to look like a single awn with 3 branches 16
16. Glumes 3-nerved *Sartidia*
16. Glumes 1-nerved *Aristida*
15. Lemmas awnless, 1- or 9-awned 17
17. Lemmas 9-awned *Enneapogon cenchroides*
17. Lemmas awnless or 1-awned 18
18. Palea 1-keeled, 3-7-nerved, spikelets laterally compressed 19
19. Palea 1-nerved *Ehrharta stipoides*
19. Palea 3-7-nerved 20
20. Lemma coriaceous *Oryza*
20. Lemma chartaceous 21
21. Spikelet 1-flowered *Leersia*
21. Spikelet with 1 bisexual floret above 2 sterile lemmas *Maltebrunia leersoides*
18. Palea 2-keeled, 2-nerved 22
22. Inflorescence a panicle 23
23. Spikelets 2-flowered, awnless *Coelachne*
23. Spikelets 1-flowered, if with additional male or sterile florets, then awned 24
24. Glumes shorter than or equalling the florets 25
25. Spikelets fusiform, rounded on the back, panicle open or contracted but not a dense head *Sporobolus*

25. Spikelets laterally compressed, panicle a dense head, subtended by an inflated leaf-sheath bearing a reduced blade *Crypsis schoenoides*
24. Glumes, at least 1, longer than florets 26
26. Spikelet with one fertile floret with additional male or sterile florets, lemmas awned *Anthoxanthum*
26. Spikelet 1-flowered, with no additional florets 27
27. Callus hairs absent or shorter than the spikelet *Agrostis*
27. Callus hairs present, as long as the spikelet *Calamagrostis emirnensis*
22. Inflorescence composed of racemes, these 1-sided, 2-sided, or spike-like 28
28. Racemes solitary 29
29. Spikelets awnless 30
30. Glumes shorter than to as long as the florets 31
31. Spikelets breaking up at maturity *Cynodon*
31. Spikelets falling entire *Tragus*
30. Glumes enclosing florets 32
32. Spikelets breaking up at maturity *Microchloa kunthii*
32. Spikelets falling entire 33
33. Spikelets dorsally compressed *Lepturus*
33. Spikelets laterally compressed *Zoysia*
29. Spikelets awned 34
34. Upper glume with a dorsal awn *Ctenium*
34. Upper glume awnless, attenuate or awned from the apex 35
35. Spikelet 2–5-flowered 36
36. Glumes membranous, shorter than the florets *Neostapfiella*
36. Glumes coriaceous, longer than the florets *Decaryella madagascariensis*
35. Spikelet with 1 bisexual floret, with or without a rachilla extension and vestigial florets 37
37. Raceme 1-sided or bilateral 38
38. Lemma with a long sinuous awn *Schoenefeldia gracilis*
38. Lemma awnless or straight-awned 39
39. Lemma awnless *Lepturus*
39. Lemma awned 40
40. Spikelets in 3s on opposite sides of a bilateral raceme *Hordeum vulgare*
40. Spikelets solitary, in 2 rows on 1 side of a unilateral raceme 41
41. Lemma dorsally compressed *Enteropogon*
41. Lemma laterally compressed *Chloris*
37. Raceme multilateral or cylindrical 42
42. Glumes with awns 5–17 mm long 43
43. Spikelets 1-flowered; glumes enclosing floret *Perotis*
43. Spikelets with 1 fertile floret accompanied by 1–3 sterile florets which are reduced to a cluster of awns; glumes shorter than the florets *Viguerella madagascariensis*
42. Glumes awnless or with an awn 3–7 mm long 44
44. Perennial; lower glume absent *Zoysia*
44. Annual; lower glume present *Decaryella madagascariensis*
28. Racemes paired, digitate, or borne on a central axis 45
45. Lemma with a long sinuous awn *Schoenefeldia gracilis*
45. Lemma awnless or awn straight 46
46. Lemma enclosed by glumes *Craspedorhachis*
46. Lemma not enclosed by glumes 47
47. Lemma awnless *Cynodon*
47. Lemma with a long or short awn 48
48. Spikelets 2–6-flowered *Chloris*
48. Spikelets 1-flowered *Daknopholis boivinii*

14. Spikelets with 2 or more bisexual florets or plant gynodioecious	49
49. Plants reed-like with culm leaves or forming a large tussock with basal leaves;	
inflorescence large and plumose	50
50. Plants forming large tussocks, gynodioecious	<i>Cortaderia selloana</i>
50. Plants reed-like with culm leaves	51
51. Lemmas ciliate, bidentate with a recurved awn	<i>Neyraudia arundinacea</i>
51. Lemmas glabrous, acuminate, awnless	<i>Phragmites mauritianus</i>
49. Plants herbaceous, small to large; inflorescence not plumose	52
52. Lemma 1–3-nerved	53
53. Inflorescence a panicle	54
54. Lemma awnless	<i>Eragrostis</i>
54. Lemma awned, entire or 3-lobed	55
55. Lemma entire, with an apical awn 5–15 mm long	<i>Pseudobromus</i>
55. Lemma 3-lobed, lobes shortly awned	<i>Styppeiochloa</i>
53. Inflorescence racemose	56
56. Raceme solitary	57
57. Awn 6–15 mm long	<i>Viguerella madagascariensis</i>
57. Awn 0.1–1.5 mm long	<i>Tripogon minimus</i>
56. Racemes 2–many (numerous in <i>Leptochloa</i> , <i>Dinebra</i> , <i>Leptocarydion</i>)	58
58. Racemes paired, digitate or subdigitate	59
59. Rachis tip naked	<i>Dactyloctenium</i>
59. Rachis terminated by a spikelet, this sometimes reduced or sterile	60
60. Terminal spikelet fertile; leaf blades flat or folded	<i>Eleusine</i>
60. Terminal spikelet reduced and sterile, leaf blades flat, involute or terete	61
61. Annual with flat, flexuous leaf blades	<i>Acrachne perrieri</i>
61. Perennial with terete, pungent leaf blades	<i>Sclerodactylon macrostachyum</i>
58. Racemes randomly distributed on an axis	62
62. Racemes crowded on the panicle axis	<i>Leptocarydion vulpiastrum</i>
62. Racemes spread on an axis	63
63. Glumes usually longer than the lower lemma	<i>Dinebra</i>
63. Glumes shorter than the spikelet	64
64. Florets with callus glabrous	<i>Diplachne fusca</i>
64. Florets with white hairs on the callus	<i>Halopyrum mucronatum</i>
52. Lemmas 5–many-nerved	65
65. Inflorescence a raceme	65a
65a. Spikelets shortly pedicelled	<i>Brachypodium</i>
65a. Spikelets sessile	<i>Triticum</i>
65. Inflorescence a panicle	66
66. Lemmas imbricate, inflated, awnless	<i>Briza</i>
66. Lemmas loose or imbricate, linear, lanceolate, oblong or ovate, awned or awnless	67
67. Lemmas keeled, awned or awnless	68
68. Lemma awnless, entire	<i>Poa</i>
68. Lemma awned, bilobed, trilobed or entire	69
69. Awn subapical, ovary with an apical appendage	<i>Bromus</i>
69. Awn from the sinus of a bilobed lemma, or trilobed lemma with central lobe awned, ovary without an apical appendage	<i>Styppeiochloa</i>
67. Lemmas rounded on the back, sometimes weakly so, awned or awnless	70
70. Lemma apex entire	71
71. Rachilla glabrous	<i>Festuca</i>
71. Rachilla hairy	<i>Pseudobromus</i>
70. Lemma apex bidentate (minutely in <i>Avena sativa</i>) or bilobed	72
72. Lemma hairy with the hairs in distinct tufts	<i>Merxmüllera</i>
72. Lemma glabrous or hairy but hairs not in distinct tufts	73
73. Lemma 3-awned, the central awn geniculate and from the sinus	<i>Pentameris</i>
73. Lemma dorsally or sub-apically 1-awned	74

74. Awn geniculate **Helictotrichon**
74. Awn straight (or absent) 75
75. Glumes shorter than the florets **Festuca**
75. Glumes enclosing the florets **Avena sativa**
11. Spikelets 2-flowered, the lower floret male or sterile, the upper floret bisexual 76
76. Spikelets breaking up at maturity, glumes persistent 77
77. Ligule membranous, short **Arundinella nepalensis**
77. Ligule a line of hairs 78
78. Lower lemma 5–7-nerved **Tristachya**
78. Lower lemma 3-nerved 79
79. Lobes of upper lemma awned **Trichopteryx dregeana**
79. Lobes of upper lemma awnless **Loudetia**
76. Spikelets falling entire at maturity 80
80. Spikelets solitary, if paired or in 3s then all identical, awnless or straight-awned (if spikelets sunk into a cylindrical rachis of a solitary raceme see *Oxyrhachis gracillima*) 81
81. Spikelets subtended by bristles, which fall off with the spikelets 82
82. Bristles forming an involucre **Cenchrus**
82. Bristles solitary, inflorescence a slender spike bearing deciduous racemelets **Paratheria prostrata**
81. Spikelets not subtended by bristles or bristles present and persistent on rachis 83
83. Spikelets subtended by persistent bristles which remain on the axis after the spikelet has fallen **Setaria**
83. Spikelets not subtended by bristles 84
84. Upper lemma hyaline to coriaceous at maturity, margins inrolled 85
85. Upper floret laterally compressed 86
86. Upper lemma with a green crest **Cyrtococcum**
86. Upper lemma uniform, without a crest 87
87. Inflorescence a large panicle **Thysanolaena latifolia**
87. Inflorescence of racemes 88
88. Racemes solitary or digitate **Dimeria**
88. Racemes borne along a central axis 89
89. Upper lemma hyaline, spikelets appear inflated **Cyphochlaena**
89. Upper lemma membranous to coriaceous, spikelets ovate, oblong or lanceolate 90
90. Upper glume inflated, with tubercle-based bristles or with wings **Pseudechnolaena**
90. Upper glume ovate or lanceolate **Poecilostachys**
85. Upper floret dorsally compressed or rounded 91
91. Inflorescence an open panicle or contracted and spike-like 92
92. Spikelets asymmetrical, glumes with prominent nerves, panicle spike-like or open **Sacciolepis**
92. Spikelets symmetrical, panicle open 93
93. Spikelets supported by a globose bead **Eriochloa**
93. Spikelets supported by a stipe or straight pedicel 94
94. Upper glume and lower lemma compressed at the tip, upper lemma with a crest **Acroceras**
94. Upper glume and lower lemma not compressed at the tip, upper lemma without a crest 95
95. Culms herbaceous, lower glume shorter than the spikelet 96
96. Panicle pyramidal, lower branches whorled **Urochloa maxima**
96. Panicle ovate, oblong or if pyramidal then branches not whorled **Adenochloa, 'Panicum', Trichanthecium**
95. Culms cylindrical, woody, branched and scrambling, lower glume as long as or longer than the spikelet, leaf blades with cross nerves **Pseudolasiacis**
91. Inflorescence racemose 97

97. Upper lemma with narrow wings or scars at the base	<i>Chasechloa</i>
97. Upper lemma without wings or scars at the base	98
98. Glumes or lemmas awned	99
99. Spikelets laterally compressed	<i>Opilsenus</i>
99. Spikelets dorsally compressed	100
100. Upper lemma awned	<i>Alloteropsis</i>
100. Upper lemma awnless	<i>Echinochloa</i>
98. Glumes and lemmas awnless	101
101. Lower glume present	102
102. Tip of upper palea reflexed and protruberent	<i>Echinochloa</i>
102. Tip of upper palea not reflexed	103
103. Raceme rachis terminating in a bristle	<i>Setaria</i>
103. Raceme rachis not prolonged at the apex	104
104. Upper lemma smooth	<i>Brachiaria</i> and <i>Moorochloa eruciformis</i>
104. Upper lemma rugulose	<i>Urochloa</i>
101. Lower glume absent or vestigial	105
105. Upper glume and lower lemma pilose with yellow/white hairs	<i>Yvesia madagascariensis</i>
105. Upper glume and lower lemma not distinctly pilose	106
106. Spikelets round and flat	<i>Paspalum</i>
106. Spikelets lanceolate to oblong	<i>Axonopus compressus</i>
84. Upper lemma cartilaginous or chartaceous, margins flat	107
107. Spikelets laterally compressed	108
108. Upper lemma dorsally compressed	<i>Tricholaena monachne</i>
108. Upper lemma laterally compressed	<i>Melinis</i>
107. Spikelets dorsally compressed	109
109. Inflorescence of free racemes	<i>Digitaria</i>
109. Inflorescence of very short racemes embedded in a leaf-like central axis	<i>Stenotaphrum</i>
80. Spikelets paired, 1 sessile, the other pedicelled (both pedicelled in <i>Imperata cylindrica</i> , the spikelets similar or dissimilar, awnless or awned	110
110. Pedicelled spikelet absent, pedicel naked or absent	111
111. Pedicel absent, inflorescence a single solitary raceme	<i>Oxyrhachis gracillima</i>
111. Pedicel present, inflorescence a panicle or of subdigitate racemes	112
112. Lower glume pilose	<i>Sorghastrum incompletum</i>
112. Lower glume scabrous	<i>Arthraxon</i>
110. Pedicelled spikelet well-developed, reduced, or vestigial	113
113. Rhachis internodes and pedicels linear, slender	114
114. Pedicelled spikelets similar to sessile	115
115. Inflorescence of racemes along an elongated axis	116
116. Raceme rachis tough, both spikelets pedicelled	<i>Imperata cylindrica</i>
116. Raceme rachis fragile, one spikelet of a pair sessile	117
117. Callus hairs shorter than the spikelet	<i>Lasiorhachis</i>
117. Callus hairs longer than the spikelet	<i>Saccharum officinarum</i>
115. Inflorescence of single, subdigitate or digitate racemes	118
118. Racemes single	<i>Pogonatherum paniceum</i>
118. Racemes 1-4(10), subdigitate	119
119. Plant tufted, culms erect, leaf blades linear	<i>Eulalia villosa</i>
119. Plant with slender rambling culms, leaf blades lanceolate	<i>Microstegum nudum</i>
114. Pedicelled spikelet different from sessile	120
120. Sessile spikelet male or sterile, pedicelled spikelet bisexual and awned	<i>Trachypogon spicatus</i>
120. Sessile spikelet bisexual, pedicelled spikelet male or sterile	121
121. Inflorescence a panicle	122
122. Lower glume of sessile spikelet laterally compressed	<i>Chrysopogon</i>
122. Lower glume of sessile spikelet dorsally compressed	123

123. Pedicelled spikelets look thinner than sessile *Sorghum*
 123. Pedicelled spikelets look the same as sessile *Lasiorhachis*
 121. Inflorescence racemose 124
 124. Pedicels and internodes with a translucent mid-line 125
 125. Homogamous spikelet pairs at base of the raceme absent *Bothriochloa*
 125. Homogamous spikelet pairs at the base of the raceme present *Euclasta condylotricha*
 124. Pedicels without a translucent mid-line 126
 126. Racemes solitary 127
 127. Lower glume of sessile spikelet 2-keeled, callus inserted into the hollow internode tip 128
 128. Lower glume of sessile spikelet concave between the keels *Andropogon*
 128. Lower glume of sessile spikelet convex between the keels *Schizachyrium*
 127. Lower glume of sessile spikelet convex and rounded 129
 129. Two homogamous pairs of spikelets present at the base of the raceme, forming an involucre *Themeda*
 129. Homogamous pairs present at the base of the raceme but not forming an involucre 130
 130. Sessile spikelet dorsally compressed; callus obtuse *Dichanthium*
 130. Sessile spikelet terete; callus pungent *Heteropogon*
 126. Racemes 2-50 131
 131. Lower floret of sessile spikelet staminate, palea present *Ischaemum*
 131. Lower floret of sessile spikelet sterile and reduced to a lemma 132
 132. Upper lemma of sessile spikelet dorsally awned *Arthraxon*
 132. Upper lemma of sessile spikelet awned from the tip or sinus of a bilobed tip or awnless 133
 133. Lower glume of sessile spikelet 2-keeled 134
 134. Racemes deflexed *Cymbopogon*
 134. Racemes not deflexed *Andropogon*
 133. Lower glume of sessile spikelet rounded or grooved 135
 135. Upper lemma entire *Dichanthium*
 135. Upper lemma bidentate 136
 136. Lower glume of sessile spikelet rounded on the back *Hyparrhenia*
 136. Lower glume of sessile spikelet with a median groove *Hyperthelia dissoluta*
 113. Rhachis internodes and pedicels stout, columnar or clavate, racemes solitary 137
 137. Pedicels free from internodes 138
 138. Pedicelled spikelet absent or reduced *Rhytachne rottboelliioides*
 138. Pedicelled spikelet present 139
 139. Spikelets awnless *Ellonurus tristis*
 139. Spikelets awned 140
 140. Pedicelled spikelet smaller than the sessile or same size, lower glume coriaceous, bearing a large flexuous awn *Urelytrum agropyroides*
 140. Pedicelled spikelet twice the size of the sessile, lower glume thinly chartaceous, foliaceous, bearing a short slender awn *Diectomis fastigiata*
 137. Pedicels fused to internode 141
 141. Rhachis tough *Hemarthria*
 141. Rhachis fragile 142
 142. Sessile spikelet globose *Hackelochloa granularis*
 142. Sessile spikelet ovate or oblong 143
 143. Sessile spikelet ovate *Rottboellia cochinchinensis*
 143. Sessile spikelet oblong 144
 144. Surface of lower glume with prominent pits *Heteropholis benoistii*
 144. Surface of lower glume smooth *Oxyrhachis gracillima*

Woody bamboos (by Soejatmi Dransfield)

Woody bamboos are members of the grass family Poaceae and form the tribes Bambuseae and Arundinarieae in the subfamily Bambusoideae. There are about 94 genera of bamboos in the world and the number of species is estimated to be 1,642. They occur in tropical, subtropical and temperate regions of all continents, except Europe and Western Asia, from the lowlands up to 4,300 m elevation. The majority of bamboos occupy low to medium elevations in the tropics. They grow in the wild, become naturalized, and are cultivated in a great variety of habitats. Their present-day distribution has been greatly influenced by human activity.

There are 14 known genera of woody bamboos recorded in Madagascar, ten of these native and four introduced. More collecting and taxonomic work still needs to be done. *Catharostachys*, *Decaryochloa*, *Hickelia*, *Hitchcockella*, *Nastus*, *Perrierbambus*, *Sirochloa*, *Sokinochloa* and *Vaiiha* are all closely related to each other and they form the subtribe Hickeliinae in the tribe Bambuseae, which is restricted to Madagascar, La Réunion, and some parts of Africa. The native *Oldeania* belongs to the tribe Arundinarieae. The other genera are all introduced in Madagascar from Asia: *Bambusa*, *Dendrocalamus*, *Gigantochloa*, and *Phyllostachys*.

To many people bamboos look alike. Seeing differences between bamboos can be difficult because all woody bamboos share a set of characteristic features. The plant consists of a segmented underground part (the rhizomes) and a segmented aboveground part called the culm. There is no central trunk similar to a tree. Bamboo morphology has the same basic characters as herbaceous grasses but it is more complex, and there is a special terminology to describe features of bamboos not found in herbaceous grasses.

Bamboos can be distinguished from other grasses by the following:

1. woody culms or stems, usually larger than herbaceous grasses
2. complex branching above the ground, with more than one branch at every culm node
3. complex branching below the ground
4. stalked leaf blades
5. specialist sheaths on the young stem or culm
6. the presence of 6 (3 in some genera) stamens and 3 lodicules, or sometimes no lodicules
7. specialized leaf anatomy such as the presence of fusoid cells, which are large cells with no known function

Some large grasses have thick woody culms that look similar to bamboos, but they never have more than one branch at each culm node, the leaf blades usually have no petiole, and there are no differentiated culm sheaths. *Phragmites* is frequently confused with bamboos: it can be distinguished by growing in wet areas, having sharp young leaves, and flowering frequently. *Saccharum* culms are filled with sugary tissue (bamboo culms are usually empty inside). *Phragmites*, *Neyraudia* and *Saccharum* have large fluffy inflorescences never seen in bamboos. The climbing forest species *Olyra latifolia* is Madagascar's only representative of the herbaceous bamboos (subfamily Bambusoideae tribe Olyreae) and we treat it with non-bamboo grasses for convenience.

Woody bamboos have two types of rhizomes. Pachymorph rhizomes are thick, and each pachymorph rhizome turns upward to form a new culm. Pachymorph rhizomes can have short or long necks and they are characteristic of many subtropical and tropical bamboos, including all the genera native to Madagascar. Leptomorph rhizomes are long and slender and usually hollow, with an apex that indefinitely grows horizontally; each internode has a solitary bud giving rise to either a culm or a rhizome. Leptomorph rhizomes are commonly found in temperate bamboos. In Madagascar, all bamboos have pachymorph rhizomes with the exception of the introduced temperate species *Phyllostachys aurea*.

Young shoots and young culms (stems) are protected by sheaths, called culm sheaths. These are often regarded as modified leaves. A culm sheath consists of a sheath, a blade (the same as a grass leaf blade but smaller), a ligule, and sometimes two auricles. The structure of the culm sheath is very important for identification. For example, *Bambusa vulgaris* 'Volobe mavo' (yellow variety), can be recognized by its culm sheaths which are covered with black hairs, have an erect broad blade, and two large auricles with long bristles.

The branching system is also useful for recognising a bamboo genus. In the majority of the world's bamboos the branch buds are found above the sheath scar, but in some bamboos, the branch buds emerge below the nodal line where the sheath scar curves downward. Most of the native bamboos in Madagascar have the branches borne below the nodal line. The number of branches at each node is the simplest character for beginners: two in *Phyllostachys* and three or more in all other genera.

There are two types of inflorescence in bamboos. All native bamboos in Madagascar have determinate inflorescences. A determinate inflorescence has spikelets in a raceme or a simple panicle, the spikelets emerge almost simultaneously, and then die almost simultaneously. The basic unit of the determinate inflorescence is a spikelet, just as in other grasses. The introduced *Bambusa*, *Dendrocalamus* and *Gigantochloa* have indeterminate inflorescences. In this type of inflorescence, a single unit is called a pseudospikelet. The apical portion of a pseudospikelet resembles a true spikelet and the basal portion bears buds, with each bud supported by a sheath (or subtending bract) and another bract-like structure called a prophyll. The buds will eventually develop into other pseudospikelets, and the process of flowering continues almost indefinitely until the culm's reserves are exhausted.

Bamboos are more difficult to identify than other members of the grass family, because their vegetative morphology is quite uniform and because flowering is rare. We provide an identification key which uses information on rhizomes, branching structure, and inflorescences. Many bamboos without flowers cannot be confidently identified to genus. It is usually not possible to identify specimens with no inflorescences.

Glossary for bamboo morphology

(not including terms already explained for grasses)

Branch complement is the group of branches that develop at a single culm node, including the branches that develop from branch buds.

Culm sheaths are modified leaves that protect young shoots and young culms by embracing the developing internodes, and usually fall off when the culm becomes mature. A culm sheath consists of a sheath, a blade, a ligule, and sometimes one or two auricles.

Extravaginal growth is developing branches emerging by breaking through the enclosing culm sheath.

Gregarious flowering is a population of bamboo flowering over a period of 2–3 years and then dying, for example in *Decaryochloa diadelpha*.

Intravaginal growth is developing branches emerging through the mouth of the enclosing culm sheath, not tearing any tissue.

Leptomorph rhizomes are long and slender and usually hollow, the apex extends and grows horizontally and indefinitely; each internode has a solitary bud giving rise to either a culm or a rhizome. In Madagascar this only occurs in *Phyllostachys*.

Lumen is the central cavity inside a hollow internode of a bamboo rhizome or culm.

Neck is the narrow basal part of a rhizome, which can be short or long. Rhizomes with short necks form a densely clumped bamboo (for example *Dendrocalamus*), rhizomes with long necks form diffuse or open clumps (for example *Valiha*).

Nodal line is a prominent line visible on a bamboo culm below the nodal region, between internodes; known also as a sheath scar.

Pachymorph rhizomes are short, solid, thick rhizomes, where a new rhizome soon turns upwards forming a new culm.

Prophyll is a sheathing organ or modified first leaf of a branch, usually 2-keeled, which is positioned between a culm and its branch.

Pseudospikelet is the basic unit of an indeterminate inflorescence in bamboo. It consists of a basal portion bearing buds, and a distal portion resembling a true spikelet. The buds grow into other pseudospikelets and the process continues until the culm reserves are exhausted.

Sporadic flowering happens when individual culms of a bamboo flower seasonally or occasionally, only flowering culms die after flowering while the rhizomes continue to live, for example in *Cathariostachys madagascariensis*.

Sheath scar is the mark left by a falling sheath on the node.

Key to genera of woody bamboos (by Soejatmi Dransfield)

1. Branches 2 at each node; rhizomes leptomorph *Phyllostachys*
1. Branches more than 2 at each node; rhizomes pachymorph 2
 2. Clump dense; rhizomes with short necks; culms erect, 2–30 cm in diameter; inflorescences indeterminate 3
 3. Culm sheaths with black hairs; blades erect; auricles rounded with bristles *Bambusa*
 3. Culm sheaths with brown to dark brown hairs; blades erect at first then deflexed; auricles small without noticeable bristles 4
 4. Culms erect with drooping tips, diameter up to 30 cm; lower internodes short, covered with golden brown hairs; nodes slightly swollen; young shoots dark purple *Dendrocalamus*
 4. Culms erect with erect tips, diameter up to 20 cm; lower internodes long, glabrous or rarely covered by light brown hair; nodes not swollen; young shoots pale green *Gigantochloa*
 2. Clump diffuse; rhizomes with relatively long to long necks; culms erect or climbing, 1–10 cm in diameter; inflorescences determinate 5
 5. Culms erect in the lower and upper part; nodes horizontal; branches intravaginal; inflorescence a panicle *Oldeania*
 5. Culm erect in the lower part with upper part scrambling or climbing; nodes dip downward; branches extravaginal; inflorescence a spike or capitate 6
 6. Culm moderately large, 3–4(8) cm in diameter, erect 7
 7. Young shoots green, covered with stiff pale to dark brown hairs especially below nodes; leaf blades 6–8 cm long; inflorescence a raceme or a spike, ca. 14 mm wide, spikelet cylindrical when young becoming laterally compressed at maturity *Valiha*
 7. Young shoots purplish green, with dark brown or black hairs; leaf blades up to 22 cm long, 6–12 mm wide; inflorescence capitate; spikelet cylindrical *Catharostachys*
 6. Culm under 3 cm in diameter, erect with scrambling or climbing upper part 8
 8. Culm erect with scrambling upper part 9
 9. Culm solid and hard, ca. 5 mm in diameter; young shoot greenish; leaf blades 3–8 mm long, 4–9 mm wide; auricle short with long bristles; inflorescence a raceme; spikelet cylindrical, 15–19 mm long *Sirochloa*
 9. Culm hollow or with small lumen 10
 10. Culm up to 18 mm in diameter; young shoot purplish green, leaf blades 8–12 cm long, 8–16 mm wide, no auricle, inflorescence a panicle, spikelets rounded, 18–20 mm long *Hickelia*
 10. Culm up to 10 mm in diameter; young shoot likely light green (not seen in the field); leaf blades linear, turning ovate lanceolate below the inflorescence, inflorescence bearing one spikelet, spikelets about 7 mm long, laterally compressed *Perrierbambus*
 8. Culm climbing 11
 11. Culm zigzag 13
 12. Culm with relatively thin walls, covered with black hairs when young; young shoot purplish, covered with black hairs; leaf blades 5–7 cm long, 7–10 mm wide; auricles short and broad with long bristles; inflorescence a raceme; spikelet terete, ca. 5 cm long *Decaryochloa*
 12. Culm solid, glabrous, smooth or rough; young shoots glabrous, light green or purplish; leaf blades 10–17 cm long, up to 25 mm wide; auricles long and linear with long bristles; inflorescence a capitulum; spikelet flattened *Soklnochloa*
 11. Culm straight, diameter not more than 2 cm, smooth, usually glabrous, spikelet laterally compressed 12
 13. Leaf blades linear, up to 15 cm long; inflorescence a raceme or panicle, bearing few to several spikelets; branches more than 6 at each node *Nastus*
 13. Leaf blades ovate-lanceolate, not more than 1 cm long; inflorescence bearing one spikelet; branches 2–6 at each node *Hitchcockella*

List of Poaceae genera in Madagascar

1	<i>Acrachne</i>	49	<i>Eleusine</i>	97	<i>Paratheria</i>
2	<i>Acroceras</i>	50	<i>Elionurus</i>	98	<i>Paspalum</i>
3	<i>Adenochloa</i>	51	<i>Enneapogon</i>	99	<i>Pentameris</i>
4	<i>Agrostis</i>	52	<i>Enteropogon</i>	100	<i>Perotis</i>
5	<i>Alloteropsis</i>	53	<i>Eragrostis</i>	101	<i>Perrierbambus</i>
6	<i>Andropogon</i>	54	<i>Eriochloa</i>	102	<i>Phragmites</i>
7	<i>Anthoxanthum</i>	55	<i>Euclasta</i>	103	<i>Phyllostachys</i>
8	<i>Aristida</i>	56	<i>Eulalia</i>	104	<i>Poa</i>
9	<i>Arthraxon</i>	57	<i>Festuca</i>	105	<i>Poecilostachys</i>
10	<i>Arundinella</i>	58	<i>Gigantochloa</i>	106	<i>Pogonatherum</i>
11	<i>Avena</i>	59	<i>Hackelochloa</i>	107	<i>Pseudechinolaena</i>
12	<i>Axonopus</i>	60	<i>Halopyrum</i>	108	<i>Pseudobromus</i>
13	<i>Bambusa</i>	61	<i>Helictotrichon</i>	109	<i>Pseudolasiacis</i>
14	<i>Bothriochloa</i>	62	<i>Hemarthria</i>	110	<i>Rhytachne</i>
15	<i>'Brachiaria'</i>	63	<i>Heteropholis</i>	111	<i>Rottboellia</i>
16	<i>Brachypodium</i>	64	<i>Heteropogon</i>	112	<i>Saccharum</i>
17	<i>Briza</i>	65	<i>Hickelia</i>	113	<i>Sacciolepis</i>
18	<i>Bromus</i>	66	<i>Hitchcockella</i>	114	<i>Sartidia</i>
19	<i>Calamagrostis</i>	67	<i>Hordeum</i>	115	<i>Schizachyrium</i>
20	<i>Cathariostachys</i>	68	<i>Humbertochloa</i>	116	<i>Schoenefeldia</i>
21	<i>Cenchrus</i>	69	<i>Hyparrhenia</i>	117	<i>Sclerodactylon</i>
22	<i>Centotheca</i>	70	<i>Hyperthelia</i>	118	<i>Setaria</i>
23	<i>Chasechloa</i>	71	<i>Imperata</i>	119	<i>Sirochloa</i>
24	<i>Chloris</i>	72	<i>Isachne</i>	120	<i>Sokinochloa</i>
25	<i>Chrysopogon</i>	73	<i>Ischaemum</i>	121	<i>Sorghastrum</i>
26	<i>Coelachne</i>	74	<i>Lasiorrhachis</i>	122	<i>Sorghum</i>
27	<i>Coix</i>	75	<i>Lecomtella</i>	123	<i>Sporobolus</i>
28	<i>Cortaderia</i>	76	<i>Leersia</i>	124	<i>Stenotaphrum</i>
29	<i>Craspedorrhachis</i>	77	<i>Leptaspis</i>	125	<i>Styppeiochloa</i>
30	<i>Crypsis</i>	78	<i>Leptocarydion</i>	126	<i>Themeda</i>
31	<i>Ctenium</i>	79	<i>Lepturus</i>	127	<i>Thuarea</i>
32	<i>Cymbopogon</i>	80	<i>Loudetia</i>	128	<i>Thysanolaena</i>
33	<i>Cynodon</i>	81	<i>Maltebrunia</i>	129	<i>Trachypogon</i>
34	<i>Cyphochlaena</i>	82	<i>Megastachya</i>	130	<i>Tragus</i>
35	<i>Cyrtococcum</i>	83	<i>Melinis</i>	131	<i>Trichanthecium</i>
36	<i>Dactyloctenium</i>	84	<i>Merxmüllera</i>	132	<i>Tricholaena</i>
37	<i>Daknopholis</i>	85	<i>Microchloa</i>	133	<i>Trichopteryx</i>
38	<i>Decaryella</i>	86	<i>Microstegium</i>	134	<i>Tripogon</i>
39	<i>Decaryochloa</i>	87	<i>Moorochloa</i>	135	<i>Tripsacum</i>
40	<i>Dendrocalamus</i>	88	<i>Nastus</i>	136	<i>Tristachya</i>
41	<i>Dichanthium</i>	89	<i>Neostapfiella</i>	137	<i>Triticum</i>
42	<i>Diectomis</i>	90	<i>Neyraudia</i>	138	<i>Urelytrum</i>
43	<i>Digitaria</i>	91	<i>Oldeania</i>	139	<i>Urochloa</i>
44	<i>Dimeria</i>	92	<i>Olyra</i>	140	<i>Valiha</i>
45	<i>Dinebra</i>	93	<i>Opismenus</i>	141	<i>Viguiereella</i>
46	<i>Diplachne</i>	94	<i>Oryza</i>	142	<i>Yvesia</i>
47	<i>Echinochloa</i>	95	<i>Oxyrhachis</i>	143	<i>Zea</i>
48	<i>Ehrharta</i>	96	<i>Panicum</i>	144	<i>Zoysia</i>

Genera arranged phylogenetically

Taxonomic arrangement is according to Kellogg (2015), with some additional more recently published placements. When all records are known to be cultivated or introduced these are marked in brackets; when some members of the genus are native or there is doubt about their native occurrence no note is made.

subfamily Pharoideae

Leptaspis

subfamily Ehrhartoideae

tribe Phyllorachideae

Humbertochloa

tribe Ehrharteae

Ehrharta (introduced)

Leersia

Maltebrunia

Oryza

subfamily Bambusoideae

tribe Arundinarieae (woody bamboos)

Oldeania

Phyllostachys (introduced)

tribe Bambuseae (woody bamboos)

Bambusa (introduced)

Catharostachys

Decaryochloa

Dendrocalamus (introduced)

Gigantochloa (introduced)

Hickelia

Hitchcockella

Nastus

Perrierbambus

Sirochloa

Sokinochloa

Valiha

tribe Olyreae

Olyra

subfamily Pooideae

tribe Brachypodieae

Brachypodium

tribe Bromeae

Bromus

tribe Triticeae

Hordeum (cultivated)

Triticum (cultivated)

tribe Poeae

Agrostis

Anthoxanthum

Avena (cultivated)

Briza (cultivated)

Calamagrostis

Festuca

Helictotrichon

Poa

Pseudobromus

subfamily Aristidoideae

Aristida

Sartidia

subfamily Panicoideae

tribe Panicoideae unplaced

Lecomtella

tribe Tristachyideae

Loudetia

Trichopteryx

Tristachya

tribe Centothecae

Centotheca

Megastachya

Thysanolaena (introduced)

tribe Andropogoneae

Andropogon

Arundinella

Arthraxon

Bothriochloa

Chrysopogon

Coix (introduced)

Cymbopogon

Dichanthium

Diectomis

Dimeria

Elionurus

Eucleasta

Eulalia

Hackelochloa

Hemarthria

Heteropholis

Heteropogon

Hyparrhenia

Hyperthelia

Imperata

Ischaemum

Lasiorrhachis
Microstegium
Oxyrhachis
Pogonatherum (cultivated)
Rhynchachne
Rottboellia
Saccharum (cultivated)
Schizachyrium
Sorghastrum
Sorghum
Themeda
Trachypogon
Tripsacum (introduced)
Urelytrum
Zea (cultivated)

tribe Paspaleae

Axonopus (introduced)
Paspalum

tribe Paniceae

Acroceras
Adenochloa
Alloteropsis
'Brachiaria'
Cenchrus
Chasechloa
Cyphochlaena
Cyrtococcum
Digitaria
Echinochloa
Eriochloa
Melinis
Moorochloa
Oplismenus
'Panicum'
Paratheria
Poecilostachys
Pseudechinolaena
Pseudolasiacis
Sacciolepis
Setaria
Stenotaphrum
Thuarea
Trichanthecium
Tricholaena
Urochloa
Yvesia

subfamily Danthonioideae

Cortaderia (cultivated)
Merxmüllera
Pentameris

subfamily Chloridoideae

tribe Triraphideae

Neyraudia

tribe Eragrostideae

Enneapogon
Eragrostis
Viguierella

tribe Zoysieae

Crypsis
Sporobolus
Zoysia

tribe Cynodonteae

Acrachne
Chloris
Craspedorhachis
Ctenium
Cynodon
Dactyloctenium
Daknopholis
Decaryella
Dinebra
Diplachne
Eleusine
Enteropogon
Halopyrum
Leptocarydion
Lepturus
Microchloa
Neostapfiella
Perotis
Schoenefeldia
Sclerodactylon
Tragus
Tripogon

subfamily Micrairoideae

Coelachne
Isachne

subfamily Arundinoideae

Phragmites
Styppeiochloa

Quick identification using inflorescence shape and presence of awns

This list documents inflorescence shape and the presence of awns. Inflorescences are divided into panicles (branched inflorescences) and different arrangements of racemes (unbranched inflorescences) based on overall appearance. This terminology is used merely for convenience and is technically not correct: a grass inflorescence defined scientifically is equivalent to a spikelet, and all arrangements of spikelets are compound inflorescences. Panicles include all branching structures which may be condensed with branches not visible (e.g. in *Anthoxanthum* and *Sokinochloa*).

Awns are long thin appendages originating from glumes or lemmas, frequently confused with hairs (thinner and originating from any surface) and bristles (thicker and usually originating outside the spikelet). For example, inflorescences of *Phragmites mauritianus* appear hairy due to abundant white hairs emerging from the rachilla, but it does not have awns. Variable and ambiguous genera are listed under all possible morphologies: for example, *Agrostis* always has a panicle and sometimes has awns, hence it is listed under "panicle, no awns" as well as "panicle, awns". Woody bamboos not known to flower in Madagascar, such as *Bambusa*, are not included in this list.

Panicle, no awns

Adenochloa
Agrostis
Avena
Briza
Cathariostachys
Cenchrus
Cenotheca
Chrysopogon
Coelachne
Crypsis
Cyrtococcum
Eragrostis
Eriochloa
Festuca
Hickelia
Imperata
Isachne
Lasiophachis
Lecomtella
Leersia
Leptaspis
Maltebrunia
Megastachya
Melinis
Oldeania
Olyra
Oryza
Panicum
Perotis
Phragmites
Poa
Pseudolasiacis
Saccharum

Sacciolepis
Setaria
Sorghum
Sporobolus
Thysanolaena
Tragus
Trichanthecium
Tricholaena
Urochloa

Panicle, awns

Agrostis
Anthoxanthum
Aristida
Arundinaria
Arundinella
Avena
Bromus
Calamagrostis
Chrysopogon
Cortaderia
Ehrharta
Enneapogon
Eriochloa
Festuca
Helictotrichon
Lasiophachis
Leptocarydion
Loudetia
Melinis
Merxmüllera
Neyraudia
Oryza
Pentameris

Perotis
Pseudobromus
Sartidia
Sokinochloa
Sorghastrum
Sorghum
Styppeiochloa
Themeda
Trichopteryx
Tripogon
Tristachya

Single raceme, no awns

Daknopholis
Decaryochloa
Elionurus
Hackelochloa
Hemarthria
Heteropholis
Leersia
Humbertochloa
Lepturus
Microchloa
Nastus
Oxyrhachis
Paratheria
Rhytachne
Rottboellia
Stenotaphrum
Thuarea
Triticum
Zea
Zoysia

Single racemes, awns

Brachypodium
Ctenium
Daknopholis
Decaryella
Diectomis
Ehrharta
Enteropogon
Heteropogon
Hordeum
Neostapfiella
Perotis
Pogonatherum
Schizachyrium
Sirochloa
Trachypogon
Tripogon
Triticum
Urelytrum
Viguierella

Digitate racemes, no awns

Acrachne
Axonopus
Chloris
Coix
Cynodon
Daknopholis
Digitaria
Eleusine
Paspalum
Sclerodactylon
Tripsacum

Digitate racemes, awns

Alloteropsis
Andropogon
Arthraxon
Bothriochloa
Chloris
Dactyloctenium
Daknopholis
Dichanthium
Dimeria
Euclasta
Eulalia
Ischaemum
Microstegium
Neostapfiella
Schoenefeldia
Trachypogon
Urelytrum

Racemes arranged along a rachis, no awns

Acrachne
Acroceras
Axonopus
'Brachiaria'
Chasechloa
Chrysopogon
Craspedorhachis
Digitaria
Dinebra
Diplachne
Echinochloa
Halopyrum

Humbertochloa
Moorochloa
Poecilostachys
Pseudechinolaena
Stenotaphrum
Urochloa
Yvesia
Zea

Racemes arranged along a rachis, awns

Alloteropsis
Bothriochloa
Cyphochlaena
Diplachne
Echinochloa
Oplismenus
Poecilostachys

Racemes arranged in a complex false panicle, no awns

Chrysopogon
Hackelochloa

Racemes arranged in a complex false panicle, awns

Andropogon
Chrysopogon
Cymbopogon
Hyparrhenia
Hyperthelia
Schizachyrium
Themeda



DESCRIPTIONS OF GENERA



Acrachne

Acrachne perrieri, endemic species (genus of Old World tropical savanna)

DESCRIPTION. Medium-sized erect **annual**. Leaf blades broadly linear, flat. Ligule a ciliate membrane.

Inflorescence composed of a number of spikes arranged subdigitately or spread along a central axis.

Racemes with imbricate sessile spikelets, usually terminating in a naked point or sometimes in an abortive spikelet. **Spikelets several-flowered**, oblong with a serrate outline, laterally compressed. Glumes shorter than the lemmas and falling before or soon after them. **Lemmas 3-nerved, cartilaginous, entire or 2-toothed and aristulate at the apex.** No awns.

HABITAT. Low elevation dry forest.

DISTRIBUTION. Mahajanga.

LOOKALIKES. *Chloris*, *Cynodon* and *Dactyloctenium* have somewhat similar racemes but their racemes are clearly digitate, starting from a single point on the culm; although most *Acrachne* racemes start from the top of the culm, at least some of them are attached lower down.

Craspedorhachis has racemes distributed along the culm, but the racemes are considerably more narrow, and *Craspedorhachis* has only one fertile floret per spikelet, while *Acrachne* has more than one fertile floret per spikelet.

MALAGASY NAMES. Tsipipina, Tsimpipiry, Tsimpipina, Tsiphipihina, Kapany.

NOTES. A small and unusual genus, racemes of *Acrachne* can be recognised by numerous lemma tips curved outwards. This species was previously placed in the endemic genus *Camusia*.



1 cm

Acrachne perrieri



Acroceras

5–10 endemic species (pantropical genus)

DESCRIPTION. Annuals or perennials with slender trailing culms, often rooting from the lower nodes. Leaf blades linear to ovate; ligule a very short membranous rim. **Inflorescence composed of racemes borne along a central axis**, but sometimes approaching a panicle. Spikelets lanceolate to oblong with 2 florets, plumply subterete, **the glumes and lemmas ± thickened at the extreme tip**; glumes unequal, membranous, the lower is $\frac{1}{4}$ – $\frac{3}{4}$ of the spikelet length, the upper as long as the spikelet; upper lemma crustaceous, dorsally compressed, glabrous or obscurely puberulous at the **green, keeled tip**; upper palea with the tip briefly reflexed and ± protruberant between the lemma margins. No awns.

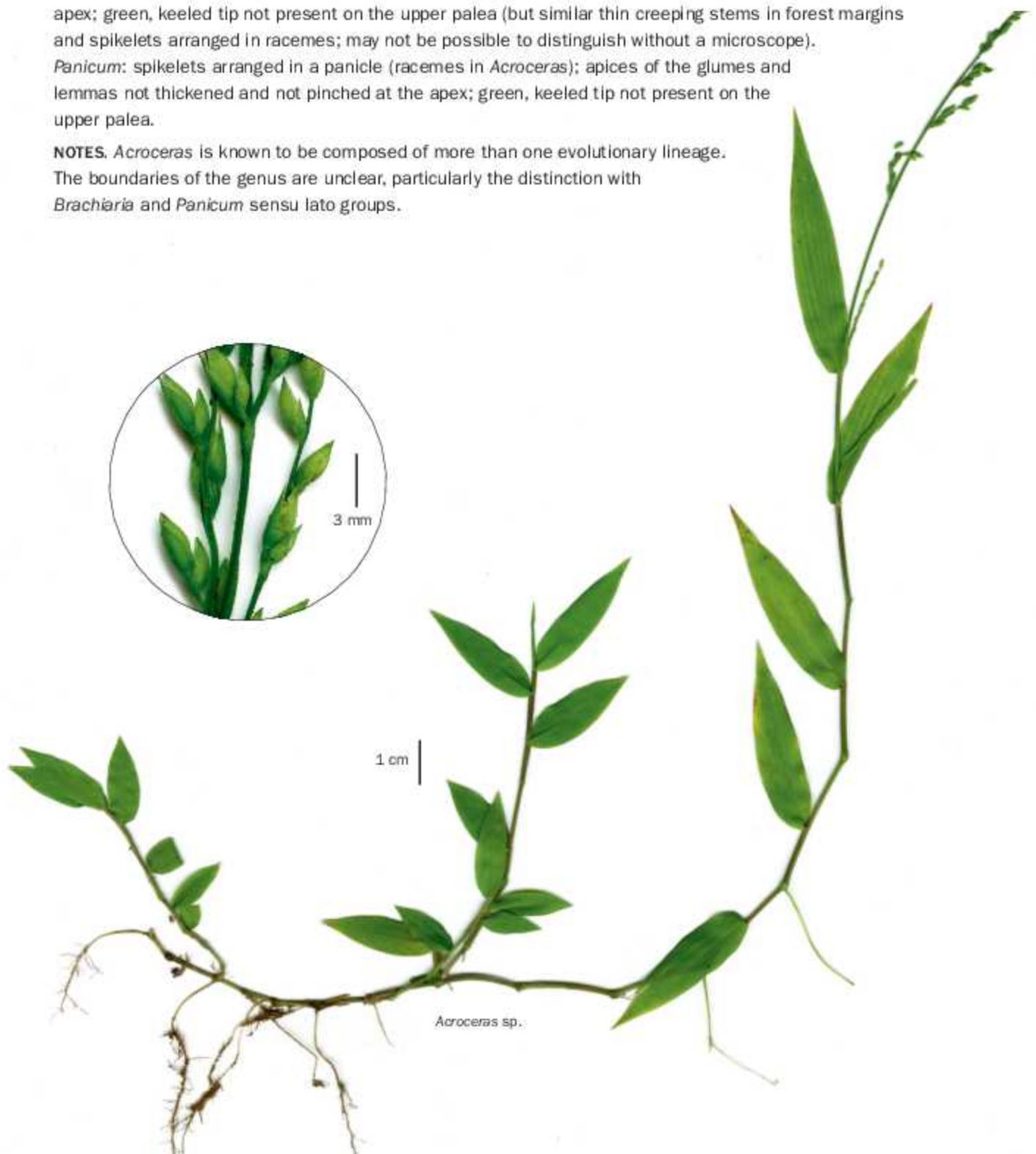
HABITAT. Forest margins; damp places with semi-closed canopy; 0–1,900 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. '*Brachiaria*' and *Urochloa*: apices of the glumes and lemmas not thickened and not pinched at the apex; green, keeled tip not present on the upper palea (but similar thin creeping stems in forest margins and spikelets arranged in racemes; may not be possible to distinguish without a microscope).

Panicum: spikelets arranged in a panicle (racemes in *Acroceras*); apices of the glumes and lemmas not thickened and not pinched at the apex; green, keeled tip not present on the upper palea.

NOTES. *Acroceras* is known to be composed of more than one evolutionary lineage. The boundaries of the genus are unclear, particularly the distinction with *Brachiaria* and *Panicum* sensu lato groups.



Adenochloa

Adenochloa hymeniochila, African genus

DESCRIPTION. Aquatic annual with long floating or trailing culms 0.1–2 m long, often rooting at the lower nodes, with gland-tipped hairs. Ligule a ciliate membrane. Leaf blades linear-lanceolate, usually deflexed. Panicles 4–10 cm long, the branches spreading almost at right angles at maturity, the spikelets almost appressed to primary panicle branches, with gland-tipped trichomes visible with a hand lens. Spikelets oblong, 2-flowered, apically obtuse, 2–2.5 mm long. Lower glume $\frac{1}{3}$ – $\frac{2}{3}$ as long as the spikelet. Upper lemma smooth, shiny, pale. No awns.

HABITAT. Streams between 500–1,800 m, especially common on the High Plateau.

DISTRIBUTION. All provinces.

LOOKALIKES. *Panicum* and *Trichanthecium* look similar, but they grow in drier places and have trichomes without glands.

Coelachne is also an aquatic grass with a panicle but its leaf blades are not deflexed and the lower floret in every spikelet is fertile (in *Adenochloa* the upper floret is fertile as in other Panicoideae).

NOTES. *Adenochloa* was previously included in the genus *Panicum*. This species was thought to be a Malagasy endemic called *Panicum glanduliferum*, and is also known as *Panicum hymeniochilum*.



Adenochloa hymeniochila

Agrostis

8 species, all endemic (global genus of temperate regions)

DESCRIPTION. Annuals or perennials with **weak herbaceous stems**, 0.4–1 m tall. Ligule a membrane. Leaf blades linear to subulate. Panicle much divided or spike-like. Spikelets pedicelled, **always with 1 floret**, laterally compressed, narrowly lanceolate to oblong. Glumes longer than the lemma or the same length, acute or acuminate. **Callus glabrous or with hairs shorter than half of the lemma.** Lemma thin, awnless or dorsally awned. **Awn straight, 0–5 mm long.**

HABITAT. Montane temperate habitat, especially by streams and at forest edges; 1,000–2,500 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. *Calamagrostis* is related and very similar, but has long white callus hairs around the same length as the lemma protruding from the spikelet.

Festuca: mature spikelets always have more than one floret; awns arise from tips of lemmas (mature spikelets always have only one floret in *Agrostis*; awns arise from the backs of lemmas).



Alloteropsis

3 species (genus of Old World tropics)

DESCRIPTION. Medium-sized to chunky annuals or perennials growing erect. **Leaf blades wide, convolute to lanceolate**; ligule membranous or a line of hairs. Inflorescence composed of untidy racemes; rachis sharply 3-angled, bearing paired or fascicled spikelets. Spikelets ovate to elliptic, dorsally compressed, with 2 florets; glumes unequal, acute to acuminate, **the upper glume equalling the spikelet and ciliate on the margins**; lower floret male, **upper lemma chartaceous, visibly awned**, its narrow inrolled margins covering only the edges of the acute palea.

HABITAT. Marshy and weedy places. *Alloteropsis cimicina* and *A. semialata* are pasture weeds; *Alloteropsis paniculata* is a common weed of rice fields; 0–1,600 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. *Alloteropsis paniculata* is easily mistaken for rice weed species of *Echinochloa* (upper lemma of *Echinochloa* spikelet can have a short beak, never an awn like that of *Alloteropsis*).

MALAGASY NAMES. Ahitomendry, Ahitrakanga, Horona, Morateraka, Tongolonakanga, Tsangambary.

NOTES. Easy to identify as individual species: *Alloteropsis cimicina* has unusually long trichomes on the edges of its upper glume; *Alloteropsis paniculata* is a large fleshy weed of rice fields; *Alloteropsis semialata* has visibly winged spikelets.



Alloteropsis semialata

Andropogon

9 species, including 7 endemics (pantropical genus)

DESCRIPTION. Usually erect or sometimes ascending perennials. Leaf blades linear, never aromatic; ligule membranous or reduced to a line of hairs. Inflorescence composed of **paired racemes or racemes arranged in a spatheate false panicle**, usually exerted from the spatheoles, **often dark purplish; internodes and pedicels filiform or clavate, usually long-ciliate on both margins**. Spikelets with 2 florets. Sessile spikelet dorsally compressed, or squeezed between pedicel and internode; **callus obtuse, inserted in the concave top of the internode**; lower glume membranous to coriaceous, mostly flat, concave or deeply grooved on the back, 2-keeled; upper glume awned or not; upper lemma hyaline, **bilobed**, passing between the teeth into a conspicuous awn with a glabrous or puberulous column. Pedicelled spikelet male or sterile.

HABITAT. Open areas; 0–2,500 m elevation.

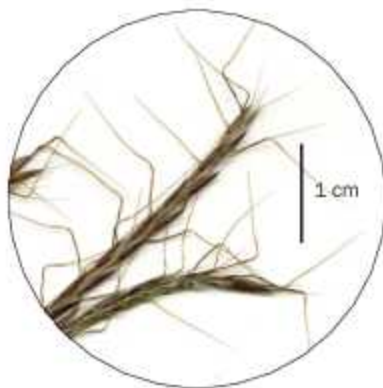
DISTRIBUTION. All provinces.

LOOKALIKES. *Hyparrhenia* and *Cymbopogon* both have shorter paired racemes that are usually folded backwards at maturity (*Andropogon* racemes are longer, erect or drooping, not folded backwards).

Diectomis and *Schizachyrium* have single racemes (always paired or numerous racemes in Malagasy *Andropogon*).

MALAGASY NAMES. Akatavero, Ahikakonga, Ahiborisoa, Ahikalonga, Ahitrakanga, Haravola, Kisizavazaha, Masiry, Kotomena, Saingona, Veroboboka, Veromanitra.

NOTES. Diagnostic characters are difficult to see when the plant is fresh and the racemes are closed forming thin tube structures. The long white trichomes perpendicular to the racemes are clearly visible on herbarium specimens of the common *Andropogon eucomus*.



Andropogon trichozygus

Anthoxanthum

2 species in Madagascar, including 1 endemic (global genus of temperate regions)

DESCRIPTION. **Sweet-scented** annuals or perennials, often stoloniferous, with weak geniculately ascending stems. Ligules membranous. **Panicles contracted, spike-like.** Spikelets 3-flowered, the **2 lowest florets reduced to sterile lemmas**, the uppermost hermaphrodite; glumes membranous with hyaline margins, the upper as long as the spikelet, the lower about half as long; sterile lemmas narrowly oblong, brown, hairy, bilobed, the lower with a short straight awn from above the middle of the back, the upper with a geniculate awn from below the middle; fertile lemma rotund, shorter than the sterile lemmas, cartilaginous.

HABITAT. Montane moist forest edges; 1,500–2,800 m elevation.

DISTRIBUTION. Antsiranana, Antananarivo, Fianarantsoa.

LOOKALIKES. Occurs in the same higher elevation places as other weak-stemmed temperate genera: *Agrostis* (similar to *Agrostis* with condensed panicles, but only one floret in each *Agrostis* spikelet, 3 compressed florets in each *Anthoxanthum* spikelet); *Festuca* and *Brachypodium* (multiple florets within each spikelet clearly visible in *Festuca* and *Brachypodium*; all florets hidden within the glumes in *Anthoxanthum*).

NOTES. Infrequent. Components of the spikelet are hidden within the upper glume and it looks as if the spikelet only has one floret: the two sterile and one fertile florets can only be seen with a hand lens or microscope after peeling back the glumes.

1 cm



Anthoxanthum odoratum

Aristida

10 species, including 5 endemics (pantropical genus)

DESCRIPTION. Annual or perennial, mostly densely tufted, usually with erect, solid, rigid culms and long, narrow leaf blades. Ligule a line of hairs. **Spikelets 1-flowered**, narrow, pedicelled, in terminal lax or contracted panicles. **Glumes persistent, equal or unequal, narrow, 1-nerved**, acute to acuminate or obtuse, or emarginate, mucronate or awn-tipped. Lemma narrow, terete or laterally compressed, becoming indurated at maturity, with a hard callus. **Awn 3-branched, with or without a column, the column articulated or not**, the branches glabrous or scabrid.

HABITAT. Usually dry exposed places, roadsides and low-quality pastureland; 0–2,000 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. The distinctive three-branched awn is unique except for the rare *Sartidia* (similar awns but broader glumes with 3 nerves instead of 1 nerve).

MALAGASY NAMES. Ahitsorohitra, Bozaka, Horombavy, Horona, Kifafa, Kifafalahy, Kifafavavy, Korona, Orombavy, Pepeka, Pepeky, Sekotovololo, Sekotovolohorombavy.

NOTES. Abundant on degraded pastures. The awn with three branches may be difficult to see on young plants or plants with very thin awns; in this case the lemma needs to be pulled out and the awn examined with a hand lens. One species can have a single awn with no side branches: *Aristida tenuissima*. Ash from *A. adscensionis*, *A. rufescens*, and *A. similis* is used for medicinal ointment. *Aristida similis* is used to make brooms and roof coverings.



Aristida tenuissima

Arthraxon

2 species, 1 endemic (genus of Old World tropics)

DESCRIPTION. Annuals or perennials with **slender trailing culms rooting at the nodes**. Leaf sheaths slightly inflated; ligule membranous; **leaf blades slightly cordate and semi-amplexicaul at the base**, pilose with bulbous-based hairs at least below, usually becoming ciliate. Inflorescence composed of slender subdigitate racemes, their internodes filiform to linear. Spikelet with 2 florets. Sessile spikelet laterally compressed; callus truncate; lower glume chartaceous to coriaceous, rounded on the back, often scabrid or muricate; lower floret reduced to a hyaline lemma; **upper floret with hyaline subtire lemma bearing a glabrous geniculate awn from low down on the back**. Pedicelled spikelet absent or much reduced.

HABITAT. Damp places by roadsides and forest edges, 800–1,800 m elevation.

DISTRIBUTION. Antananarivo, Fianarantsoa.

LOOKALIKES. Awned racemes typical of Andropogoneae, the racemes superficially similar to those of *Andropogon*, *Bothriochloa*, *Dichanthium*, and *Schizachyrium*, but the plant trailing with broad leaves (*Andropogon* always erect, *Schizachyrium* with linear leaves which are not cordate or semi-amplexicaul).

NOTES. The diagnostic awn base arising from the back of the upper lemma is almost impossible to see without a hand lens. To see it, pull out the awn and the small transparent upper lemma will come out of the spikelet attached to the lower part of the awn.



Arthraxon antsirabense

Arundinella

Arundinella nepalensis (pantropical genus)

DESCRIPTION. Large perennial tussocks with tough erect culms. Leaf blades linear, rigid, flat or rolled. Ligule a short scarious rim. Inflorescence an oblong panicle, open or contracted, often with simple raceme-like primary branches, the spikelets usually paired. **Spikelets yellowish green or purplish, usually gaping**, disarticulating beneath the upper floret, with two florets, the lower floret male or barren; glumes membranous to chartaceous, the lower acute to mucronate, the upper as long as the spikelet and often $\pm$ caudate; upper lemma thinly coriaceous, **with a persistent awn**, sometimes the lateral lobes also slenderly awned; callus short, rounded.

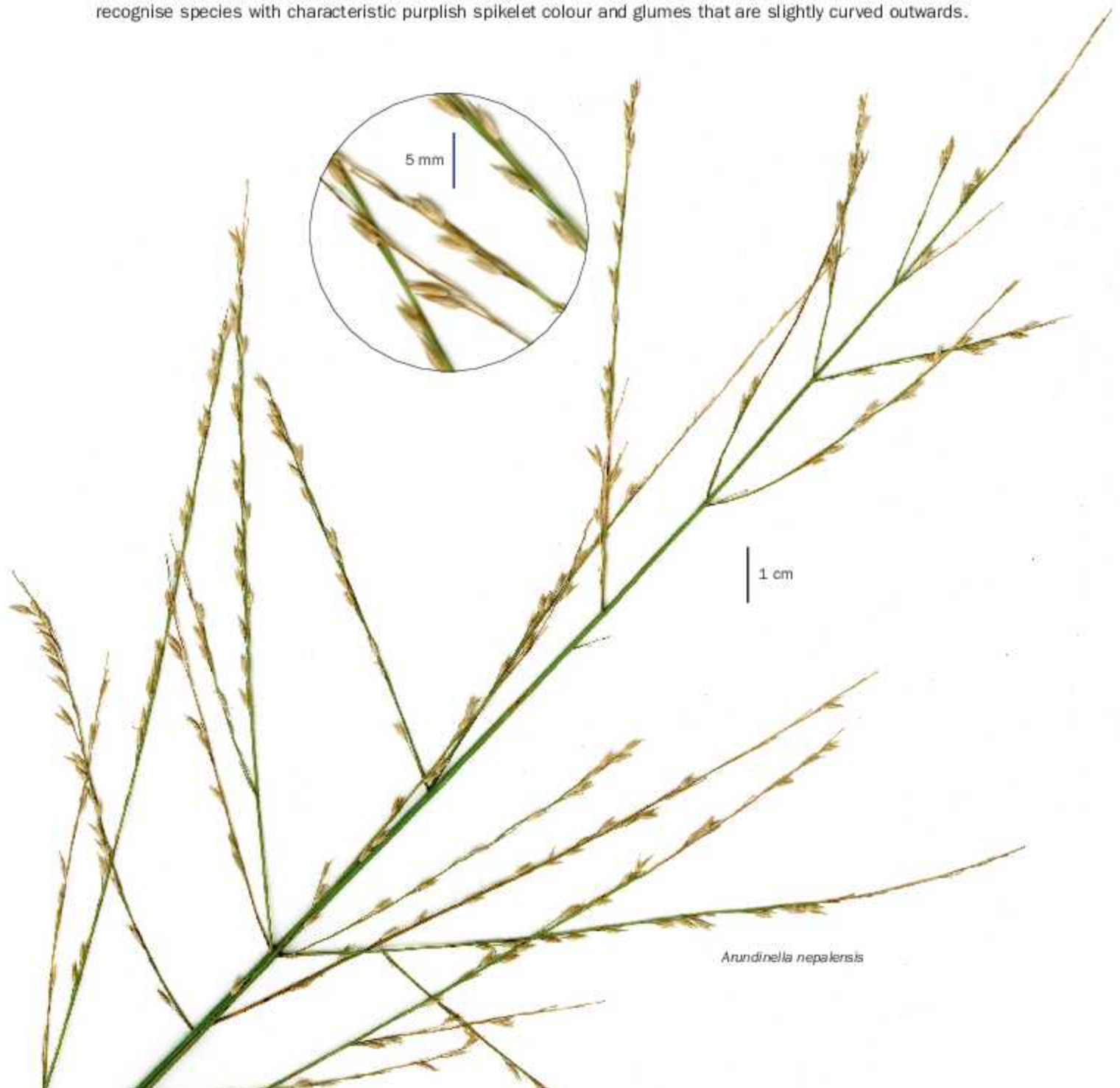
HABITAT. Abundant forming dense stands in marshes and by water, 500–2,000 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. The spikelets gaping open at maturity are similar to those of some species of *Panicum*, but *Panicum* never has awns (a small awn protrudes from each spikelet of *Arundinella*).

MALAGASY NAMES. Fantaka, Kitsangy.

NOTES. The best clues to the identity of *Arundinella* is its large height and aquatic habitat. It is an easy to recognise species with characteristic purplish spikelet colour and glumes that are slightly curved outwards.



Avena

Avena sativa (temperate genus)

DESCRIPTION. Erect annual 60–100 cm tall. **Ligule a membrane 2–5 mm long.** Leaf blades linear. Panicle narrowly ovate, nodding, 10–30 cm long. **Spikelets pedicelled, pendulous, 20–30 mm long**, with 2–3 florets, the third floret reduced. Glumes subequal, papery, green, as long as the spikelet, with 9–11 clearly visible nerves giving the glumes a striped appearance. Lemmas glabrous, becoming hard at maturity. **Awn sometimes present on some spikelets but not on others, arising from the back of the lemma, 2–4 cm long.**

HABITAT. Fields and roadsides, 1,300–1,700 m elevation.

DISTRIBUTION. Fianarantsoa.

LOOKALIKES. *Helictotrichon* has similar spikelets and also grows on the High Plateau, but it has shorter glumes, all of its spikelets have awns, and there are hairs inside its spikelets on the rachilla and the callus.

NOTES. *Avena* can be easily recognised by its unusually large spikelets hanging downwards, with long glumes that have numerous nerves. Introduced probably as animal feed, occasionally found as a weed on the High Plateau.



Axonopus

Axonopus compressus (naturalised from the New World; genus of New World tropics)

DESCRIPTION. **Stoloniferous creeping perennials** with ascendant flowering stems. **Young shoots noticeably flat.** **Leaf blades broad and flat with rounded apices**; ligule short, membranous. **Inflorescence composed of 2–many slender racemes**, these digitate or borne upon a short common axis, rarely solitary; rachis 3-angled, glabrous to villous, bearing single spikelets, their lower lemma adaxial. Spikelets with 2 florets, lanceolate to oblong, dorsally compressed, small. Lower glume absent; upper glume membranous, as long as the spikelet; lower floret barren, resembling the upper glume; upper lemma crustaceous, usually obtuse, the margins inrolled and clasping only the edges of the obtuse palea. No awns.

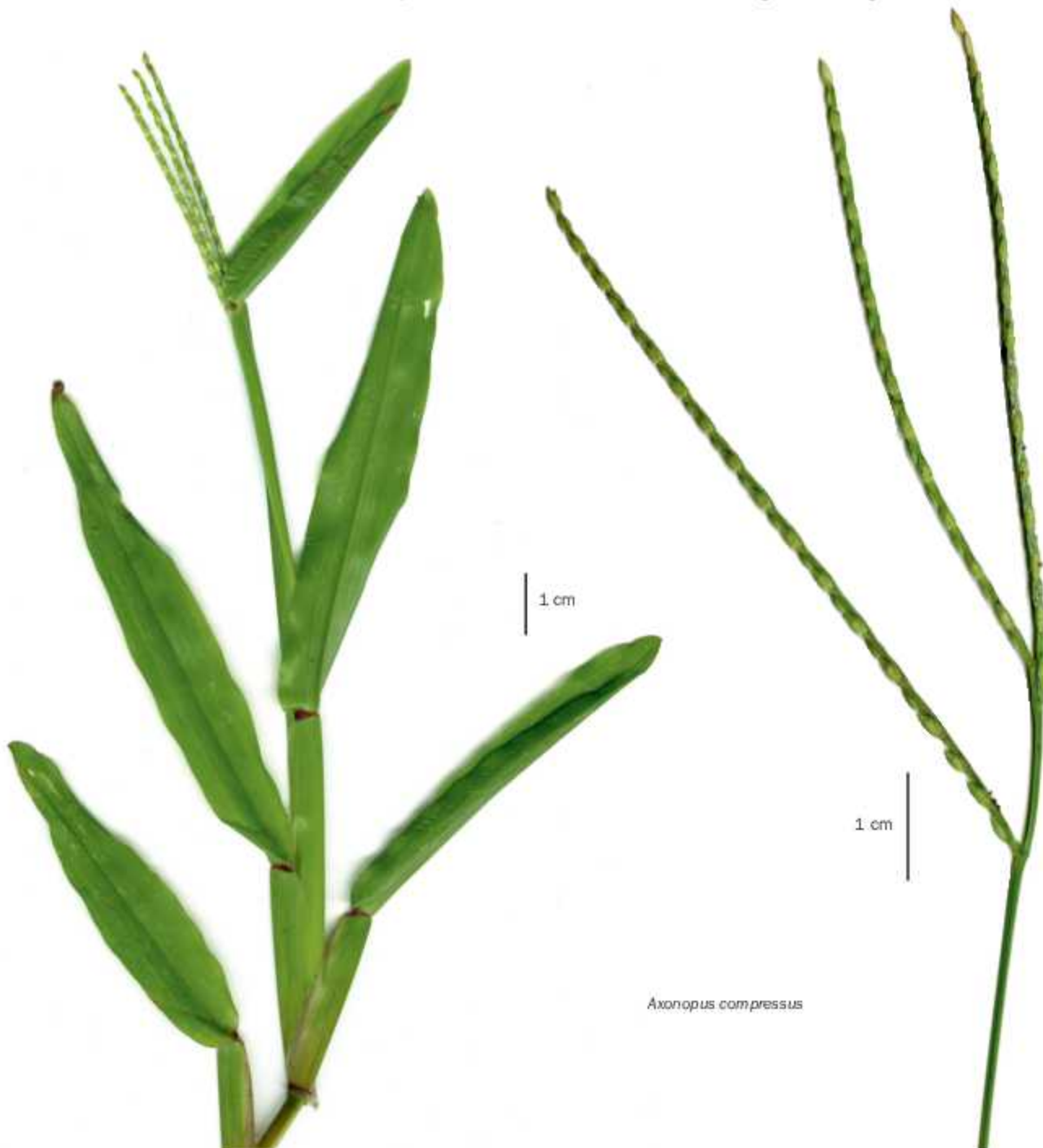
HABITAT. Lawns and secondary vegetation; 0–1,700 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. Deceptively similar to *Digitaria*, differing by its wide leaves with rounded apices (narrow leaves with acute apices in *Digitaria*); it is also possible to distinguish it from *Digitaria* by examining the margins of the upper lemma using the microscope (inrolled in *Axonopus*, flat in *Digitaria*).

MALAGASY NAMES. Ahipisakavavy, Ahipisaka.

NOTES. “Carpet Grass” is commonly planted in lawns and naturalised throughout Madagascar.



Axonopus compressus

Bambusa

Bambusa vulgaris and *Bambusa multiplex* (Introduced; *Bambusa* is a genus of tropical and subtropical Asia)

DESCRIPTION. Clumping bamboo with pachymorph rhizomes. **Culm erect**, small to large diameter, with relatively thick to thick walls, usually glabrous. Young shoots covered with black hairs. Culm sheaths usually covered with dark brown or black hairs, with blades typically erect, ovate to broadly ovate, **auricles moderately large with bristles**. **Branches several at each node** with middle branches dominant and elongating. Leafy branches becoming much branched; leaf blades glabrous, auricles small with bristles. Flowering has not been recorded in Madagascar.

HABITAT. Eastern regions, planted in villages or naturalised along the rivers, also planted occasionally on the High Plateau. *Bambusa vulgaris* can tolerate a broader range of conditions than any native bamboo.

DISTRIBUTION. Antananarivo, Toamasina.

LOOKALIKES. *Bambusa*, *Dendrocalamus* and *Gigantochloa* are related to each other, they are not easy to differentiate from each other without flowers. *Bambusa* can be differentiated from *Dendrocalamus* and *Gigantochloa* by the erect blades of its culm sheath and the presence of black hairs on its culm sheath. *Bambusa*, *Dendrocalamus* and *Gigantochloa* are larger than all the native bamboos.

MALAGASY NAMES. Anambolo, Fotobalo, Volo, Volozatsy, Volozaty. The yellow variety is called Vologe mavo.

NOTES. There are two varieties of *Bambusa vulgaris*, green and yellow varieties (yellow with green stripes) found in Madagascar. The leaf blades are often given to the bamboo lemurs as food. Culms of *B. vulgaris* are used for building material, in boats for masts, rudder making, outriggers, boating poles, chairs etc. *Bambusa multiplex* is only known from cultivation, planted as hedges.



1 cm

2 cm

Bambusa vulgaris

5 mm



Bothriochloa

3 species (pantropical genus)

DESCRIPTION. Medium-sized erect perennials. Leaf blades flat. Ligule membranous. **Inflorescence of digitate or subdigitate erect racemes**, racemes with more than 8 sessile spikelets; **internodes and pedicels linear, with a hyaline median line**. Spikelet with 2 florets. Sessile spikelet dorsally compressed; callus very short, rounded. **Lower glume sometimes with 1–3 circular pits**, acute; lower floret reduced to a hyaline lemma; **upper lemma entire**, with a glabrous awn. Pedicelled spikelet much like the sessile or smaller.

HABITAT. Arid areas, savanna, secondary vegetation; 0–1,500 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. *Dichanthium* is very similar but its pedicels and internodes have no impressed median line, and its sessile spikelets are more obtuse apically.

Euclea is related but its racemes are nodding and there are no awns on the lowermost 3–4 sessile spikelets in every raceme.

Andropogon is also an erect plant with numerous racemes and awns, but its awns arise from the 2-toothed (not entire) upper lemmas and its pedicels and internodes do not have an impressed median line.

Arthraxon has superficially similar multiple racemes but has a creeping habit and short broad leaves (erect habit and long linear leaves in *Bothriochloa*).

MALAGASY NAMES. Mafiloah, Tsimanimpanariva.

NOTES. Common genus of Andropogoneae with multiple thin racemes and awns, *Bothriochloa* has no unique features except for the one or more circular pits visible with the naked eye as “dots” on the lower glume of the sessile spikelets on *Bothriochloa pertusa* and *Bothriochloa insculpta*. The impressed line (translucent or purple line down the middle of pedicels and internodes, often seen on dry specimens as a channel running down the middle) is almost impossible to see without strong magnification. Many genera of the Andropogoneae are difficult to distinguish without looking at microscopic characters. *Bothriochloa bladhii* is a significant forage grass.



Bothriochloa pertusa



Bothriochloa bladhii

'Brachiaria'

Ca. 15 species including 13 endemic to Madagascar (pantropical genus)

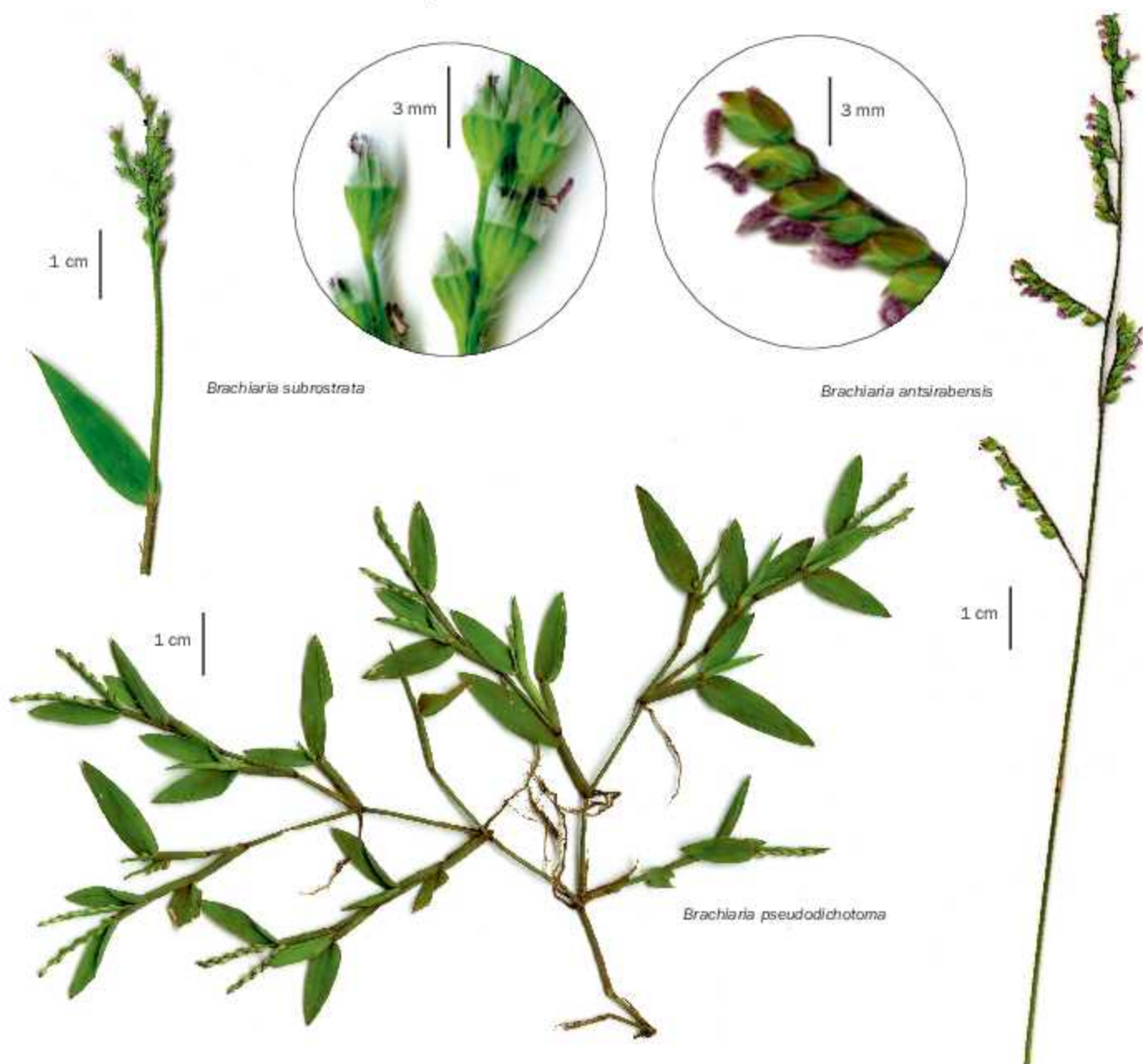
DESCRIPTION. **Creeping or erect annuals or perennials, 0.1–1 m tall.** Ligule a line of hairs. Leaf blades linear to lanceolate. **Inflorescence composed of racemes on a common axis.** Spikelets sessile or pedicelled, with 2 florets, ovate to oblong, plump, obtuse to acute or apiculate. Lower glume usually shorter than the spikelet; upper glume $\frac{2}{3}$ to as long as the spikelet. Lower lemma like the upper glume. **Upper lemma hardened, obtuse to acute. No awns.**

HABITAT. Mesic damp closed or open locations, forest edges, roadsides; 0–2,500 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. *Urochloa* now includes most of the genus *Brachiaria*, although some species of *Brachiaria* do not yet have a definite generic placement; most species of *Urochloa* have an ornamented upper lemma and a fine point at the apex of the lemma, while species still in *Brachiaria* usually have a smooth upper lemma with no apical point. *Moorochloa* is similar but has erect racemes tightly appressed to the central axis and its upper lemma is obtuse. *Panicum*: similar habit and similar spikelets, but arranged in a panicle. *Acroceras*: similar thin creeping stems in forest margins and spikelets arranged in racemes, but the apices of the glumes and lemmas are thickened and pinched at the apex.

NOTES. The recognition of the genus *Brachiaria* is out of date and represents a temporary classification waiting for final generic placements; all '*Brachiaria*' will have different names once the research is complete. This is a typical Panicoideae group with distinctive spikelets: hard upper lemma protecting the caryopsis and becoming easily detached from the soft herbaceous and glume-like lower lemma.



Brachypodium

4 species in Madagascar, 3 of these endemic (temperate genus)

DESCRIPTION. Erect or drooping, weak-stemmed annuals 15–80 cm tall. Ligule membranous. Leaf blades flat and thin. **Inflorescence a simple terminal raceme** with the spikelets alternating in 2 rows on opposite sides of the rachis. **Spikelets 2–4.5 cm long, subsessile, the pedicels 1–3 mm long, with 5–20 florets.** Glumes shorter than the lowest lemma. Lemmas dorsally rounded. **Awn 5–10 mm. Ovary with a villous apical appendage or simply hairy;** styles inserted at the appendage.

HABITAT. Mesic environments, roadsides, and forest edges; 1,000–2,000 m elevation.

DISTRIBUTION. Antananarivo, Toamasina, Fianarantsoa, Toliara.

LOOKALIKES. *Festuca*, *Bromus*, and *Pseudobromus* look similar and grow in the same habitats, but they have spikelets on significant filiform pedicels; *Brachypodium* spikelets are longer and have almost no pedicels or a short thickened pedicel no more than 3 mm long.

NOTES. *Brachypodium* is related to bread wheat (*Triticum*) and barley (*Hordeum*), but has spikelets which are separate instead of condensed into a dense raceme. Young spikelets have fewer florets, and when the plant is dried many florets can drop off, but the genus can still be identified by its lack of a significant pedicel.



Brachypodium madagascariensis

Briza

2 introduced species (temperate genus)

DESCRIPTION. Fairly small erect annuals or perennials. Leaf blades flat or rolled. Ligules membranous. Inflorescence a loose or contracted panicle. **Spikelets pedicelled, several-flowered, broadly ovate, laterally compressed, densely imbricate, inflated, shiny.** Florets all fertile, hermaphrodite, exerted from the glumes. Glumes shorter than lowest lemma. Lemmas broad, cordate at the base, horizontally spreading, papery. No awns.

HABITAT. Damp sheltered places; elevation not known.

DISTRIBUTION. Not known.

LOOKALIKES. The inflated appearance of the mature spikelets is unique. There is some resemblance to other genera with broad ovate spikelets and multiple florets per spikelet, e.g. *Eragrostis capensis* with spikelets held erect and 3 nerves on every lemma (*Briza* spikelets are usually pendent at maturity with 7–9 nerves on every lemma).

NOTES. Members of the genus *Briza* are widely cultivated as ornamentals for their pendent inflated and often large spikelets. The rare occurrences in Madagascar are almost certainly escapes from cultivation. No modern collections are known.



Bromus

2 species including 1 endemic (temperate genus)

DESCRIPTION. Weak-stemmed weakly tufted annuals or perennials 10–90 cm tall. **Leaf sheaths hairy.** Ligule membranous. Leaf blades flat, 4–8 mm wide. Panicle usually fairly large and open. **Spikelets pedicelled, many-flowered, laterally compressed.** Glumes keeled, shorter than the lowest lemma. Lemmas 5–9(–13)-nerved, keeled, membranous, lanceolate to lanceolate-elliptic. **Awn straight, 5–15 mm long.** **Ovary crowned by an apical pilose or villous appendage above the style arms.**

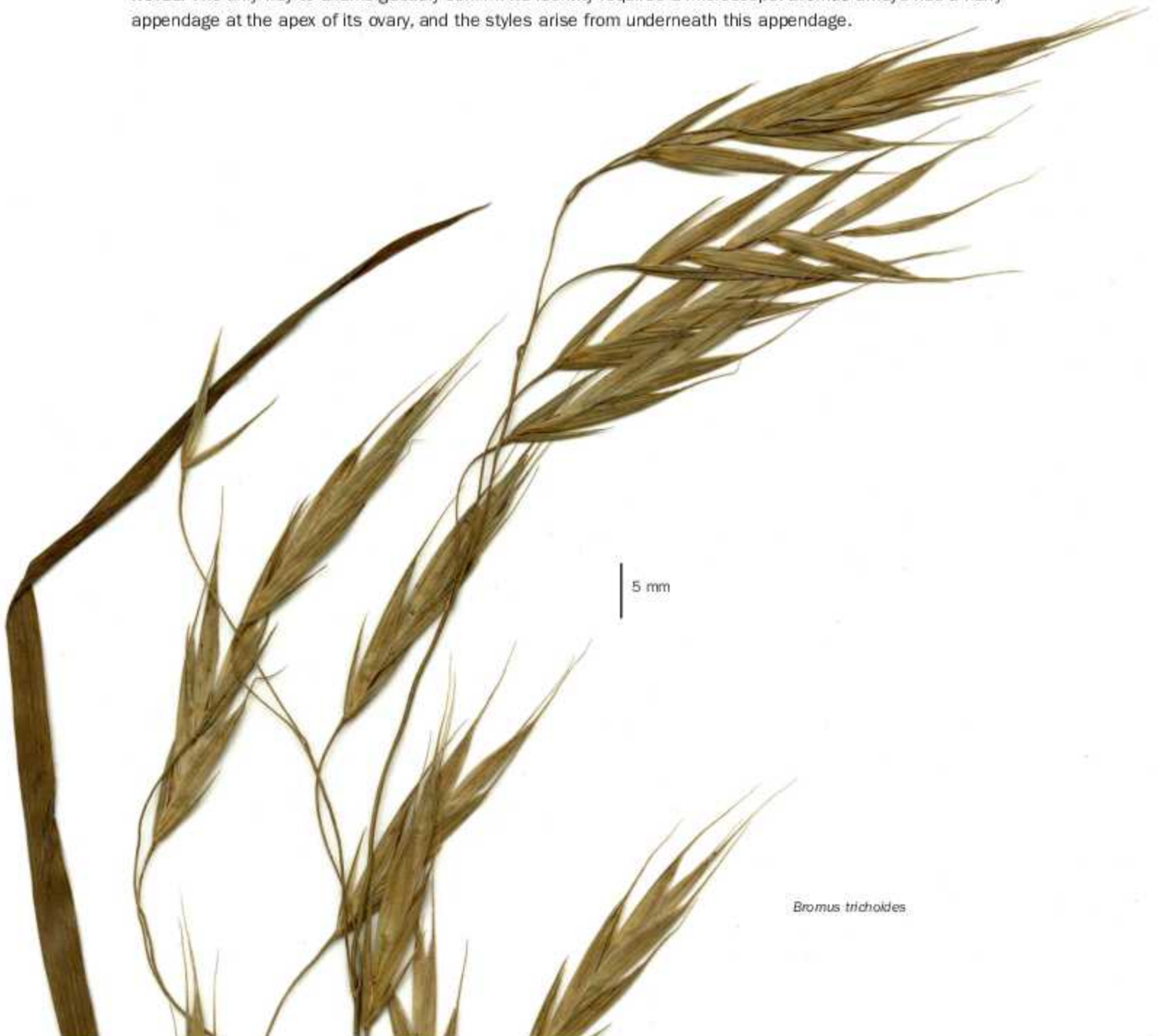
HABITAT. High elevation areas with medium humidity, roadsides and forest edges; 1,000–2,500 m elevation.

DISTRIBUTION. Antsiranana, Mahajanga, Fianarantsoa.

LOOKALIKES. *Brachypodium*, *Festuca* and *Pseudobromus* occur in the same habitat, have a similar habit, and similar pedicelled spikelets with multiple florets and more than 3 nerves on every lemma. The leaf sheaths of *Festuca* and *Pseudobromus* are glabrous and the ovaries have no hairy appendage. *Brachypodium* can be distinguished by its sessile or almost sessile spikelets (spikelets on distinct pedicels in *Bromus*).

Helictotrichon has geniculate awns and hairs on the rachilla and callus which are visible when the spikelet is dry and open.

NOTES. The only way to unambiguously confirm its identity requires a microscope: *Bromus* always has a hairy appendage at the apex of its ovary, and the styles arise from underneath this appendage.



Bromus trichoides

Calamagrostis

Calamagrostis emimensis, endemic (global genus of temperate regions)

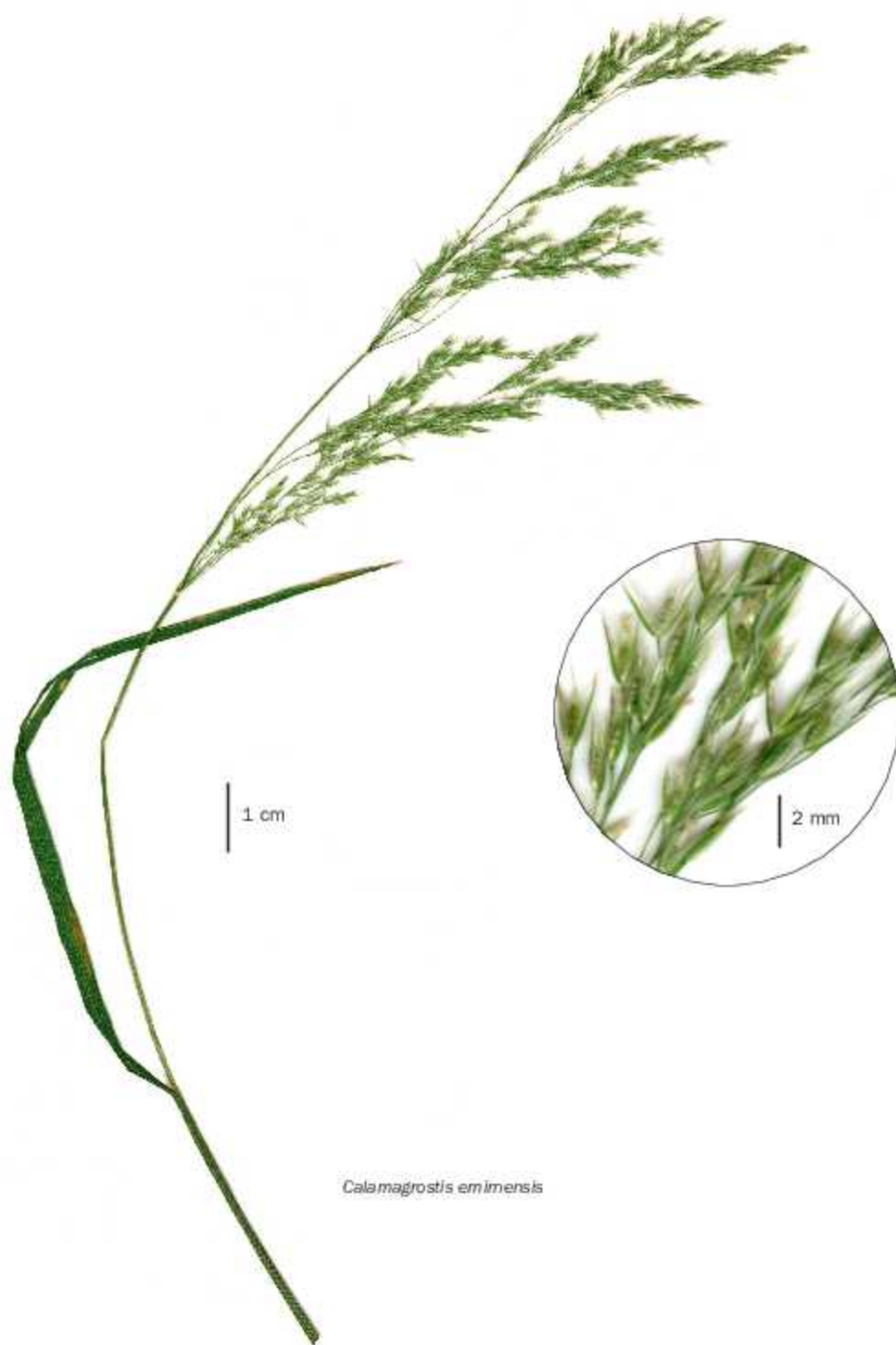
DESCRIPTION. Ascendant rhizomatous perennial with weak stems, 30–80 cm tall. Ligule a membrane. Leaf blades flat, 2–4 mm wide. Inflorescence a panicle. **Spikelets always with 1 floret, 2.8–3.8 mm long, gaping open.** Glumes acute. **Callus with long white hairs as long as the spikelet.** Lemma thin, with a small awn 1–2.5 mm.

HABITAT. Boggy places, near streams, 800–2,000 m elevation.

DISTRIBUTION. Antananarivo, Fianarantsoa.

LOOKALIKES. *Agrostis* is closely related and very similar, but the white callus hairs are absent or less than half as long as the lemmas, and they do not protrude from the spikelets.

Festuca: mature spikelets always have more than one floret; awns arise from tips of lemmas (mature spikelets always have one floret in *Agrostis* and *Calamagrostis*; awns arise from back of lemmas).



Calamagrostis emimensis

Cathariostachys

Two species, endemic (*Cathariostachys capitata* and *C. madagascariensis*).

DESCRIPTION. Open clumping bamboo with pachymorph rhizomes and relatively long necks. Culm erect with drooping or arching upper parts, 7–10 m tall, 4–8(–12) cm in diameter; internodes 40–60 cm long, with relatively thin walls, covered with black hairs below nodes when young, or whitish or with fine golden brown hairs; sheath scar or nodal line dipping markedly. Young shoots pale to purplish green, covered with sharp, stiff brown to black hairs. Branches several to many with primary branch dominant, elongating and scrambling over nearby trees or vegetation. Culm sheath coriaceous, with a base which is rugose and conceals the branch bud; the sheath covered with brown to black hairs; blade erect or deflexed, with dark brown hairs on the back, especially near the base. Ligule entire, short; auricle with curly bristles. Leaf blades lanceolate with long fine tips. Ligule very short; auricles short with curly bristles, easily shed. Inflorescences determinate, contracted panicle, capitate or subcapitate, terminating leafy branches, 1.5–3 cm long, 2–3 cm in diameter, bracts or subtending sheaths present, prophyll usually absent, or when present usually split. Spikelets 13–22 cm long, consisting of 5 (or 3) glumes, one fertile floret, and a vestigial rachilla extension, rhachis internodes very short. Fruit cylindrical or oblong, about 7 mm long, a typical grass caryopsis but with a stalk.

HABITAT. *Cathariostachys capitata* grows in lowland and mid-elevation primary forest, surviving in disturbed forest; *C. madagascariensis* grows in lower montane forest and in very disturbed forest or open ground, 800–1,000 m elevation.

DISTRIBUTION. Fianarantsoa, Toamasina.

LOOKALIKES. *Valiha* has a similar habit due to the long necks of its rhizomes giving rise to similar culms that grow singly and do not form a clump; *Cathariostachys* can be differentiated from *Valiha* by its capitate inflorescences and black hairs on the culm sheaths.

MALAGASY NAMES. *Cathariostachys capitata*:

Volo, Volosarona, Volosy, Voloatsy;

C. madagascariensis: Voloto or Volobe (Andasibe), Volotsangana, Volosy (Ranomafana).

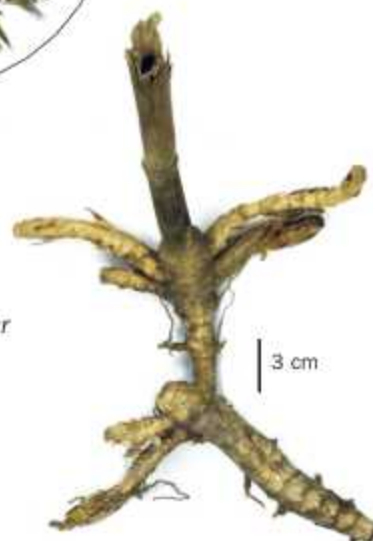
NOTES. *Cathariostachys* can be recognized by its purplish young shoots, broadly ovate and erect blades of the culm sheaths, and the black hairs on the culm sheaths. It is not easy to differentiate the two species. In Ranomafana National Park and in Andasibe, *C. madagascariensis* is the main source of food for the bamboo lemurs, *Hapalemur aureus* and *Prolemur simus*. The culm of *C. capitata* is used for making flutes or “sudim”; the internodes of *C. madagascariensis* are used for water containers, and for making the walls of houses.



Cathariostachys madagascariensis



1 cm



3 cm

Cenchrus

13 species, one endemic (pantropical genus)

DESCRIPTION. Erect or ascending annuals or perennials up to 1.5 m tall (sometimes to 3.5 m). Leaf blades flat or rolled. Ligule a line of hairs. Inflorescence a spike-like panicle with **deciduous clusters of 1–several spikelets subtended by an involucre of bristles, the bristles soft or spinous, free or fused into a cup shape.** Spikelets lanceolate to ovate with 2 florets. Lower glume up to $\frac{1}{2}$ length of spikelet. Upper glume and lower lemma as long as spikelet or a little shorter. Upper lemma chartaceous to thinly coriaceous with flat thin margins. No awns.

HABITAT. Arid open habitats and mesic habitats; 0–2,000 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. *Setaria* and *Paratheria* are related genera with bristles subtending awnless spikelets. Spikelets of *Setaria* fall without the bristles, leaving the bristles on the plant; *Cenchrus* spikelets fall off together with subtending bristles.

Paratheria is a prostrate plant with a raceme branch extending into a long bristle below each spikelet.

MALAGASY NAMES. Ahitranga, Ahitokotoko, Motidambo, Trongatse, Tsilainday, Tanandalltra.

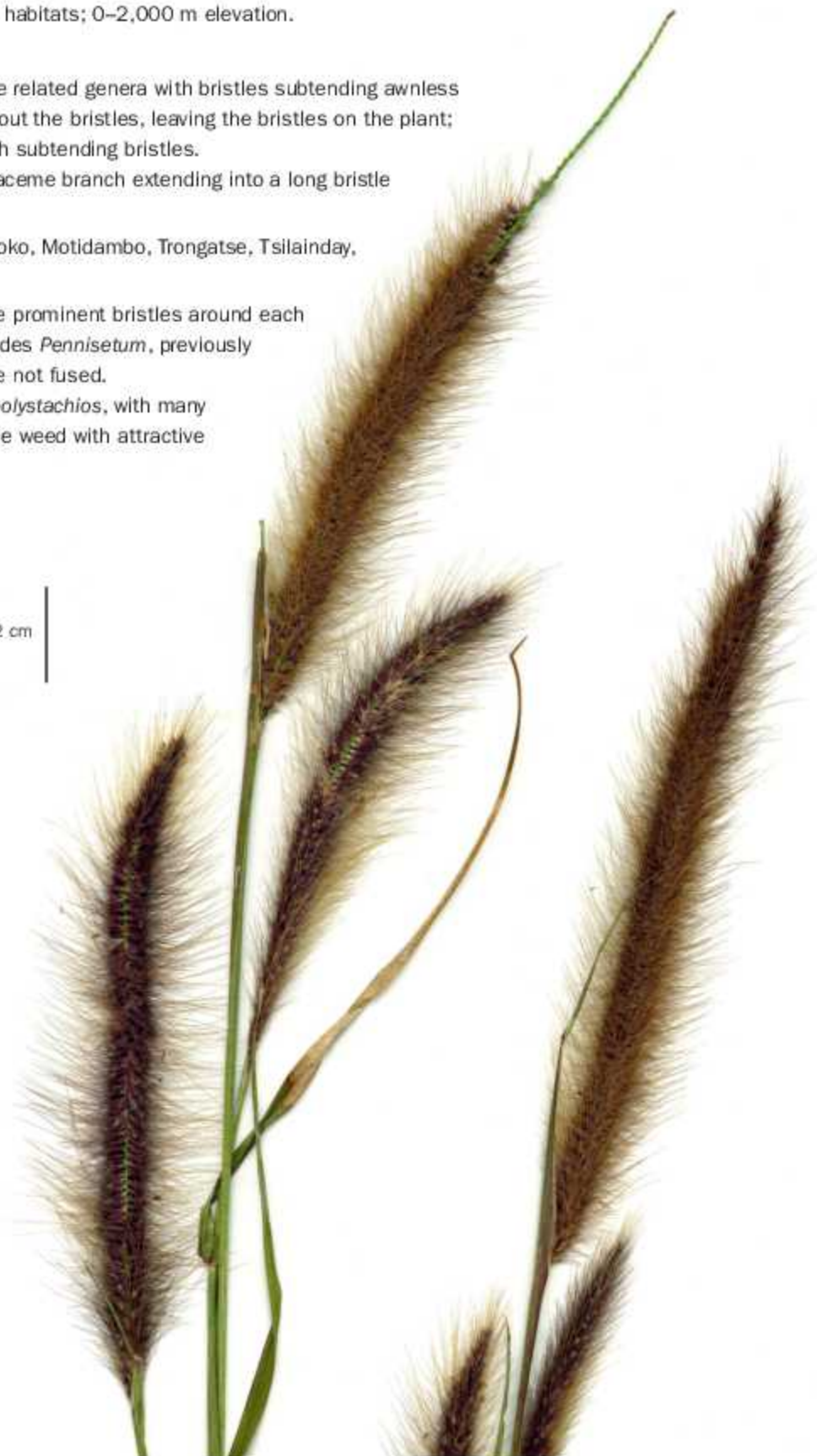
NOTES. *Cenchrus* is recognisable by the prominent bristles around each group of spikelets. *Cenchrus* now includes *Pennisetum*, previously distinguished by softer bristles that are not fused.

Cenchrus polystachios (= *Pennisetum polystachios*, with many spelling variants) is a common roadside weed with attractive purple inflorescences.



2 cm

Cenchrus polystachios



Centotheca

Centotheca lappacea (genus of Old World tropics)

DESCRIPTION. Weakly tufted ascending annual or perennial 20–80 cm tall. Ligule a membrane. **Leaf blades lanceolate, 1.5–2 cm wide, with branching nerves.** Inflorescence a panicle. Spikelets 5–8 mm long when mature, with 2–4 flowers, oblong, laterally compressed, green. Glumes shorter than the lower lemma. **Lemmas pointed, with thick reflexed bristles at maturity.** No awns.

HABITAT. Wet forest understory; 0–500 m elevation.

DISTRIBUTION. Antsiranana, Mahajanga, Toamasina.

LOOKALIKES. *Megastachya* is another forest understory grass with many florets per spikelet and broad leaves; mature *Megastachya* has more than 8 florets per spikelet unlike the 1–4 florets in a *Centotheca* spikelet; *Megastachya* also lacks the retrorse lemma bristles.

Eragrostis can have superficially similar inflorescences but has linear leaves and grows in drier and more open environments than *Centotheca*.

Poecilostachys is a forest understory genus with similar habit and green spikelets, but its spikelets have two flowers only and often have awns.

NOTES. Common on forest floor. Recognised by the bristles on the lemma which are just about possible to see without magnification; the bristles are thought to aid dispersal. This genus is difficult to recognise when the inflorescences are young, the spikelets are smaller and the bristles have not developed.



Chasechloa

2 species (endemic genus)

DESCRIPTION. Erect, loosely tufted, rhizomatous perennials 0.2–1 m tall. Leaf blades ovate to lanceolate or linear. **Flowering culms with a terminal 1-sided raceme and sometimes up to 5 lateral racemes.** The rachis narrowly winged. Spikelets paired, 2-flowered, laterally compressed. Glumes keeled, $\frac{2}{3}$ as long as the florets to slightly exceeding the florets, with 5–9 nerves, **with prominent stiff tubercle-based hairs.** Lower floret male. Lower lemma with 9–11 nerves, apically dentate. Upper floret with a basal swollen appendage and an apical dorsal crest. Upper lemma and upper palea smooth, shiny, white becoming brown at maturity. No awns.

HABITAT. Savanna, rocky outcrops, dry forest; 0–350 m elevation.

DISTRIBUTION. Antsiranana and Mahajanga.

LOOKALIKES. *Brachiaria*, *Urochloa*, *Acroceras*, and *Poecilostachys* are also broad-leaved forest grasses with racemes and no awns but they have thinner and looser racemes; *Eleusine* and *Dactyloctenium* have similar racemes but they are genera of open arid environments with narrow leaves.

NOTES. The two Malagasy species were previously placed in the South American genus *Echinolaena*. The distinctive one-sided racemes resemble toothbrushes. *Chasechloa egregia* is known from a single collection from Nosy Be and is probably extinct.



Chloris

7 species, 1 endemic (global tropical and warm temperate genus)

DESCRIPTION. Tufted, rhizomatous or stoloniferous small perennials or annuals 0.1–1.2 m tall. Ligule a ciliate membrane. Leaf blades linear, 2–7 mm wide, acute to acuminate or **rounded**. **Inflorescence of 2–15 digitate racemes. Spikelets broadly triangular, laterally compressed**, with 2–4 flowers, shortly pedicelled or sessile, in 2 rows on a tough rachis. Glumes shorter than lowest lemma. Lowermost floret fertile; fertile lemma hardened, with tufts of hair, awned. **Awn (0.2–)3–25 mm**. 2nd–4th flowers sterile.

HABITAT. Open arid areas; common on roadsides; 0–2,000 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. A number of other pioneers of open areas with digitate racemes are similar.

Neostapfiella is a similar annual with awned digitate racemes and triangular spikelets, but there are fewer racemes, and there are 2 fertile florets in every spikelet.

Daknopholis looks similar to *Chloris pycnothrix* but has only 1 floret per spikelet and its racemes are more narrow.

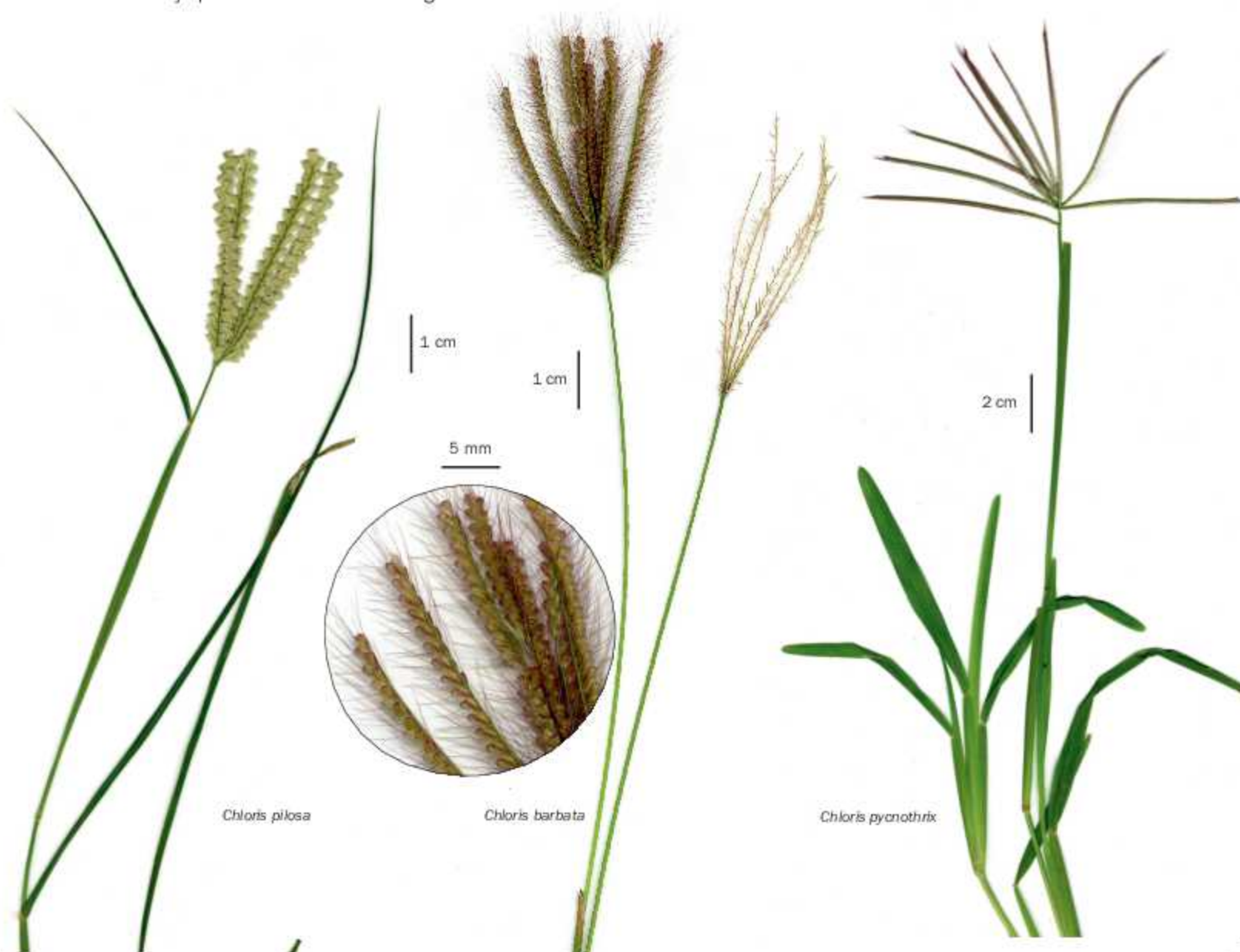
Schoenefeldia has curved awns and fewer longer racemes.

Cynodon has elliptic spikelets and no awns (in *Chloris* the spikelets are triangular and awns are present).

Eleusine has 2–6 fertile florets per spikelet, and no awns (in *Chloris* the spikelets are triangular with only the basal floret fertile and awns are present).

MALAGASY NAMES. Ahikatoto, Ahikinga, Tsibora, Tsvongo.

NOTES. When the florets fall out, a skeleton of glumes remains protruding from both sides of the rachis. The common weed *Chloris pycnothrix* has distinctive rounded leaf apices. The likely introduced *Chloris pilosa* is the only species without obvious long awns.



Chrysopogon

3 species, including 1 endemic (pantropical genus)

DESCRIPTION. Erect tufted perennials, 0.3–3 m tall. Ligule a short membrane or a line of hairs. Leaf blades linear, thick, 2–10 mm wide. Inflorescence a panicle with branches bearing terminal racemes. **Racemes either reduced to a triad of 1 sessile and 2 pedicelled spikelets, the sessile spikelet pale yellowish with yellowish callus hairs (savanna grasses) or racemes 5–12 cm long (*Chrysopogon zizanioides*).** Spikelets with 2 florets. Lower glume of sessile spikelet thick, rounded on the back, sometimes with small spines on the margins; upper glume often awned. Upper lemma bidentate or entire. **Awn absent (*Chrysopogon zizanioides*) or 1–3 cm long.** Pedicelled spikelet male or infertile.

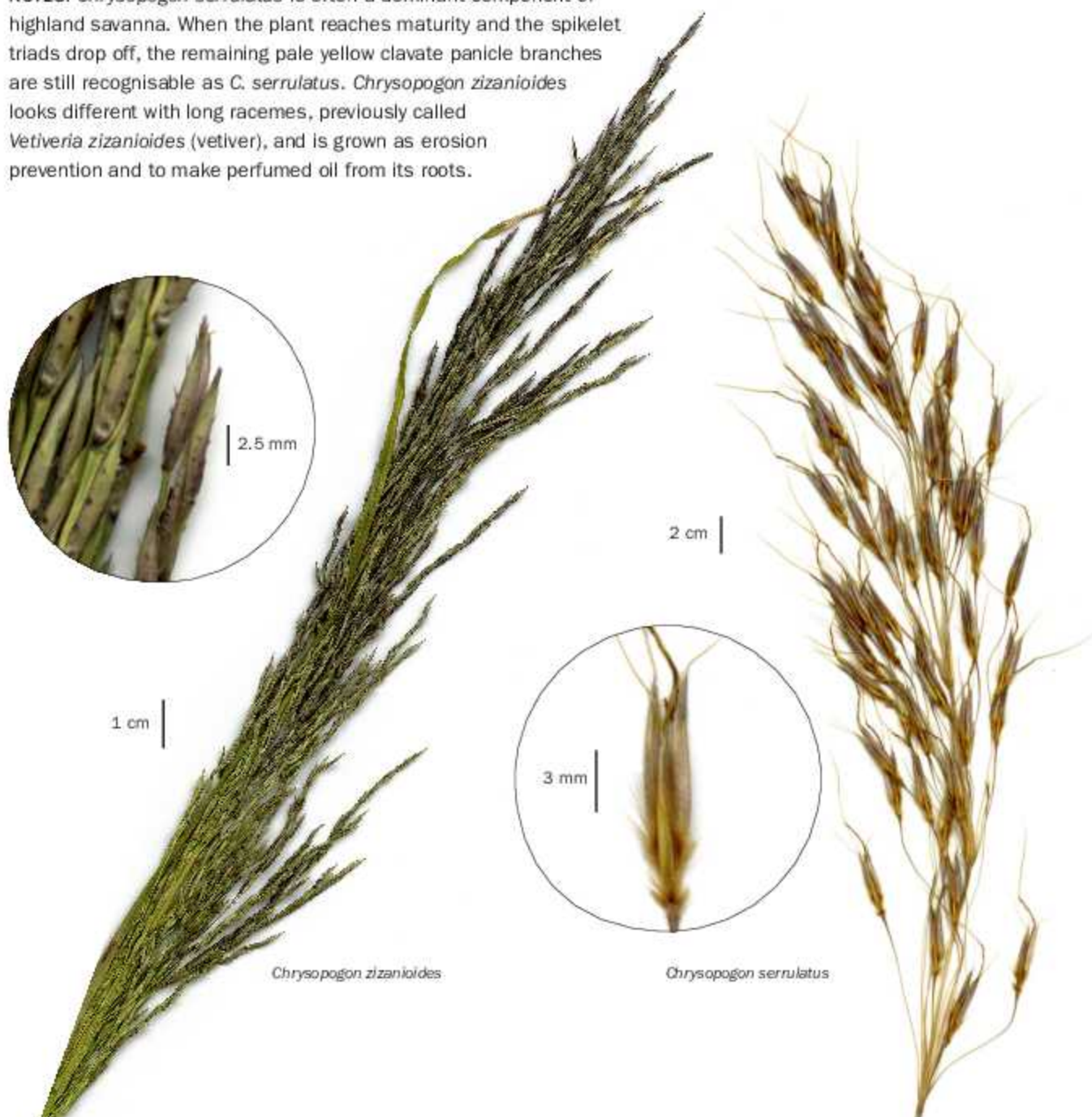
HABITAT. Open grassland, dry exposed locations, or in cultivation; 0–1,500 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. When examined closely, the “triads” of one sessile and two pedicelled spikelets supported by a tuft of hairs, which are seen in *Chrysopogon serrulatus* and *C. humbertianus*, are quite unlike any other genus of Madagascar Poaceae. The overall habit of the plant can be mistaken for the similarly robust common savanna grass *Loudetia* (*Loudetia* has single spikelets rather than triads, and no tufts of hairs in its panicle).

MALAGASY NAMES. *Chrysopogon serrulatus*: Ahitrombilahy, Kifafa, Paipaika. *Chrysopogon zizanioides*: Fehana.

NOTES. *Chrysopogon serrulatus* is often a dominant component of highland savanna. When the plant reaches maturity and the spikelet triads drop off, the remaining pale yellow clavate panicle branches are still recognisable as *C. serrulatus*. *Chrysopogon zizanioides* looks different with long racemes, previously called *Vetiveria zizanioides* (vetiver), and is grown as erosion prevention and to make perfumed oil from its roots.



Coelachne

3 species, none endemic (genus of Old World tropics)

DESCRIPTION. Small annuals 5–25 cm tall, ascending or creeping, lower part of the plant often underwater.

Ligule a line of hairs or absent. Leaf blades short, linear or lanceolate. Inflorescence a panicle, loose or sometimes spike-like. **Spikelets 2–3 mm long, 2-flowered, the lower hermaphrodite and the upper male gaping at maturity.** Glumes shorter than lowest lemma. **Lower lemma membranous to cartilaginous.** Upper lemma $\frac{2}{3}$ to almost as long as the inferior. No awns.

HABITAT. In marshes and shallow standing water; 100–2,000 m elevation.

DISTRIBUTION. Antsiranana, Antananarivo, Toamasina, Fianarantsoa, Toliara.

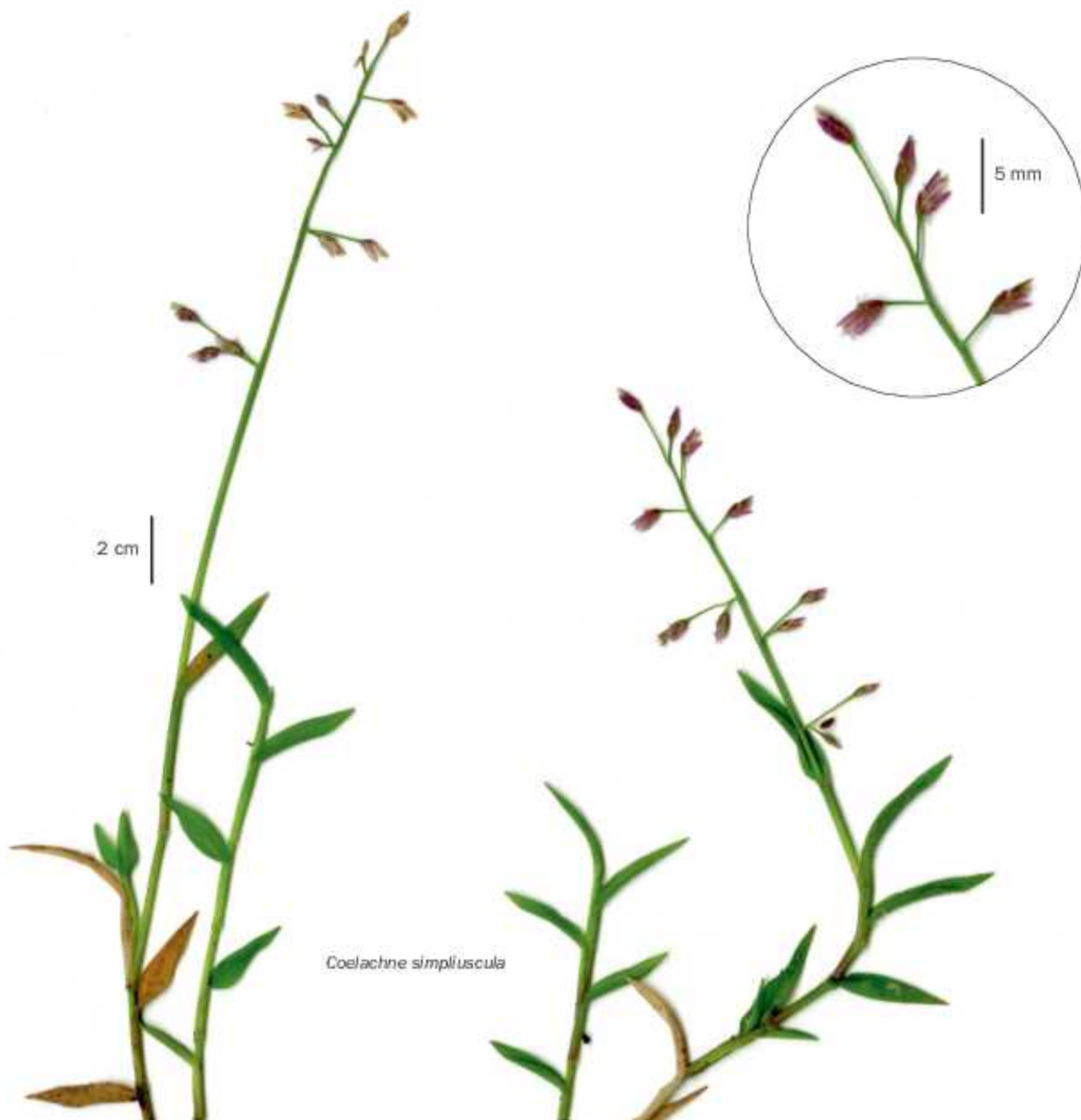
LOOKALIKES. Generally similar to small shade-dwelling *Panicum*, *Brachiaria*, and *Cyrtococcum*, with a fertile hardened upper lemma and soft herbaceous lower lemma. *Coelachne* also has two florets in every spikelet but the arrangement is the opposite: the lower lemma is fertile and hardening with age while the upper lemma contains a male flower and remains herbaceous; the upper lemma gapes open at maturity giving the spikelet an overall appearance different to the panicoid spikelets. Small-flowered *Eragrostis* can also look superficially similar, but *Eragrostis* almost always has more than two florets per spikelet. Habitat preferred by *Coelachne* is wetter than all the other genera.

Poa usually has more than two florets and its ligule is a membrane.

Sporobolus does not usually grow in water and always has one floret per spikelet.

MALAGASY NAME. Ahigisa.

NOTES. Fairly common in shallow standing water, often abundant. The closest relative of this genus is *Isachne*.



Coix

Coix lacryma-jobi (tropical Asian genus)

DESCRIPTION. Robust annuals or perennials with erect or floating culms and **broad flat leaf blades**. Ligule short, membranous. **Inflorescences subtended by a globose or elongated ivory-like white-grey utricle** (a modified leaf-sheath) and comprising 2 racemes. Female raceme enclosed by the cupule, and consisting of 1 sessile spikelet accompanied by 2 barren pedicels. Male raceme exserted from the mouth of the cupule, the spikelets imbricate and borne in pairs or 3s, one pedicelled, the other(s) sessile. Spikelet with 2 florets. Female spikelet: glumes orbicular; lower floret represented by an orbicular membranous lemma; upper floret with membranous lemma and palea, the 2 stigmas exserted from the cupule. Male spikelet lanceolate to elliptic-oblong; lower glume flat on the back; upper glume boat-shaped; florets 2. No awns.

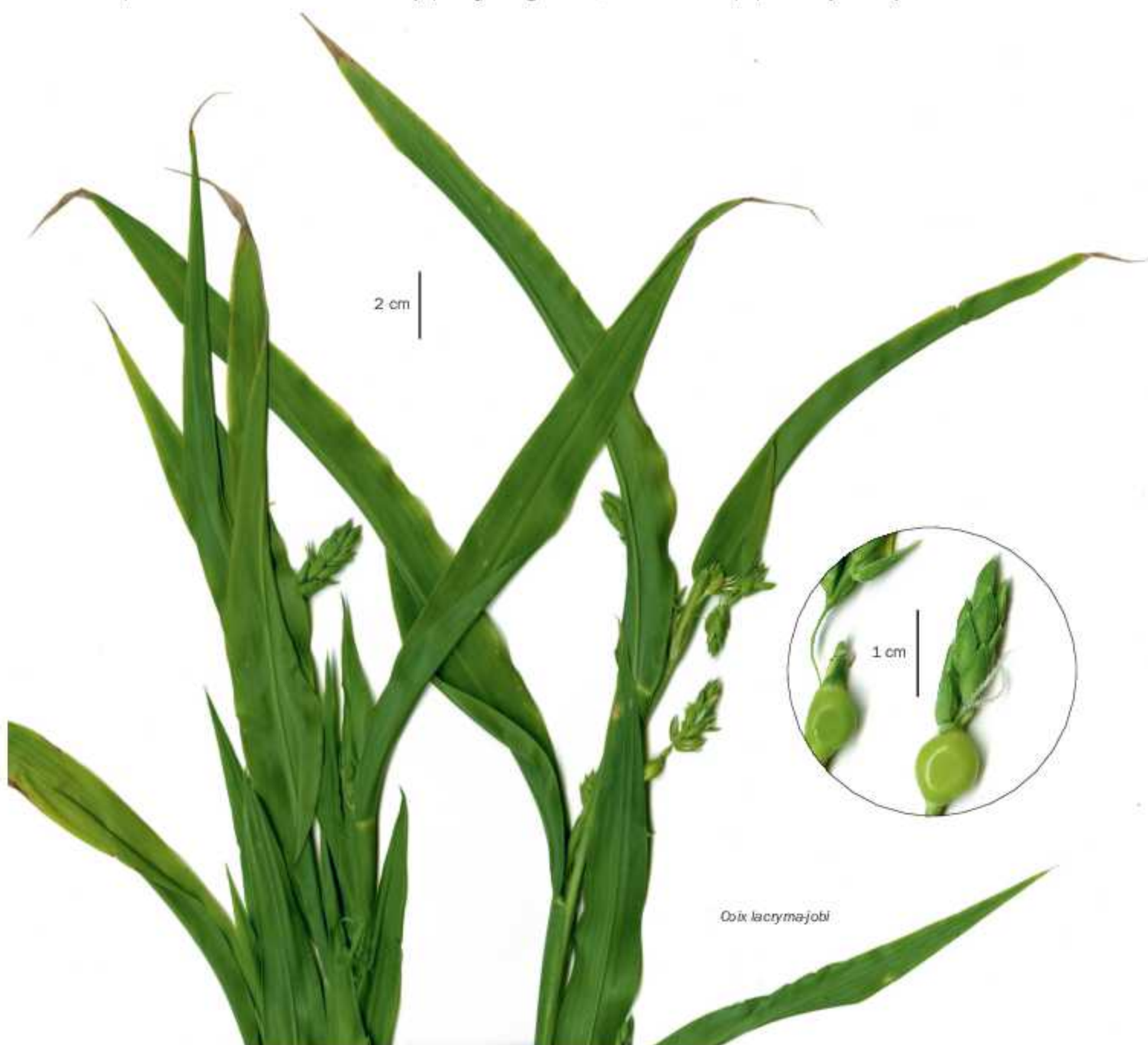
HABITAT. Open mesic weedy environments, marshes; 0–1,500 m elevation.

DISTRIBUTION. All except Antananarivo.

LOOKALIKES. Unique and immediately recognisable by its hard white-grey utricles ("balls") surrounding the female racemes.

MALAGASY NAMES. Pikopiko, Tsimaromana, Tsilaimbery, Vakamanitry, Vakamanivo, Vero.

NOTES. Introduced throughout the tropics. The utricles are a complex compound structure. Their hard surface protects the female flower and caryopsis growing inside; the "balls" are popular as jewellery beads.



Cortaderia

Cortaderia selloana (South American genus)

DESCRIPTION. Large erect tufted decorative perennial 1–3 m tall, all leaves at the base of the plant. Some plants are female and other plants are bisexual. Ligule a line of hairs. Leaf blades thick and stiff, 60–200 cm long, with a clearly visible midrib and sharp edges. **Inflorescence a white hairy open panicle 25–100 cm long.** Spikelets with more than 2 florets. Glumes a little shorter than the adjacent lemmas, 1-nerved. **Lemmas with white hairs 4–8 mm long on the back, and with awns 1–2 cm long arising from a sinus between two lobes.**

HABITAT. Cultivated.

DISTRIBUTION. Antananarivo.

LOOKALIKES. In *Neyraudia* leaves arise all the way up the stems.

Phragmites has no awns, leaves arise all the way up the stems, and plants grow in wet habitats.

NOTES. Cultivated in Antsirabe, not seen naturalised. This species has potential to become invasive. The inflorescences are very hairy because of both lemma hairs and awns that also arise from the lemmas.



Cortaderia selloana

Craspedorhachis

2 species, not endemic (South African genus)

DESCRIPTION. Erect tough densely tufted perennials 20–50 cm tall. Leaf blades flat or rolled. **Inflorescence of several racemes scattered along a central axis**; racemes 4–8 cm long, erect or horizontal, straight, bearing appressed spikelets on a flat rhachis. **Spikelets 1-flowered**, sessile. **Glumes longer than the lemma**. Lemma rounded, with tufts of hair. **No awns**.

HABITAT. Dry exposed areas, cultivated ground, savanna; 800–2,200 m elevation.

DISTRIBUTION. Antananarivo, Fianarantsoa, Toliara.

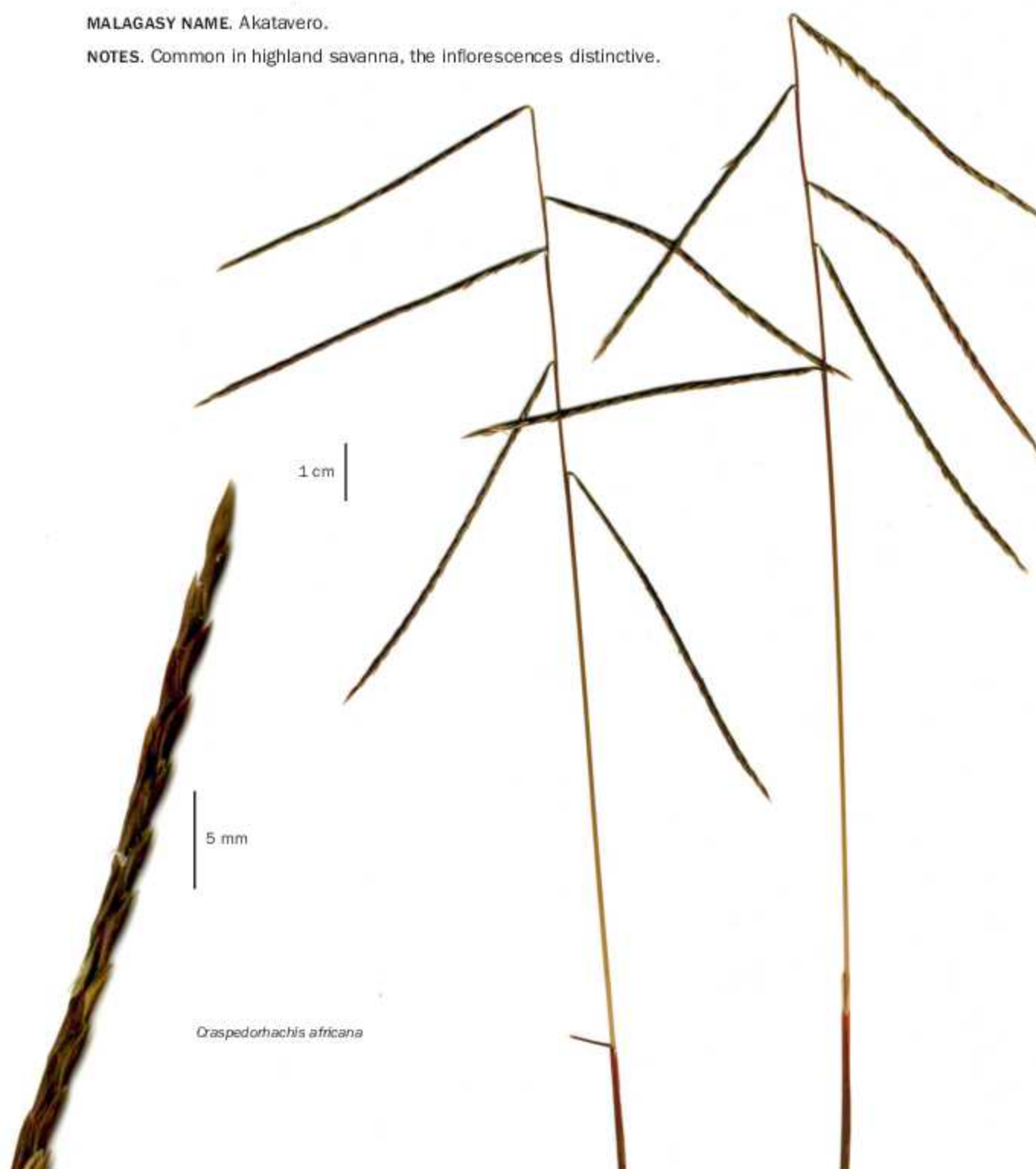
LOOKALIKES. *Dinebra perrieri* has similar horizontal racemes on an axis but is a larger plant with more than one flower in each spikelet.

Diplachne and other species of *Dinebra* have longer racemes that are often curved.

Acrachne has broader racemes with the tips of lemmas curved noticeably outwards, and some racemes clustered towards the top of the culm.

MALAGASY NAME. Akatavero.

NOTES. Common in highland savanna, the inflorescences distinctive.



Crypsis

Crypsis schoenoides (Old World genus)

DESCRIPTION. Low-growing tufted annuals 10–30 cm tall; culms prostrate or geniculately ascending. Ligule a line of hairs. Leaf blades linear to lanceolate, 1–5 mm wide. **Inflorescence a dense hemispherical to cylindrical head 1–4 cm long, embraced below by 1–2 inflated leaf-sheaths bearing a reduced blade.** Spikelets with 1 flower, laterally compressed. Glumes shorter than the lemma. No awns.

HABITAT. A range of habitats from dry to humid, borders of rice fields, sometimes on saline soils; 0–500 m elevation.

DISTRIBUTION. Mahajanga, Toliara.

LOOKALIKES. Looks more like a sedge (Cyperaceae) than a grass (Poaceae) due to the leaves directly subtending the dense panicle. No other Madagascar grass genus has this appearance.

MALAGASY NAME. Isimbalalia.

NOTES. Forming dense balls in arid locations and sprawling plants in humid locations, this species has strong morphological plasticity.



Crypsis schoenoides

Ctenium

2 species (pantropical genus)

DESCRIPTION. Firmly rooted erect tufted perennials 0.4–1 m tall. Ligule a membrane. Leaf blades linear or involute. **Inflorescence a solitary terminal raceme. Raceme 15–20 cm long, 1-sided, straight becoming curled.** Spikelets sessile, with 3–5 flowers, only the 3rd flower fertile. Glumes longer than the lemmas. Upper glume enclosing the florets, **with a dorsal awn 1.8–4.5 mm long.** Lemmas membranous, awned, hairy. **Awns straight, 2–5 mm long.**

HABITAT. Open mature grassland and savanna; 900–2,000 m elevation.

DISTRIBUTION. Antananarivo, Fianarantsoa.

LOOKALIKES. Mature plants easy to recognise by their curved or twisted apical raceme (the Mascarene *Dactyloctenium pilosum* has similarly twisted racemes but is not recorded in Madagascar); the immature raceme is straight and held erect and is less distinctive.

Enteropogon is also an arid area and savanna genus with single terminal awned 1-sided racemes, but its racemes never curl and the awns are over 10 mm long.

Schoenefeldia has fine curved awns over 2 cm long.

Heteropogon and *Trachypogon* have geniculate awns.

NOTES. Awns on the lemmas are the longer ones; they protrude perpendicular to the raceme rhachis and are shed at maturity together with florets. Awns on the upper glumes are shorter and held parallel to the raceme rhachis forming a line along the side of the rhachis and these persist on the rhachis after the florets have fallen.



Cymbopogon

7 species, none endemic (genus of Old World tropics)

DESCRIPTION. Tall robust perennials, rarely annuals. Ligule membranous or scarious. Leaf blades filiform to broadly linear, aromatic, with filiform tip.

Racemes short, in pairs, enclosed by the spatheoles, arranged in a dense and sometimes interrupted spatheate false panicle; peduncles 0.5–2.5 mm long, flattened, **reflexed at maturity**; internodes and pedicels filiform, long-ciliate on both margins. Spikelet with 2 florets. Sessile spikelet dorsally compressed, narrowly lanceolate to narrowly ovate; callus obtuse. Lower glume with a median groove, occasionally flat on the back, awnless; upper floret fertile, **the lemma deeply bilobed or entire**, awned. Pedicelled spikelet male, $\pm$ the same length as the sessile spikelet, rounded on the back, awnless.

HABITAT. Mature grassland and savanna; 0–2,200 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. *Cymbopogon* is difficult to identify and is frequently mistaken for the more common *Hyparrhenia* because of their similar paired reflexed racemes and erect stems growing in open grassland and savanna. The easiest practical diagnostic character for *Cymbopogon* is the aromatic smell produced when a young leaf is crushed. Sessile spikelets of *Cymbopogon* have an obtuse callus inserted into a cup (*Hyparrhenia* sessile spikelets have an acute callus applied to the raceme obliquely). The green parts of *Cymbopogon* are more glaucous (white-green) than those of *Hyparrhenia*.

Andropogon racemes are fully exerted from the spatheoles, while *Cymbopogon* racemes are around the same length as the spatheoles. Reflexed racemes are a useful but not always reliable character: *Andropogon* racemes are never reflexed, whereas *Cymbopogon* racemes are usually reflexed.

MALAGASY NAMES. Ahibero, Fatakamanitra, Fiahana, Fehana, Fiehana, Maroforoaha, Verofehana, Veromafaka, Verombato, Veromanitra.

NOTES. *Cymbopogon citratus* is lemongrass, used medicinally and to flavour food.



5 mm

Cymbopogon caesus



1 cm

Cynodon

5 species, 1 endemic (genus of Old World tropics)

DESCRIPTION. Low-growing rhizomatous or stoloniferous perennials, with creeping stems but erect flowering culms, often forming dense mats, 10–60 cm tall. Ligule a ciliate membrane. Leaf blades linear to filiform. **Inflorescence of 2–11 digitate racemes.** Racemes 1.5–10 cm long, fine, 1-sided. **Spikelets sessile, 1-flowered,** strongly laterally compressed. Glumes shorter than the floret. Lemma acute. **No awns.**

HABITAT. Open grazed and weedy places; 0–2,000 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. *Chloris* has similar digitally arranged horizontal rhizomes and weedy habitat, but *Chloris* has awns visible without magnification (*Cynodon* has no awns). *Eleusine* is also a secondary vegetation weed with digitate racemes, but its racemes are wider and every spikelet has many fertile florets (narrow racemes and one fertile floret per spikelet in *Cynodon*).

MALAGASY NAMES. Arampandrotra, Arapandrotra, Fandrahana, Fandropalana, Fandrotrarana, Fandrotsana, Firifiry, Kidesy, Kindresy, Kindrese, Rampandrotsa, Rampandrotra, Vahitsitafitahady, Vandrahana, Volonaondry.

NOTES. Almost every patch of grass near human habitation in Madagascar contains the famous weed and lawn grass species *Cynodon dactylon*, “Bermuda grass”, which spreads by both underground rhizomes and surface stolons. The presence of underground rhizomes is a useful identification character for this species. It is planted for animal feed, rhizomes are used to make brushes, and medicinal uses have also been documented.



Cynodon dactylon



Cyphochlaena

2 species (genus endemic to Madagascar, Comoros, and Mayotte)

DESCRIPTION. **Small prostrate annual.** Ligule a ciliate membrane. **Leaf blades very thin, ovate to oblong, asymmetric at base. Inflorescence composed of erect unilateral racemes borne along a central axis.** Spikelets in pairs of one sessile sterile spikelet and one pedicelled bisexual spikelet, with 2 florets each. **Pedicelled bisexual spikelets obovate and appearing inflated**, laterally compressed, with a basal male or sterile floret and an upper female or bisexual floret. Glumes reaching apex of florets, firmer than fertile lemma. Lower glume linear or ovate, membranous, awned; **upper glume lanceolate to oblong, indurate.** Lower lemma wide and inflated, indurate, acute. Upper fertile lemma ovate, laterally compressed, inflated or not, hyaline. Sessile male spikelets represented by a single-awned glume.

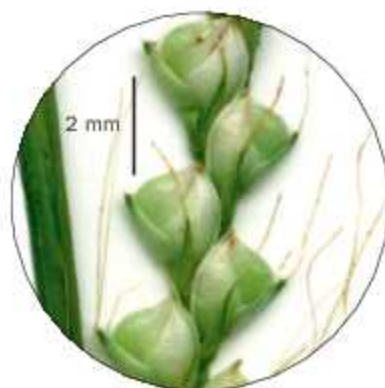
HABITAT. Dry forest understory; 0–500 m elevation.

DISTRIBUTION. Antsiranana, Mahajanga, Toliara.

LOOKALIKES. The overall appearance of the plant is strongly reminiscent of the related forest understory genus *Oplismenus* with similar short-awned racemes borne along an axis. The racemes on an axis with regular rows of spikelets are also similar to small species of *Echinochloa*, *Brachiaria*, and *Acroceras*. *Cyphochlaena* can be distinguished from all of these by its inflated obovate apically truncate spikelets and by its hardened upper glume (*Oplismenus*, *Echinochloa*, *Brachiaria*, and *Acroceras* spikelets are narrow, ovate or elliptic, apically rounded to apiculate; upper glume is always herbaceous). The strongly asymmetric spikelet is reminiscent of *Cyrtococcum* and some *Panicum*, but *Cyrtococcum* and *Panicum* have a panicle (not racemes) and a herbaceous upper glume (not a hardened upper glume).

MALAGASY NAMES. Ambody, Agnanopody, Ahifotsy, Intsihombilona, Manimbafoana.

NOTES. Previously placed in *Boivinella*.



Cyphochlaena madagascariensis

Cyrtococcum

8 species, 5 of these endemic (genus of Old World tropics)

DESCRIPTION. Annuals or perennials with **decumbent or creeping culms**. Ligule membranous. Leaf blades linear to narrowly ovate. **Inflorescence an open or somewhat contracted panicle. Spikelets obliquely obovate in profile, strongly laterally compressed**, with 2 florets. Glumes thinly membranous, $\frac{1}{2}$ – $\frac{4}{5}$ as long as the spikelet, obtuse. Lower floret barren, its lemma as long as the spikelet, obtuse or rarely mucronate; upper lemma as long as the spikelet, subcoriaceous to crustaceous, gibbous, crested near the tip; palea tip reflexed. No awns.

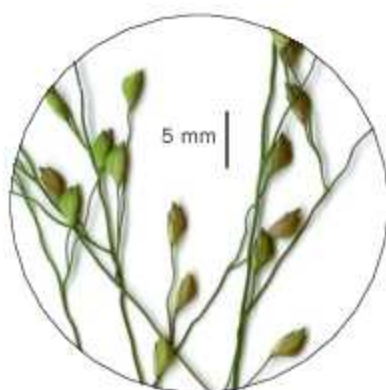
HABITAT. Damp forest understory; 0–1,600 m elevation.

DISTRIBUTION. All provinces.

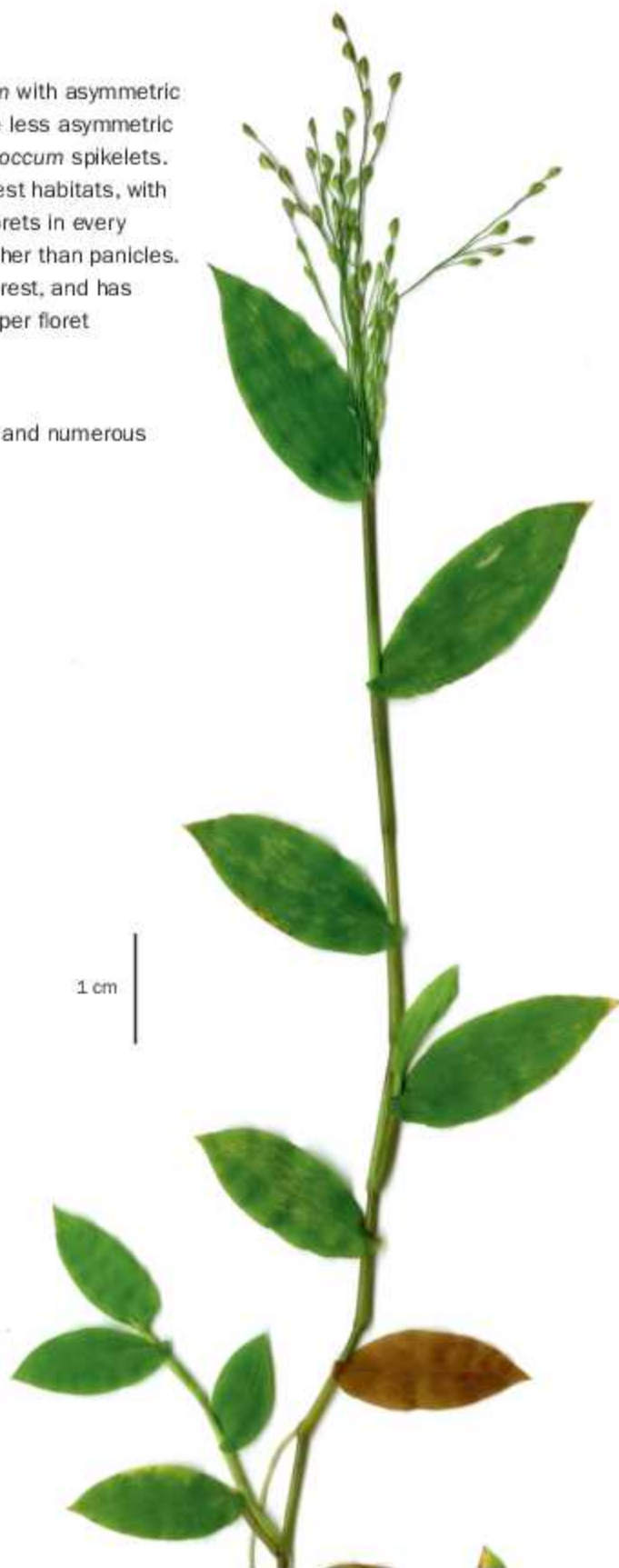
LOOKALIKES. Some species of forest understory *Panicum* with asymmetric spikelets can be very similar but the *Panicum* florets are less asymmetric and never have the strong lateral compression of *Cyrtococcum* spikelets. *Isachne* can look strikingly similar to *Cyrtococcum* in forest habitats, with similarly fine diffuse panicles; *Isachne* has two fertile florets in every spikelet. *Brachiaria* and *Cyphochlaena* have racemes rather than panicles. *Coelachne* grows in open aquatic habitats rather than forest, and has more symmetric spikelets with the upper floret male (upper floret female in *Cyrtococcum*).

MALAGASY NAMES. Velatrahitra, Velatrahitrahy.

NOTES. Attractive and poorly known plants with panicles and numerous fine pedicels.



Cyrtococcum deltoideum



Dactyloctenium

7 species, one of these endemic (global tropical and warm temperate genus)

DESCRIPTION. Tufted or stoloniferous erect annuals or perennials 10–70 cm tall. Ligule membranous, often cillolate. Leaf blades linear, flat or folded. **Inflorescence of 2–9 digitate racemes. Racemes 6.5–14 mm wide, straight, held horizontally, terminating in a naked pointed extension of the rachis. Spikelets sessile, with 3–5 flowers,** laterally compressed. Glumes shorter than the lemmas, upper glume with a stout awn 0.8–2 mm long. Lemmas acute to shortly awned.

HABITAT. Open arid habitats, frequently near the coast; 0–1,000 m elevation.

DISTRIBUTION. Antsiranana, Mahajanga, Toamasina, Fianarantsoa, Toliara.

LOOKALIKES. Other arid habitat genera with digitate racemes: *Eleusine*, *Chloris*, *Cynodon*; of these, *Dactyloctenium* has the widest racemes and it is the only one to have racemes terminating in a naked rhachis point. *Eleusine* differs by having no awns on the glumes; *Chloris* has longer and finer awns than *Dactyloctenium*; *Cynodon* has only one floret per spikelet rather than several.

In *Acrachne*, most racemes are digitate at the apex of the culms but there is usually one extra raceme below these; the tips of lemmas in *Acrachne* clearly curve outwards while the tips of lemmas in *Dactyloctenium* are perpendicular to the rachis.

Awns on every upper glume create a line down the side of each raceme similar to that of *Ctenium*, but *Ctenium* is a taller plant with a single terminal raceme.

MALAGASY NAMES. Ahitrombilahy, Betombo, Betrihaka, Tamatama or Tamatamaka, Tambrota, Tranondahitra, Tsibora, Tsimpimpina, Voatondro, Vondoha.

NOTES. This genus is usually easy to recognise by its odd-shaped star arrangement of fat racemes with sharp raceme ends and sharp lemma tips.



Dactyloctenium aegyptium



Daknopholis

Daknopholis boivinii, monotypic genus of East Africa and Madagascar

DESCRIPTION. **Mat-forming prostrate stoloniferous** annual or perennial, with flowering culms ascending to 10–30 cm high. Ligule a line of hairs. **Leaf blades often purple, 1–3.5 cm long, broadly obtuse to rounded at the apex.** Inflorescence of (1–)2–5 digitate 1-sided racemes 2.5–6 cm long. **Spikelets with 1 floret** and a minute rhachilla extension, laterally compressed, imbricate in 2 rows. Glumes 1-nerved, shorter than the floret. Lemma glabrous with a pubescent callus. **Awn arising from the apex of the lemma,** thin, 2–12 mm long (or sometimes the awn is absent).

HABITAT. Common at low elevations on sand, near the coast.

DISTRIBUTION. Antsiranana, Mahajanga, Toliara.

LOOKALIKES. Similar to *Chloris pycnothrix* but *Chloris* has more than one floret in every spikelet, so *Chloris* racemes are wider.

Neostapfiella looks similar vegetatively and grows in similar places, but it also has more than one floret per spikelet and its racemes are wider.

Cynodon has similar inflorescences but no awns.

NOTES. Easy to recognise by its rounded leaf tips, thin racemes, and awns. Previously placed in the genus *Chloris*.



2 cm

Daknopholis boivinii



Decaryella

Decaryella madagascariensis, endemic monotypic genus

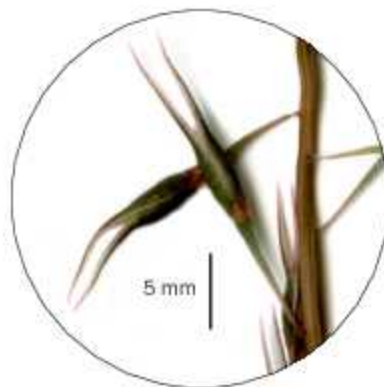
DESCRIPTION. Decumbent ascending annual 10–30 cm. Ligule a ciliate membrane. Leaf blades linear and stiff. Inflorescence a single raceme with solitary spikelets on long pedicels. **Pedicels widening towards the top and spikelets falling together with pedicels.** Spikelets with 1–2 fertile florets, ovate, laterally compressed, 6–8.5 mm long. **Glumes equal, exceeding apex of florets, firmer than fertile lemma, coriaceous, 5-nerved, dark grey, hairy, awned at the apex.** Lemma ovate; membranous; 1–3-nerved.

HABITAT. Spiny forest understory and degraded open areas; 100–900 m elevation.

DISTRIBUTION. Toliara.

LOOKALIKES. Unique in Poaceae.

NOTES. Does not look like a typical grass. Rare. The two dark grey glumes covering the spikelet each have a noticeable apical awn, so every spikelet has two “tails” at the tip.



Decaryella madagascariensis

Decaryochloa

Decaryochloa diadelpha (monotypic, endemic genus)

DESCRIPTION. Open clumping bamboo with pachymorph rhizomes and long necks. Culms about 10 (or more) m long, lower parts erect, straight or geniculate, upper parts scrambling; internodes with relatively thin to relatively thick walls, 30–80 cm long, 2–2.5 cm in diameter, covered with black hairs when young, becoming glabrous and smooth; sheath scar dipping markedly below the bud. Branch buds borne at the point where the sheath scar curves downwards. **Branches extravaginal, many at each node, with primary branches dominant and elongating, scrambling over or leaning upon nearby trees. Young shoots covered with black hairs.** Culm sheaths comprising two parts: upper (or sheath proper) with many nerves, covered with light to dark brown hairs, margins hairy, the lower (the base) without nerves, also covered with dark brown hairs, concealing branch buds; blades tapering to long tips, densely hairy near the base. **Auricles large, reflexed, with curly bristles 16 mm long along the edges. Ligule with bristles about 1 cm long.** Leaf blades ovate-lanceolate, 5–7 cm long, 7–10 mm wide, hairy adaxially; sheaths hairy; **auricles prominent with curly bristles 15 mm long; ligule 1 mm long with long bristles.** Inflorescences 5–7 cm long terminating leafy branches, determinate, racemose, bearing 1–4 sessile spikelets, bracts and prophylls present. Spikelet terete, densely hairy, consisting of 3–4 glumes, one fertile floret and a vestigial rachilla extension, florets up to 5 cm long; glumes hairy on the back, with long pointed tips; lemma coriaceous, rigid, hairy on the back; palea coriaceous, rigid, groove densely hairy, with long bilobed tip. Caryopsis obconical when young, oblong at maturity with hairy flat top, 7–14 mm long.

HABITAT. Montane forest, from Andasibe to Ranomafana and Vondrozo (south-west of Farafangana); 800–1,200 m elevation.

DISTRIBUTION. Fianarantsoa, Toamasina.

LOOKALIKES. *Decaryochloa diadelpha* is often found growing together with other climbing bamboos with large leaf blades: *Sokinochloa viguieri* or *Sokinochloa chapelieri* especially in Andasibe. *Decaryochloa diadelpha* can be differentiated by its large auricles with long bristles on the culm sheaths and leaf blades, and hairy young shoots and culm sheaths.

MALAGASY NAME. Tsimbolo(?).

NOTES. *Decaryochloa diadelpha* has gregarious flowering behaviour and the plants die after mass flowering; it flowers every 40–50 years. In Andasibe, seedlings of various ages can be found on the forest floor where this bamboo has flowered and died. Seedlings can be recognized by hairs covering all parts of the seedling and by the presence of prominent auricles with long bristles on leaf blades and culm sheaths. This bamboo has the longest floret in Poaceae.



Dendrocalamus

2 introduced species *Dendrocalamus asper* and *Dendrocalamus giganteus* (genus of tropical and subtropical Asia)

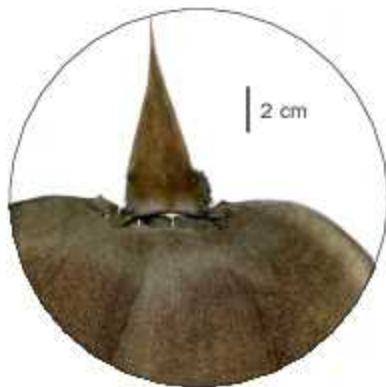
DESCRIPTION. Clumping bamboo with pachymorph rhizomes. **Culm erect, straight**, with pendulous tips, **6–30 m tall**, 2.5–30 cm in diameter, with relatively thick walls, often covered with white wax or with brown velvety hairs when young, **lower nodes often developing aerial roots. Branches several at each node with middle branch dominant.** Young shoots often purplish green. Culm sheaths pale green or dark purplish green, covered with dark brown hairs or with white wax, blades broadly ovate or broadly lanceolate, erect then spreading or deflexed, auricles prominent, with or without bristles, ligules 4–7 mm long. Leaf blades 5–35 cm long, 2–9 cm wide, glabrous to short hairy. Not known to flower in Madagascar.

HABITAT. Planted near human habitation; 0–1,500 m elevation.

DISTRIBUTION. Antananarivo, Antsiranana, Fianarantsoa, Toamasina.

LOOKALIKES. *Dendrocalamus* is related to *Gigantochloa* and *Bambusa* and it is not easy to differentiate them without flowers. In *Dendrocalamus*, aerial roots can usually be found on the lower nodes of the culm.

NOTES. *Dendrocalamus giganteus* is the largest bamboo found in Madagascar, originally from Burma, introduced everywhere in the world. The culms are up to 30 m tall with a diameter of 18–30 cm, the walls are up to 2–5 cm thick, and the culms are used for many purposes (construction, scaffolding, water pipes, furniture); young shoots are edible. *Dendrocalamus asper* is not so common and is planted on the eastern coast, around Tamatave. Young shoots are also edible and are better quality food than *D. giganteus*. The culms are up to 20 m tall with a diameter of 5–10 cm. Propagation is usually by branch cutting.



2 cm



Dendrocalamus giganteus

Dichanthium

2 species (Old World tropical genus)

DESCRIPTION. Fairly small erect annuals or perennials. Ligule membranous. Leaf blades flat or rolled, sometimes aromatic. **Inflorescence of digitate or subdigitate racemes**, these rarely branched below; **spikelets conspicuously imbricate; rachis internodes and pedicels solid**. Spikelet with 2 florets. Sessile spikelet callus obtuse; lower glume chartaceous to cartilaginous, broadly convex to slightly concave, sometimes pitted, acute to broadly obtuse at the apex; **upper lemma forming the hyaline base to its awn, entire**; awn glabrous. Pedicelled spikelet similar to the sessile spikelet, male or neuter, awnless.

HABITAT. Open arid habitats and roadsides; 0–1,600 m elevation.

DISTRIBUTION. Antsiranana, Mahajanga, Fianarantsoa.

LOOKALIKES. *Dichanthium* is related to both *Bothriochloa* and *Euclasta*, but these have linear depressions in their pedicels and rachis.

Other Andropogoneae genera with erect racemes and awns: *Andropogon* (larger plants, awn from a sinus of a 2-toothed lemma), *Ischaemum* (racemes much wider, awn from a sinus of a 2-toothed lemma).

MALAGASY NAMES. Ahipasira, Angofo, Famaky, Sarivary, Taimboriky.

NOTES. *Dichanthium annulatum* and *Dichanthium aristatum* can be recognised by the unusual rounded, almost truncate apices of their lower glumes; *Dichanthium annulatum* has a noticeable ring of white hairs around its nodes.



Dichanthium annulatum



Diectomis

Diectomis fastigiata (monotypic pantropical genus)

DESCRIPTION. Erect annual 0.3–2 m tall. Ligule membranous, 3.5–7 mm long. **Inflorescence of single terminal exerted or partly exerted racemes. Racemes 3–5 cm long, with prominent white hair tufts when dry.** Sessile spikelet tightly wedged between the pedicel and internode. Internode and pedicels clavate, ciliate. Spikelet with 2 florets. Sessile spikelet bisexual, 4.5–5.5 mm long. Lower glume linear, deeply depressed between the dorsal keels. Upper glume with an awn 10–20 mm long. Upper lemma bilobed for a quarter of its length, with a **geniculate awn 30–38 mm long. Pedicelled spikelet staminate, 5–9 mm long, around twice the size of the sessile spikelet, the lower glume foliaceous, orange** with an awn 2–6 mm long.

HABITAT. Savanna on basalt; low elevation.

DISTRIBUTION. Mahajanga.

LOOKALIKES. *Heteropogon* has a lower glume of the pedicelled spikelet which is green or brown, with no awn.

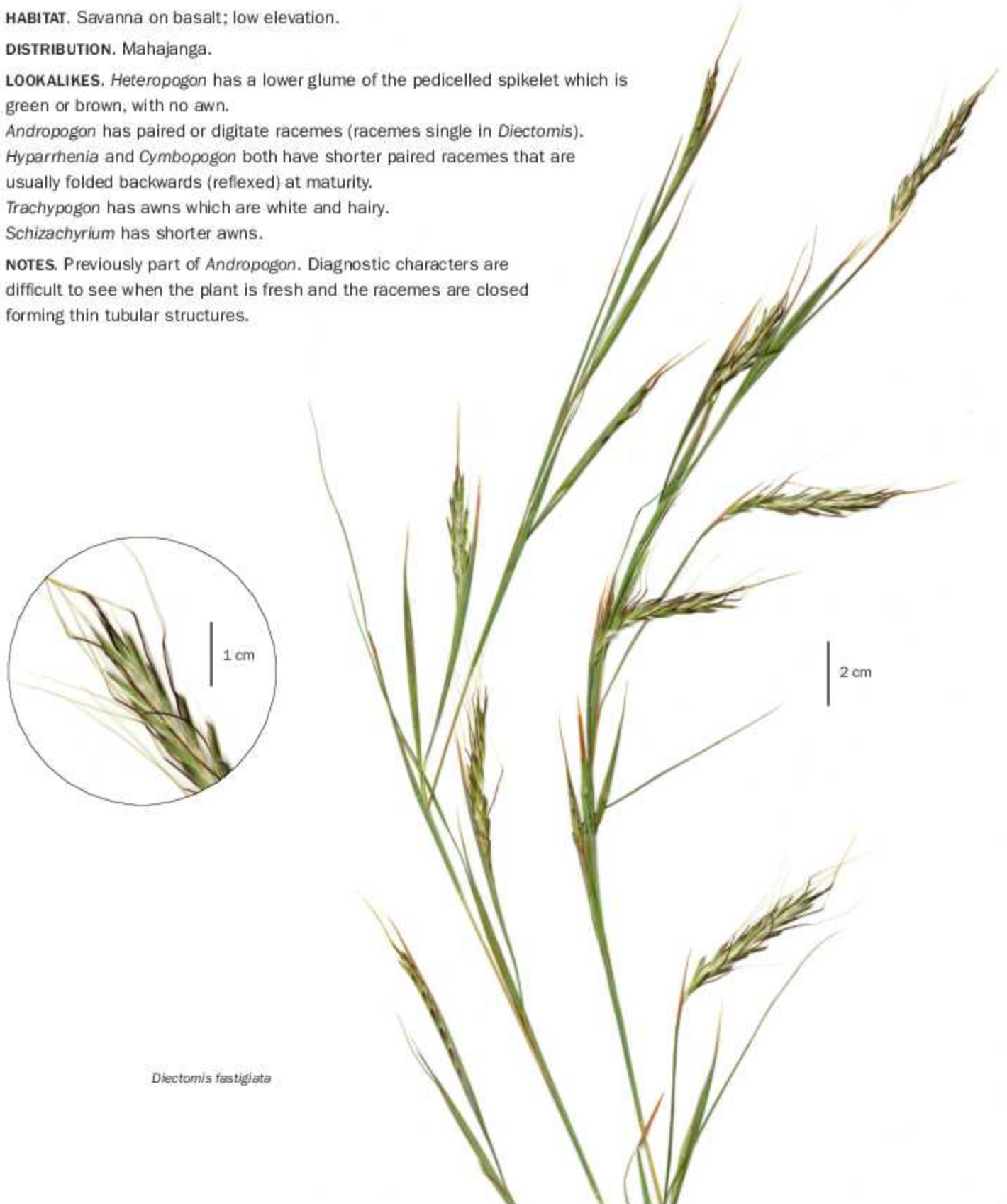
Andropogon has paired or digitate racemes (racemes single in *Diectomis*).

Hyparrhenia and *Cymbopogon* both have shorter paired racemes that are usually folded backwards (reflexed) at maturity.

Trachypogon has awns which are white and hairy.

Schizachyrium has shorter awns.

NOTES. Previously part of *Andropogon*. Diagnostic characters are difficult to see when the plant is fresh and the racemes are closed forming thin tubular structures.



Diectomis fastigiata

Digitaria

30 species, including 8 endemics (genus of tropical and warm temperate regions)

DESCRIPTION. Creeping, ascending or erect herbaceous annuals or perennials 0.05–1 m tall. Ligule short, scarious or membranous. Leaf blades mostly linear and flat. **Inflorescence of several racemes, digitate or subdigitate.** Rhachis sharply 3-angled. Spikelets pedicelled, in groups of 2–3(5), 2-flowered, inferior floret barren, superior floret bisexual, slightly dorsiventrally compressed, **typically hairy between the nerves of the superior glume and inferior lemma.** Glumes shorter or longer than the lemma. Inferior lemma usually as long as the spikelet. **Superior lemma hard, acute to acuminate,** longitudinal ornamentation more or less pronounced, pale to dark brown in fruit. No awns.

HABITAT. Common herbs of damp weedy habitats; 0–2,500 m elevation.

DISTRIBUTION. All provinces.

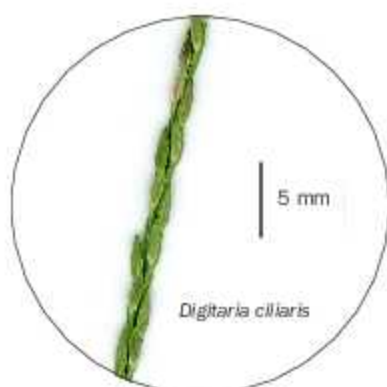
LOOKALIKES. The common lawn grass *Axonopus* has similar thin pale green digitate racemes with panicoid spikelets, but differs by its wide leaves with rounded apices (narrow leaves with acute apices in *Digitaria*); it is also possible to distinguish *Axonopus* from *Digitaria* by examining the margins of the upper lemma under the microscope (inrolled in *Axonopus*, flat in *Digitaria*).

Racemes are horizontal at maturity in *Cynodon* but held erect in *Digitaria*; *Cynodon* spikelets have one floret while *Digitaria* has panicoid spikelets with 2 florets.

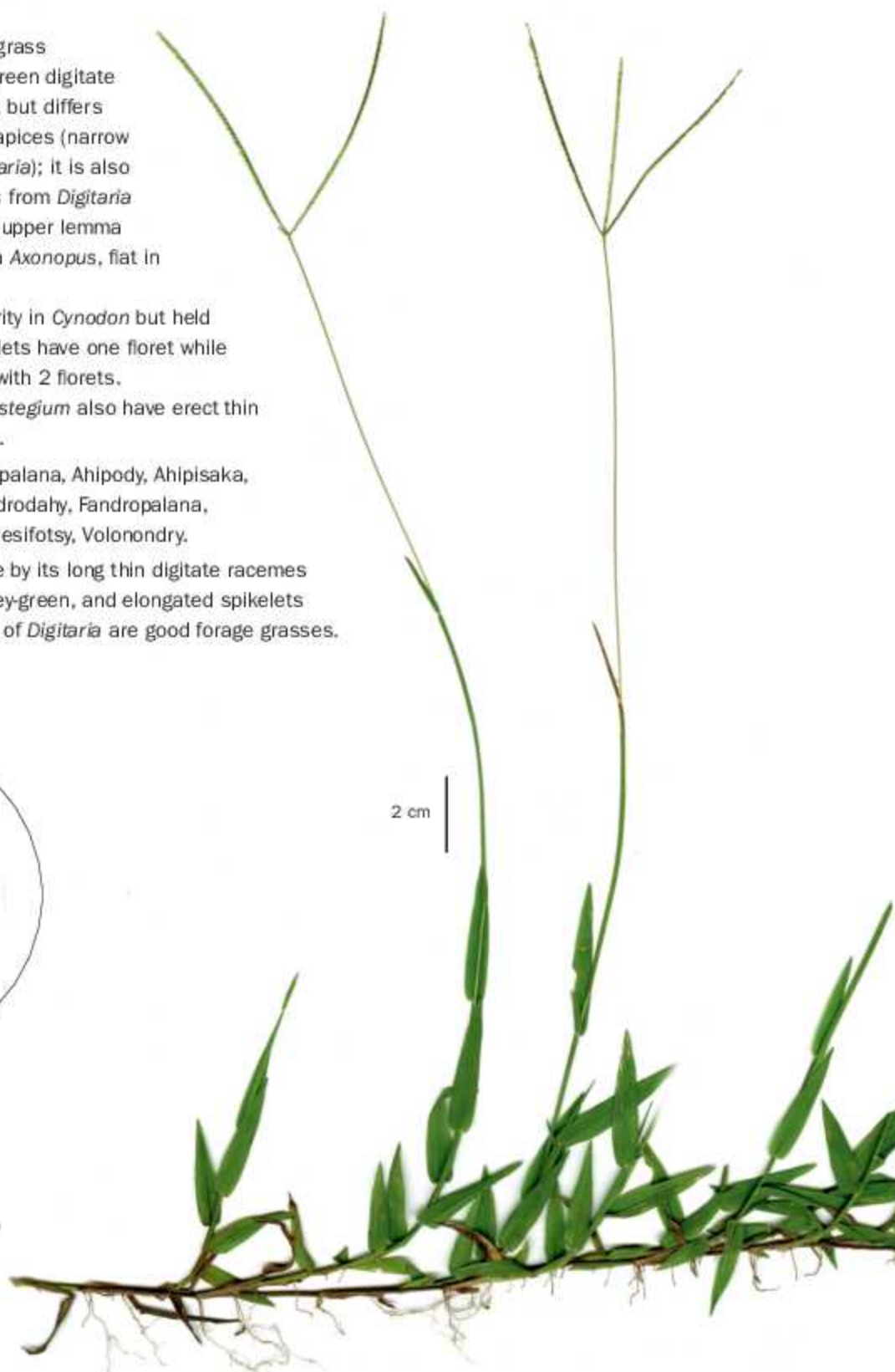
Dimeria, *Neostapfiella*, and *Microstegium* also have erect thin digitate racemes, but have awns.

MALAGASY NAMES. Ahimena, Ahipalana, Ahipody, Ahipisaka, Ahipody, Ahidahy, Ahipalana, Fandroahy, Fandropalana, Langariatra, Kindresimena, Kindresifotsy, Volonondry.

NOTES. Usually easy to recognise by its long thin digitate racemes that are usually pale green or grey-green, and elongated spikelets with acute points. Many species of *Digitaria* are good forage grasses.



Digitaria longiflora



Dimeria

3 endemic species (genus of Old World tropics)

DESCRIPTION. Small erect slender annuals or perennials. Ligule a membrane, sometimes cilliolate. Leaf blades linear or lanceolate, stiff. **Inflorescence composed of 2–3 erect digitate unilateral racemes subtended by a leaf sheath. Spikelets on short pedicels, single and never paired**, elliptic or oblong, laterally compressed, with two florets in each spikelet. Glumes exceeding apex of florets; lower glume elliptic or oblong, coriaceous; upper glume elliptic, coriaceous. Lower floret barren. Upper fertile floret lemma hyaline, apically bilobed, awned. **Principal lemma awn from a sinus, geniculate.**

HABITAT. Open rocky habitats and forest margins; 0–1,500 m elevation.

DISTRIBUTION. Antsiranana, Mahajanga, Toamasina, Fianarantsoa, Toliara.

LOOKALIKES. Deceptively similar to small *Digitaria*, but with filiform awns (*Digitaria* never has awns). *Bothriochloa* and *Dichanthium* are also small erect plants of open areas with erect awned racemes; they have pedicelled spikelets that are distinct from sessile spikelets (all spikelets in *Dimeria* are the same). *Neostapfiella* has obtuse or rounded leaf apices (pointed in *Dimeria*).

NOTES. Spikelets fall off early leaving a zigzag rachis which can help with identification.



Dimeria manongarivensis



Dinebra

5 species, including one endemic (tropical genus)

DESCRIPTION. Erect or ascending **annuals** 0.3–1 m tall. Ligule a membrane, sometimes with cilia. Leaf blades linear, 1–8 mm wide. **Inflorescence of 4–25 racemes on an elongated central axis.** Racemes slender, straight or curved, erect or horizontal, 2–25 cm long. Rhachis narrow, but broad in *Dinebra perrieri*. **Spikelets sessile**, with 2–6 flowers, laterally compressed. **Glumes usually longer than the lower lemma.** Lemmas obtuse or acute. **No awns.**

HABITAT. Grassland, savanna, and dry forest; 0–800 m elevation.

DISTRIBUTION. Antsiranana, Mahajanga, Fianarantsoa, Toliara.

LOOKALIKES. Difficult to distinguish from other arid area Chloridoideae grasses with awnless racemes arranged in a panicle.

Diplachne is a perennial growing by the water and has straight erect racemes and very small awns.

Craspedorhachis and *Sporobolus* have only one floret per spikelet.

Leptocarydion has a visibly hairy panicle.

Eragrostis has open panicles with pedicelled spikelets.

Tripsacum is a smaller plant with only one terminal raceme.

NOTES. A species list is given here because of recent classification changes: *Dinebra coerulescens*, *D. panicea*, *D. perrieri*, *D. retroflexa*, *D. squarrosa*. *Dinebra perrieri* looks similar to *Craspedorhachis* and was previously classified in that genus; the other species were previously placed in *Leptochloa*.



Dinebra panicea



Diplachne

Diplachne fusca (tropical genus)

DESCRIPTION. Densely tufted erect rhizomatous perennial 0.6–1.5 m tall. Ligule a membrane. Leaf blades linear or rolled. **Inflorescence 15–35 cm long, of 10–30 straight racemes along a common axis.** Racemes slender, mostly straight. Spikelets sessile or on short pedicels, with 6–11 flowers, narrow. Glumes shorter than the lowest lemma. Lemmas rounded, hairy on the lower part of the nerves. **Awn difficult to see, 0.3–1.5 mm long.**

HABITAT. Wet places, stream margins and alluvial planes; 0–1, 500 m elevation.

DISTRIBUTION. Mahajanga, Toliara.

LOOKALIKES. Arid area Chloridoideae grasses with awnless racemes arranged in a panicle are difficult to distinguish.

Dinebra is an annual growing away from water, with no awns.

Craspedorhachis is a plateau genus of higher elevations; it has only one floret in every spikelet.

Sporobolus has similar racemes but only one floret per spikelet.

Leptocarydon has a visibly hairy panicle while *Diplachne* inflorescences appear generally glabrous.

Eragrostis has open panicles with pedicelled spikelets.

NOTES. Distinguishing characters are the small awns and the small hairs on the lemma nerves, difficult to see without a microscope. The aquatic habitat is useful for recognition of this genus. Previously placed in *Leptochloa*.



5 mm

Diplachne fusca



Echinochloa

4 species, not endemic (global tropical and warm temperate weedy genus)

DESCRIPTION. Small to large, prostrate to erect annuals or perennials 0.3–3 m tall. **Ligule often absent** or represented by a line of hairs. Leaf blades linear, 3.5–20 mm wide. **Inflorescence of racemes along a central axis, the spikelets paired or in short secondary racemelets, typically densely packed in 4 rows.** Spikelets, with 2 florets each, narrowly elliptic to subrotund, often hispidulous, the apex usually cuspidate or awned. Glumes as long as spikelet. Inferior lemma often stiffly awned. **Superior lemma crustaceous, terminating in a short, membranous, laterally compressed beak.**

HABITAT. Common weed of roadsides, cultivation, and rice paddies; near water or in shallow water; 0–1,500 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. *Brachiaria*, *Urochloa* and *Panicum* have panicoid spikelets with rounded, obtuse, or acute apices, while the upper florets in *Echinochloa* are always acuminate (pointed).

Alloteropsis paniculata is a robust weed of rice fields with a habit similar to that of some *Echinochloa*; the long awns of *A. paniculata* arise from the upper fertile lemma, while the long awns of *Echinochloa* arise from the lower herbaceous lemma.

MALAGASY NAMES. Akatafotsy, Ahibary, Ahbava, Ahibe, Ahidrano, Ahidrasy, Ahilava, Ahipody, Akatambivy, Karanga, Osaosa, Sarivary, Songolo, Tsimparifarimanja, Tsimparifarifotsy, Tsimparifary, Tsimbolo, Tsiriry vary, Varimbivihy, Voloandro.

NOTES. The taxonomy is uncertain at species level. The lack of ligule is a characteristic feature of *Echinochloa*. The most common roadside species *Echinochloa colona* is the smallest species and has awnless purplish spikelets; it is often mistaken for *Brachiaria*.



Echinochloa colona

Ehrharta

Ehrharta stipoides (Old World genus centred in South Africa)

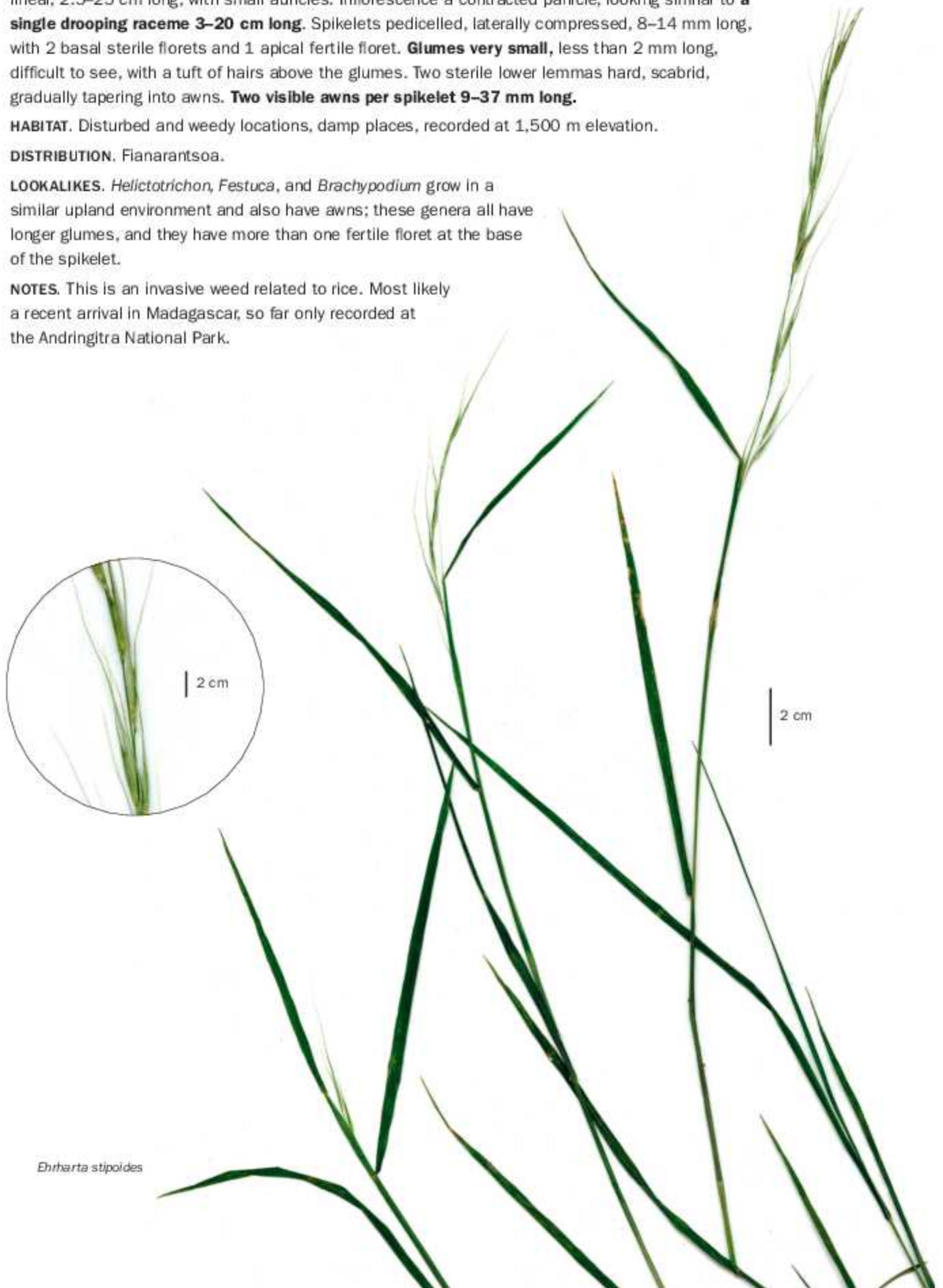
DESCRIPTION. Tufted stoloniferous perennial 20–70 cm long. **Ligule a ciliolate membrane.** Leaf blades linear, 2.5–25 cm long, with small auricles. Inflorescence a contracted panicle, looking similar to a **single drooping raceme 3–20 cm long.** Spikelets pedicelled, laterally compressed, 8–14 mm long, with 2 basal sterile florets and 1 apical fertile floret. **Glumes very small,** less than 2 mm long, difficult to see, with a tuft of hairs above the glumes. Two sterile lower lemmas hard, scabrid, gradually tapering into awns. **Two visible awns per spikelet 9–37 mm long.**

HABITAT. Disturbed and weedy locations, damp places, recorded at 1,500 m elevation.

DISTRIBUTION. Fianarantsoa.

LOOKALIKES. *Helictotrichon*, *Festuca*, and *Brachypodium* grow in a similar upland environment and also have awns; these genera all have longer glumes, and they have more than one fertile floret at the base of the spikelet.

NOTES. This is an invasive weed related to rice. Most likely a recent arrival in Madagascar, so far only recorded at the Andringitra National Park.



Ehrharta stipoides

Eleusine

3 species, not endemic (pantropical genus)

DESCRIPTION. Tufted erect annuals or perennials from a short ascending rhizome; culms flattened, 0.3–1.5 m tall. Ligule a ciliate membrane. Leaf blades linear, usually folded. **Inflorescence composed of digitate or subdigitate racemes,** the axis shorter than the longest raceme. **Racemes with overlapping spikelets terminating in a fertile spikelet.** Spikelets with 2–6 flowers, laterally compressed. Glumes shorter than the lowest lemma. Lemmas strongly keeled. **No awns.**

HABITAT. Open dry weedy habitats; 0–1,500 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. Other dry environment Chloridoideae with digitate racemes and no awns: *Acrachne* (tips of lemmas turned conspicuously outwards), *Dactyloctenium* (broader racemes terminating in a sharp rhachis point), *Sclerodactylon* (wider racemes with 7–20 flowers per spikelet).

Other Chloridoideae with digitate racemes, no awns, but only one floret per spikelet: *Cynodon*, *Craspedorhachis* (several florets per spikelet in *Eleusine*).

MALAGASY NAMES. Ahidrindrina, Tsimpimpina, Tsipipina.

NOTES. Trampled tussocks of *Eleusine indica* are seen near human habitation in Madagascar. *Eleusine coracana* is the finger millet, a popular African cereal.



Eleusine indica

Elionurus

Elionurus tristis, endemic (pantropical genus)

DESCRIPTION. Erect tufted perennial with drooping inflorescence. Leaf blades flat or rolled. Ligule a short membrane or a line of hairs. **Inflorescence a single raceme; racemes flexuous**, dorsally compressed; rachis internodes columnar to subclavate, strongly oblique at the summit, neither crateriform nor scariously rimmed. Spikelet with 2 florets. **Sessile spikelet lanceolate to narrowly ovate**; callus often large, applied obliquely to the summit of the internode; lower glume subcoriaceous to herbaceous, broadly convex on the back; upper glume **awnless**; upper lemma entire. Pedicelled spikelet well developed. No awns.

HABITAT. Highland dry savanna; 1,400–2,500 m elevation.

DISTRIBUTION. Antananarivo, Toamasina, Fianarantsoa, Toliara.

LOOKALIKES. *Hemarthria* and *Lepturus* have superficially similar single awnless racemes, but they have a creeping habit (*Elionurus* grows erect).

Oxyrhachis is an erect plant with a similar raceme but it has no pedicelled spikelet and the raceme is erect, not drooping.

Rhynchne has a transversely jointed raceme.

Rottboellia is a larger plant with green herbaceous pedicelled spikelets and pedicels fused to the internodes.

MALAGASY NAMES. Ahipody, Kofafa.

NOTES. Recognisable by its elegant drooping single racemes with apically pointed spikelets and no awns. Broom-making and medicinal uses are reported for this species.



Elionurus tristis

Enneapogon

Enneapogon cenchroides (genus of Old World tropics and subtropics)

DESCRIPTION. Tufted erect annual or perennial 0.6–1 m tall. Ligule a fringe of hairs. Leaf blades linear, flat, often with gland-tipped hairs. **Inflorescence a contracted white fluffy panicle.** Spikelets solitary, slightly laterally compressed, 3-flowered. Glumes as long as the lowest lemma. **Lemma of the lower floret 9-awned**, broad, dorsally rounded, densely hairy at least in the lower $\frac{1}{2}$. **Awns straight, ciliate, 2.5–5 mm long.**

HABITAT. Dunes, open arid weedy places, savanna, dry forest; 0–1,200 m elevation.

DISTRIBUTION. Tollara.

LOOKALIKES. Viewed under magnification, the lemmas with 9 awns are unique and immediately recognisable. Without magnification, the fluffy panicles can resemble those of *Cenchrus*, but the bristles on *Cenchrus* arise below the spikelets, not from the lemma tips as awns in *Enneapogon*. Other genera with fluffy contracted panicles are *Neyraudia*, *Phragmites*, and *Arundo*, but these are all much larger plants and the hairs arise from the sides of lemmas (*Neyraudia*) or rachilla (*Arundo* and *Phragmites*). The size of the plant and the fluffy panicles resemble those of *Melinis repens*, which only has 0–2 awns per spikelet.



Enneapogon cenchroides

Enteropogon

2 species not endemic (genus of pantropical grasses)

DESCRIPTION. Tufted erect perennials with wiry culms 0.1–1 m tall. Ligule a line of hairs. Leaf blades linear or rolled. **Inflorescence a solitary terminal 1-sided raceme 6–20 cm long.**

Spikelets 2–3-flowered, sessile, alternate in 2 rows along a tough axis. Glume shorter than the spikelet, terminating in a short awn. Lowest lemma elliptic, dorsally compressed, indurate, prominently awned. **Awn straight, 10–20 mm long.**

HABITAT. Dry forest, open areas, cultivation and roadsides; 0–500 m elevation.

DISTRIBUTION. Antsiranana, Mahajanga, Toliara.

LOOKALIKES. *Ctenium* is also an arid area genus with single terminal awned 1-sided racemes, but its racemes curl at maturity and its awns are less than 5 mm long.

Schoenefeldia has 2–4 racemes with fine curved awns over 2 cm long.

Habit has some resemblance to Andropogoneae savanna grasses with single one-sided terminal racemes, namely *Heteropogon* and *Trachypogon*, but both of these have larger geniculate awns (*Enteropogon* awns are straight).

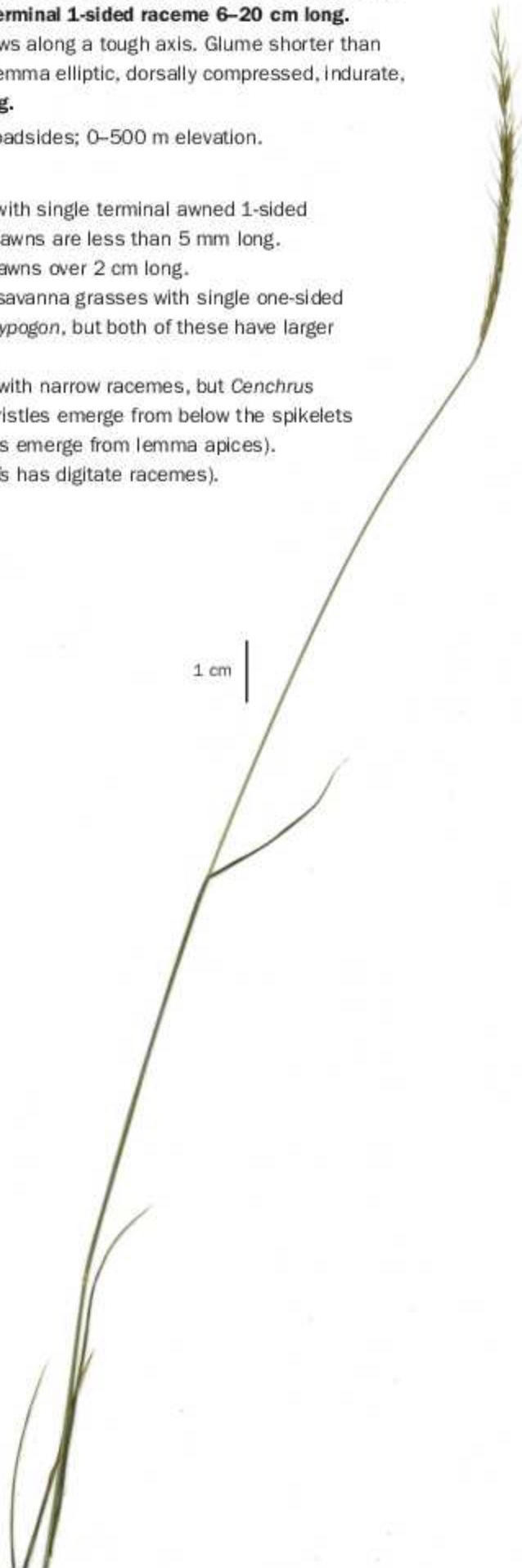
Habit can also be similar to species of *Cenchrus* with narrow racemes, but *Cenchrus* inflorescences are radially symmetrical and the bristles emerge from below the spikelets (*Enteropogon* racemes are one-sided and the awns emerge from lemma apices).

Related to *Chloris*, but with single racemes (*Chloris* has digitate racemes).



1 cm

Enteropogon sechellensis



Eragrostis

Around 40 species with 17 endemics (genus of warm areas across the world)

DESCRIPTION. Small erect annuals or perennials, often glandular particularly on the leaf-sheath and inflorescence. Ligule usually reduced to a ciliate rim, rarely membranous. **Leaf blades linear.** **Inflorescence an open or contracted panicle** (rarely racemes along a central axis). **Spikelets many-flowered, orbicular to elongated**, variously disarticulating. Glumes often deciduous, 1- or rarely 3-nerved. Lemmas 3-nerved but the laterals sometimes very faint and occasionally suppressed, membranous to coriaceous, obtuse to acuminate, rarely mucronate or shortly awned; palea keels sometimes winged or ciliate. Fruit mostly rotund to elliptic, fruit shape significant in species-level taxonomy. **No awns.**

HABITAT. Broad ecological tolerance, usually in open habitats; 0–2,400 m elevation.

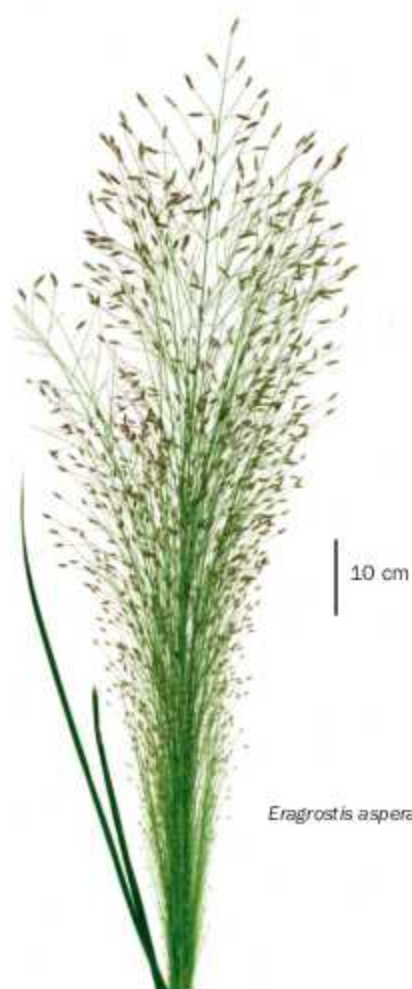
DISTRIBUTION. All provinces.

LOOKALIKES. *Megastachya* panicles and spikelets are almost indistinguishable from those of *Eragrostis*, but it has broad leaf blades and is a genus of the forest understory.

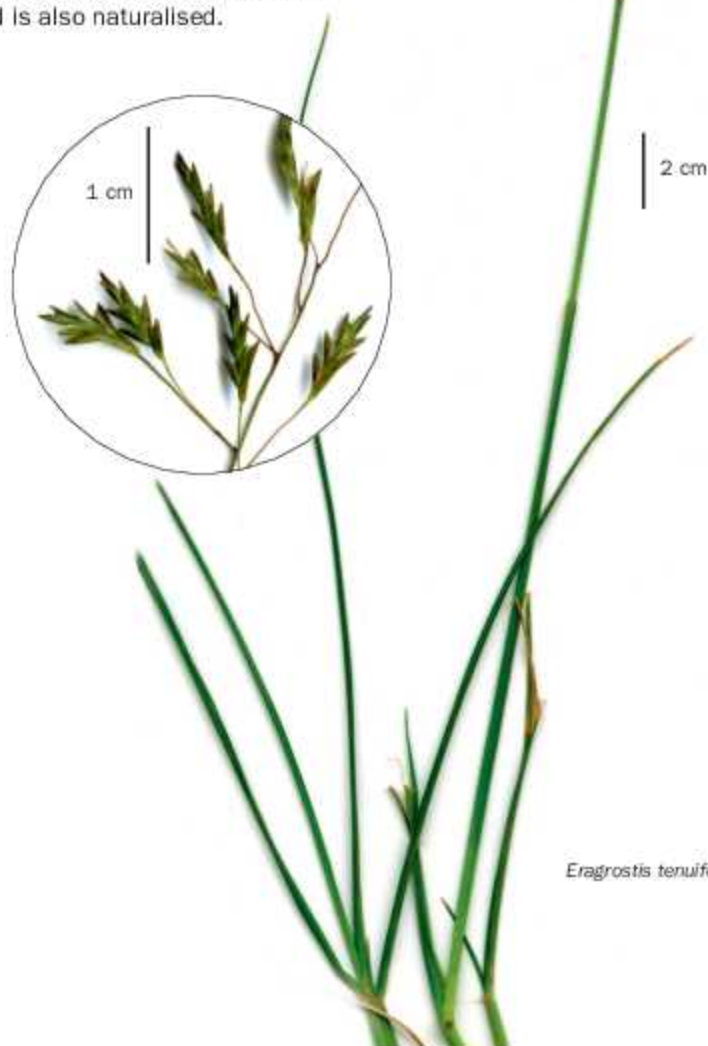
Centotheca has somewhat similar spikelets but has frequent retrorse bristles on the lemmas; it is also a forest understory genus.

MALAGASY NAMES. Ahidrano, Ahimoka, Ahipilo, Ahipolo, Ahipody, Akatafotsy, Dravala, Fangomoka, Fantakavazaha, Fingomoka, Horona, Kifafa, Liritoto, Taindambo, Tsimbony, Tarifina, Tsiroadroatra, Tefy.

NOTES. Usually easy to recognise by its elegant open panicles and numerous small florets making up every spikelet. This genus has a great variety of spikelet sizes and shapes, and the order of dehiscence is of taxonomic significance. Molecular data have shown that *Eragrostis* is broader than previously realised and it now includes *Pogonarthria squarrosa*, which has racemes arranged along a central axis and acuminate lemmas. *Eragrostis tef* is cultivated for food and is also naturalised.



Eragrostis aspera



Eragrostis tenuifolia

Eriochloa

6 species, none endemic (pantropical genus)

DESCRIPTION. Erect weakly tufted annuals or perennials. Ligule represented by a line of hairs. Leaf blades flat, linear, tapering to a fine point. **Inflorescence a panicle condensed about the primary branches of racemes along a central axis**, the spikelets single, paired or on short side branchlets. **Spikelets lanceolate to narrowly ovate**, with 2 florets each, **acute to aristate, with a small globose bead at the base**. Lower glume vestigial, adnate to swollen basal internode of the rachilla forming the bead. **Upper glume as long as spikelet, often with an awn-point**. Upper lemma coriaceous, granulose, usually mucronate.

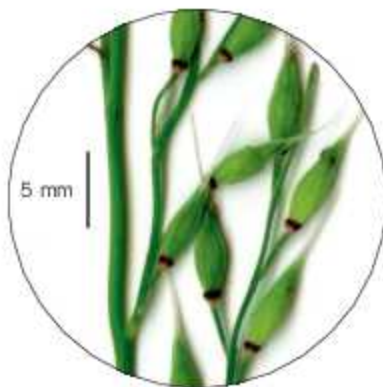
HABITAT. Dunes, dry forest, humid places and secondary vegetation; 0–1,600 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. The inflorescences can be similar to some *Panicum*, *Brachiaria*, *Echinochloa*, or *Agrostis* at higher elevations. The overall ovate pointed spikelet shape and the common awn point on the upper glume distinguish *Eriochloa* as does the swelling at the base of the spikelet; some magnification may be needed to see these.

MALAGASY NAME. Karanga.

NOTES. The bead-like swelling under the spikelets is small and can be hard to see especially on dried specimens that have lost any distinguishing colouration. The species of *Eriochloa* are quite uniform and hard to distinguish.



1 cm

Eriochloa fatmensis

Euclasta

Euclasta condylotricha (pantropical genus)

DESCRIPTION. Usually scandent annuals with weak stems. Ligule membranous. Leaf blades flat. **Inflorescences of delicate subdigitate nodding pedunculate racemes**; racemes with 1–3 large homogamous pairs of spikelets at the base; **rhachis internodes and pedicels with a depressed translucent longitudinal groove**. Spikelet with 2 florets. Sessile spikelet: lower glume chartaceous, more or less flat; lower floret empty with a hyaline lemma; upper floret bisexual, **the upper lemma entire, with a geniculate awn**. Pedicelled spikelet larger than the sessile.

HABITAT. Savanna and dry forest; 0–800 m elevation.

DISTRIBUTION. Mahajanga.

LOOKALIKES. The habit and inflorescences are similar to those of the related *Bothriochloa* (all sessile spikelets in *Bothriochloa* produce awns, but the lower 3–4 homogamous pairs in *Euclasta* have no awns) and *Dichanthium* (more overlapping apically obtuse glumes in most *Dichanthium*, and no longitudinal depression in *Dichanthium* pedicels and rhachis). *Andropogon* has similar awned digitate racemes but the plants usually grow erect with strong stems.

NOTES. Racemes bent and nodding downwards can be a useful distinguishing character for *Euclasta*.



Euclasta condylotricha

Eulalia

Eulalia villosa (genus of Old World tropics)

DESCRIPTION. Erect tufted perennials 0.5–2 m. Leaf blades linear. Ligule short, membranous, densely ciliate. **Inflorescence of 1–4(10) subdigitate racemes; racemes fragile, conspicuously pilose, yellowish or brownish** with slender internodes. **Spikelets alike, paired, 2-flowered, one sessile, one pedicelled**, dorsally compressed, the callus obtuse. Lower glume cartilaginous to subcoriaceous, the back flat and usually nerveless, sharply inflexed on the flanks or becoming 2-keeled above, acute to obtuse or truncate, rarely biaristulate. Upper glume usually awnless. Lower floret represented by a lemma or sometimes suppressed.

Upper lemma bidentate to bifid with a glabrous awn.

HABITAT. Common in open grassland and savanna; 1,000–2,500 m elevation.

DISTRIBUTION. Antsiranana, Antananarivo, Toamasina, Fianarantsoa.

LOOKALIKES. *Andropogon* is also an erect savanna grass with digitate erect hairy racemes but its racemes are thinner and its pedicelled spikelets are not awned, or have awns much smaller than those of the sessile spikelets (sessile and pedicelled spikelets of *Eulalia* have equal geniculate awns).

The only other Andropogoneae genera where the sessile and pedicelled spikelets are the same are: *Imperata* (with very long white hairs), *Saccharum* and *Lasiorhachis* (inflorescence is a panicle) and *Pogonatherum* (much smaller inflorescences).

MALAGASY NAMES. Mafaibaratra, Vodikongo.

NOTES. The wide hairy yellowish racemes of *Eulalia* are easy to recognise. Unusually in Andropogoneae, the sessile spikelet and pedicelled spikelet are the same, both female fertile and both with an awn. One side of each raceme shows the yellow lower glumes of both the sessile and the pedicelled spikelets, and the other side shows the structure of the raceme with the pedicels and the rachis internodes. The racemes disintegrate very easily on drying.



Eulalia villosa

1 cm

Festuca

Ca. 3 endemic species (temperate genus)

DESCRIPTION. Loosely tufted perennials. Leaf sheaths glabrous. Ligule a membrane. **Leaf blades usually rolled,** sometimes flat, erect or drooping. Inflorescence an open or contracted panicle. **Spikelets 1–many-flowered, laterally compressed, pedicelled, solitary.** Glumes shorter than the lowest lemma. **Rhachilla glabrous or scabrous.** Lemmas 3–5(7)-nerved, firmly membranous, dorsally rounded. Callus glabrous. **No awn or a straight awn 0–10 mm.** Ovary with the apex glabrous or pilose; no apical appendage.

HABITAT. Forest edges, mesic habitat, 1,000–2,500 m elevation.

DISTRIBUTION. Antananarivo, Fianarantsoa, Toliara.

LOOKALIKES. *Pseudobromus* is hard to distinguish and frequently confused with *Festuca*; it has broader leaves with branching venation, hairs on the rhachilla and callus, and always has awns. *Bromus* has hairy leaf sheaths, broader leaves, and larger spikelets.

Brachypodium has a similar drooping habit, also with many florets in every spikelet; *Brachypodium* spikelets are sessile or subsessile, whereas *Festuca* spikelets have a significant pedicel.

NOTES. The taxonomy of this already difficult group is further complicated by the fact that florets often fall off after the plants are collected, leaving incomplete specimens.



Festuca perrieri

Gigantochloa

Gigantochloa pseudoarundinacea, introduced (Asian genus of 30 species)

DESCRIPTION. Clumping bamboo with pachymorph rhizomes. Culms erect, 9–18(–30) m tall, 5–12 cm in diameter, with thick or moderately thick walls, green or with yellow stripes. Branches arising from midculm nodes, several with the middle branch dominant. Young shoots yellow-green to brown-green, often covered with brown hairs. Culm sheaths usually covered with dark brown or black hairs, blades erect then deflexed, auricles usually present. Leaf blades generally lanceolate, up to 35 cm long, 6 cm wide. Inflorescences borne on branches of leafless culm, axes pubescent; pseudospikelets in groups at nodes, usually hairy. Spikelet usually laterally flattened or compressed, or rarely cylindrical, up to 1 cm long, consisting of 2–5 glumes, 2–5 florets, terminated by an empty lemma, rachilla internodes very short.

HABITAT. Planted near human habitation.

DISTRIBUTION. Toamasina.

LOOKALIKES. The culms of *Gigantochloa pseudoarundinacea* are large, similar to those of *Dendrocalamus giganteus* and *D. asper*. It can be differentiated by its yellow-green or brown-green young shoots, and a culm sheath with small auricles. The inflorescences are similar to these of *Bambusa* and *Dendrocalamus*.

MALAGASY NAME. Volobesoratana.

NOTES. *Gigantochloa pseudoarundinacea* can be recognised by its large green culm with yellow stripes and the reflexed or deflexed blades of culm sheaths. Its origin is not known but it is widely cultivated in Indonesia (especially in Java), and it was introduced and found planted in villages around Maroantsetra, and also around Tamatave.



Gigantochloa pseudoarundinacea

Hackelochloa

Hackelochloa granularis (pantropical genus)

DESCRIPTION. Erect loosely tufted annual 40–90 cm tall. Ligule a ciliate membrane. Leaf blades flat, coarse, 5–12 mm wide. **Numerous single racemes 1–2 cm long** are gathered together into a leafy false panicle. Internodes flattened, cup-shaped above, fused to the pedicels. Spikelet with 2 florets. **Sessile spikelet globose. Lower glume hemispherical, orange, with prominent pits and bumps.** Upper lemma entire. Caryopsis oblate, slightly dorsally flattened. Pedicelled spikelet green, leaf-like. No awns.

HABITAT. Dry open secondary vegetation; 0–500 m elevation.

DISTRIBUTION. Mahajanga.

LOOKALIKES. Other grasses with cylindrical awnless inflorescences and prominent bumps on the lower glume of the sessile spikelet include *Rhytachne*, *Heteropholis*, and *Ischaemum rugosum*; in all of these, the lower glume is elongated, while it is rounded in *Hackelochloa*. *Rottboellia* and *Lepturus* have cylindrical awnless inflorescences with smooth spikelets without pits and bumps.

MALAGASY NAME. Tsikalabana.

NOTES. Easily recognisable by its round sessile, prominently sculptured spikelet covered in pits and tubercles, resembling a golf ball. Thought to be an ancient introduction to Madagascar.

1 cm

Hackelochloa granularis

Halopyrum

Halopyrum mucronatum (monotypic genus of Indian ocean shores)

DESCRIPTION. Erect tough stoloniferous perennial, the stolons rooting to form dense tufts. Culms rigid, woody, to 1 m. Ligule a ciliate rim. Leaf blades narrow, stiff, glaucous. Inflorescence of short racemes scattered along an elongated central axis, the racemes held erect. Spikelets with 8–25 flowers, shortly pedicelled, laterally compressed, disarticulating above the glumes and between the florets. Callus with conspicuous white hairs 4–5 mm long visible when the spikelet is broken. Glumes thick, shorter than the lowest lemma. Lemmas thick, rounded. No awns.

HABITAT. Coastal sandy dunes; 0–200 m elevation.

DISTRIBUTION. Mahajanga, Toliara.

LOOKALIKES. The spikelets look like those of a large-spikelet *Eragrostis*, but with spikelets held in racemes (always panicles in *Eragrostis*) and white rhachilla hairs easily visible between the florets when the spikelet is open (rhachilla glabrous in *Eragrostis*).

NOTES. Apparently rare; only three collections are known.



Halopyrum mucronatum

Helictotrichon

Two species, not endemic (temperate genus)

DESCRIPTION. Erect or ascendant loosely tufted perennials 0.5–1 m tall. Ligule a hyaline membrane. Leaf blades linear or rolled.

Inflorescence a narrow panicle, erect or drooping.

Spikelets pedicelled, 0.8–1.8 cm long, with 2–6 flowers, laterally compressed. **Rhachilla and callus villous.** Glumes a little shorter than the lowest lemma. Lemmas acute, awned. **Awn inserted in the upper $\frac{1}{2}$ of the lemma, geniculate, 12–20 mm long.**

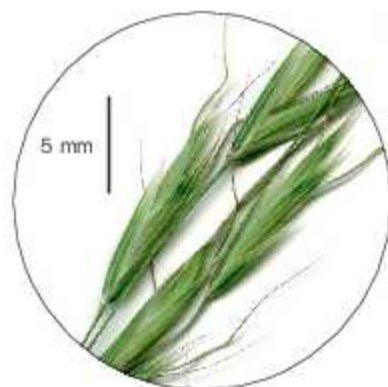
HABITAT. Open forest and grassland; 1,500–2,500 m elevation.

DISTRIBUTION. Antananarivo, Fianarantsoa.

LOOKALIKES. *Merxmüllera* is also a high elevation genus with long glumes, which are longer than the spikelet.

Pentameris has smaller spikelets and only 2 awns per spikelet.

NOTES. When *Helictotrichon* spikelets are pressed and dried, they open the long white hairs on the callus and rhachilla become clearly visible, and the awn bends. When the plant is fresh, the white hairs are not visible, the awn looks straight and the spikelets look similar to those of *Bromus* and *Festuca* (other high-elevation Poideae genera with racemes and pedicelled multi-flowered spikelets).



Helictotrichon elongatum

Hemarthria

2 species, none endemic (genus of Old World tropics)

DESCRIPTION. **Creeping stoloniferous robust perennials, the plant often with a reddish colour.** Ligule a very short ciliate membrane. Leaf blades flat. **Inflorescence a single axillary raceme** embraced below by the subtending leaf sheath; racemes tough, dorsally compressed; **internodes thickened, clavate, nearly always obliquely articulated, fused to the adjacent pedicel.** Spikelet with 2 florets. Sessile spikelet dorsally compressed; callus obtuse to cuneate, rarely truncate. Lower glume narrowly elliptic, rigidly herbaceous, obtuse, caudate or bifid at the apex; upper glume obtuse to long-acuminate; lower floret reduced to a hyaline lemma; upper lemma entire. Pedicelled spikelet similar to the sessile spikelet but truncate at the base and without a callus; pedicel flattened, broadly linear. No awns.

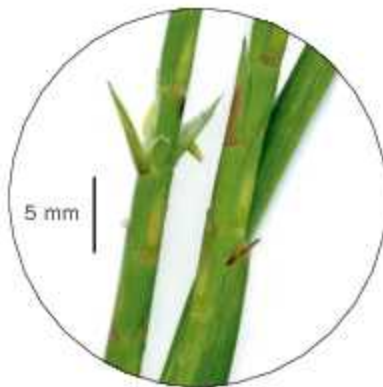
HABITAT. Near water; 0–1,800 m elevation.

DISTRIBUTION. Mahajanga, Antananarivo, Toamasina.

LOOKALIKES. The awnless single racemes and creeping habit are superficially very similar to those of the coastal genus *Lepturus*. *Lepturus* racemes are single and apical on the culms (several axillary racemes on one culm of *Hemarthria*).

MALAGASY NAME Tsimatiloaha, Tsimatimpanarivo.

NOTES. *Hemarthria* is a member of the Andropogoneae with one sessile and one pedicelled spikelet in each spikelet pair, but the pedicels are fused to the internodes so all the spikelets appear sessile and the inflorescence structure is difficult to interpret.



Hemarthria altissima

Heteropholis

Heteropholis benoistii, endemic (genus of Old World tropics)

DESCRIPTION. Erect tufted perennial 30–50 cm tall. Ligule a membrane. Leaf blades flat or rolled, 1–2 mm wide.

Inflorescence a single terminal cylindrical raceme 5–13 cm long, ca. 1.5 mm wide. Internodes thick, fused to the pedicel. Spikelet with 2 florets. Sessile spikelet sunk into the internode, oblong. Callus truncate, with prominent central peg. **Lower glume convex, often with prominent pits in the surface.** Upper lemma entire. Pedicelled spikelet the same size as the sessile or smaller, apically rounded. No awns.

HABITAT. Open grassland on rocks; ca. 1,500 m elevation.

DISTRIBUTION. Antananarivo.

LOOKALIKES. Single thin cylindrical racemes resemble *Hemarthria* (creeping reddish plant near water), *Oxyrhachis* (no pedicels or pedicelled spikelet), *Rottboellia* (much larger plant with wider racemes), and *Rhynchne* (pedicels are not fused to the rhachis).

NOTES. Rare endemic species; only four collections are known. The distinctive pits on the lower glume are useful for recognition but not always present.

2 mm

Heteropholis benoistii

Heteropogon

2 species, not endemic (pantropical genus)

DESCRIPTION. Erect annuals or erect tufted perennials. Ligule very short, membranous, ciliate on the upper edge. Leaf blades linear. **Inflorescence a single clearly asymmetric raceme**, partially enclosed by a narrow spatheole; racemes with homogamous spikelet pairs for the inferior $\frac{1}{4}$ – $\frac{2}{3}$ of their length; internodes linear, the pedicels reduced to a minute stump. Spikelet with 2 florets. Sessile spikelet terete; **callus pungent**; lower glume coriaceous, convex without a median groove, obtuse at the apex; lower floret reduced to a hyaline lemma; upper lemma entire, passing directly into a **stout pilose geniculate dark brown awn**. Pedicelled spikelet male or barren, lanceolate, larger than the sessile spikelet, awnless, with a **long slender callus functioning as a pedicel**.

HABITAT. Arid poor grassland and roadsides; 0–1,500 m elevation.

DISTRIBUTION. All provinces.

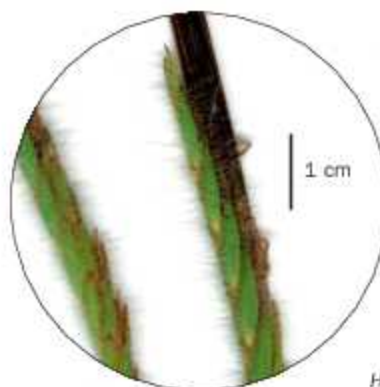
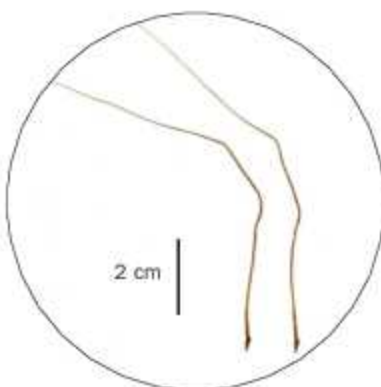
LOOKALIKES. *Trachypogon* is also an erect savanna grass with a single terminal awned raceme, but its racemes are not obviously asymmetric, and the awns are almost white.

Diectomis has an awned foliaceous pedicelled spikelet lower glume which is orange at maturity.

Other erect savanna Andropogoneae grasses *Andropogon*, *Cymbopogon*, *Hyparrhenia* and *Hyperthelia* all have racemes in groups of 2 or more.

MALAGASY NAMES. Ahetse, Ahidambo, Ahitra, Ahitsa, Ahimoso, Boka, Ahimoso, Danga, Kitrofoka, Kitrofony, Kotrofony, Lefodambo, Lefondambo, Lefonomby, Tsevodambo.

NOTES. *Heteropogon contortus* is a common plant of grasslands and roadsides. At maturity, all the hairy awns from one raceme twist together, forming a single dark brown dispersal unit with numerous very sharp calluses protruding outwards. These can penetrate clothing and skin, and cause damage to animals. Homogamous spikelets with no awns and empty glumes and lemmas remain on the callus after the dispersal unit has detached. *Heteropogon melanocarpus* can be recognised by a row of circular glands on the lower glume of the pedicelled spikelet which are visible with a hand lens.



2 cm

Heteropogon contortus

Hickelia

4 species, endemic (genus found in Madagascar and Tanzania, one species in Tanzania)

DESCRIPTION. Scrambling bamboo with pachymorph rhizomes and long necks. **Lower part of the culm erect, upper part and branches pendulous or scrambling**, about 3–15 m long; internodes 25–40 cm long, with relatively thick walls, usually smooth, nodes slightly swollen or not swollen, sheath scar or nodal line dipping below the bud. **Branches many at each node with the primary or middle branch dominant.** Young shoots green or purplish green, usually glabrous. Culm sheaths green or purplish green, glabrous or hairy, blades linear or narrowly lanceolate. Auricle not present. Ligule very short, fringed or deeply toothed. Leafy branches up to 40 cm long. Leaf blades 8–12 cm long, 8–16 mm wide, usually glabrous or minutely pubescent below, ligule very short, auricles not present. Inflorescence terminating leafy or leafless branches, determinate, branched or unbranched panicle. Spikelets 18–20 mm long, about 6 mm wide, consisting of 3–5 (rarely 2) transitional glumes, one fertile floret; lower glumes chartaceous, with many prominent nerves, glabrous or hairy along the margins, upper glumes coriaceous, with many nerves, glabrous or hairy toward the apex, **often shiny after fertilization**; lemma coriaceous, glabrous or hairy toward the apex, with many nerves, **often shiny after fertilization**; palea coriaceous, 2-keeled, enclosed by the lemma before fertilization, later exposed after fertilization. Caryopsis ovoid with thin pericarp.

HABITAT. Highland forests. *Hickelia madagascariensis* is widely distributed in the Central Highlands, *H. perrieri* is found in the Tsaratanana mountain range, and *H. alaotrensis* is found around Lake Alaotra. The population of *H. madagascariensis* has decreased as the mountain forests in the highlands have declined.

DISTRIBUTION. Antananarivo, Antsiranana, Fianarantsoa, Toamasina.

LOOKALIKES. The fertilized and mature spikelets or florets of *H. perrieri* and *H. madagascariensis* superficially look like the involucre in the inflorescence of *Coix*. Branches are several to many at each node, which can be mistaken for *Nastus*. In *Hickelia*, the leaf blades are more or less ovate-lanceolate, whereas in *Nastus* they are lanceolate or linear-lanceolate.

NOTES. It is not difficult to recognize *Hickelia* in the field: the lower portions of the culms are erect and straight, the upper portions are scrambling, bearing many branches at each node and small lanceolate leaf blades, the spikelets are large, arranged in panicles. The plants die after flowering.

Culms are collected from the wild to make baskets. This is one of the reasons why populations of *H. madagascariensis* have decreased. The leaf blades and fruits are often eaten by lemurs.



Hickelia madagascariensis

Hitchcockella

Hitchcockella baronii (monotypic endemic genus)

DESCRIPTION. Climbing bamboo with pachymorph rhizomes, **delicate**. Culm **zigzag**, internodes 6–7 cm long, up to 1 mm in diameter, smooth. **Branches 1–5(6) at each node**, borne below the supranodal ridge where the sheath scar curves downward, middle branch elongated with secondary branching. Leafy branches about 5 cm long, bearing 3–6 leaf blades; leaf blades 2–2.5 cm long, 0.4 cm in diameter. **Inflorescences terminating leafy branches, consisting of 1 spikelet**. Spikelet laterally compressed, 7 mm long, comprising 3 glumes and 1 fertile floret.

HABITAT. Marojeiy wet forest, 500–1,000 m.

DISTRIBUTION. Antsiranana.

LOOKALIKES. Differs from *Perrierbambus* by its climbing habit.

NOTES. Known only from the type and a single recent collection. Little is known about this genus and further research is necessary.



Hitchcockella baronii

Hordeum

Hordeum vulgare, barley (temperate genus)

DESCRIPTION. Erect annual up to 130 cm. Young leaf sheaths with curved auricles at the tip. Ligule membranous. Leaf blades linear. Inflorescence a **single erect raceme** 4–12 cm long. **Spikelets arranged in groups of 3 on opposite sides of the raceme**, all 3 spikelets sessile, the central spikelet fertile and 9–12 mm long. Long thin glumes visible in front of the spikelets. **Awns straight, 10–18 cm long, rough**, arising from the apex of all the spikelets or from the central spikelet only.

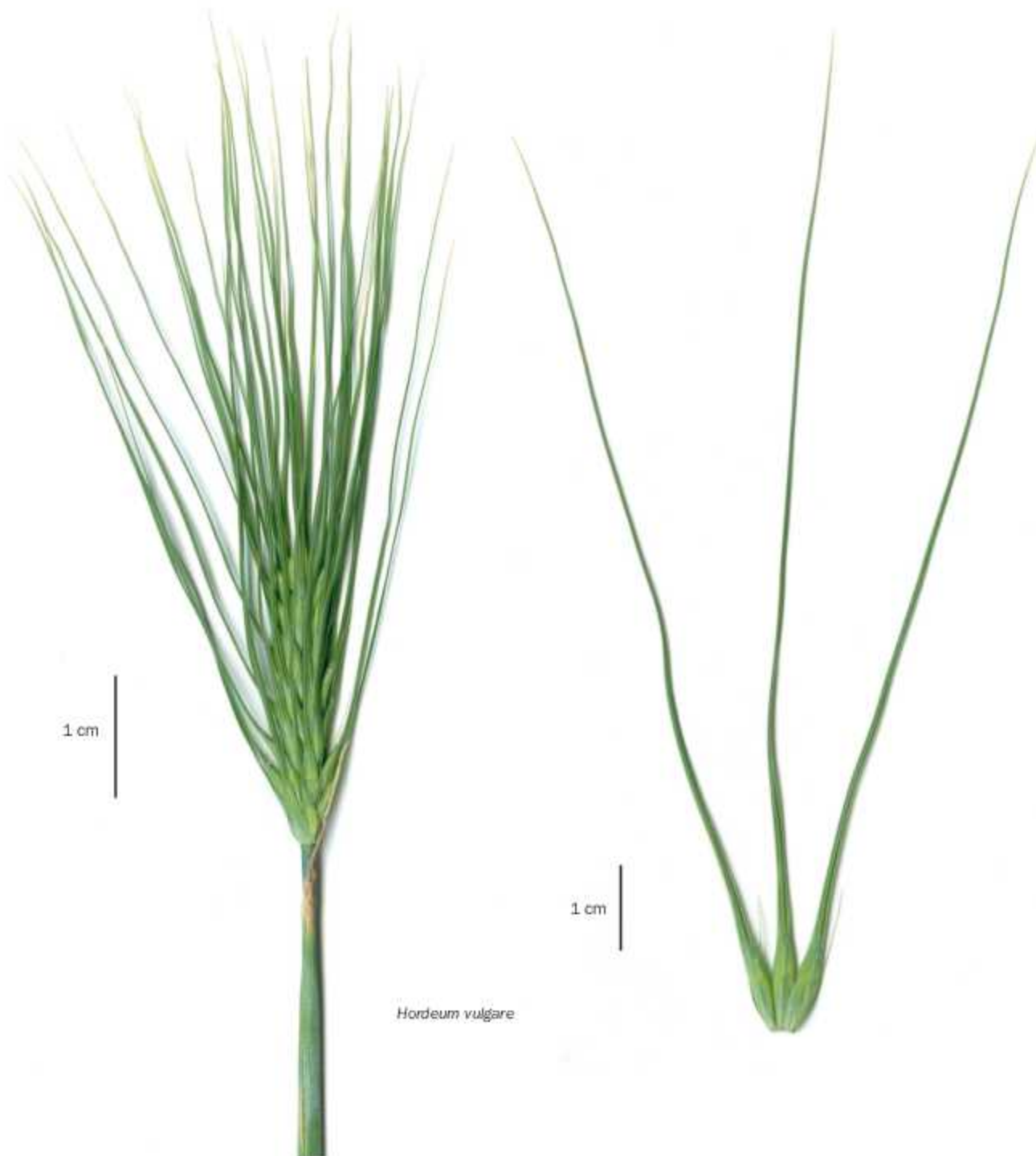
HABITAT. Cultivated; 800–1,500 m elevation.

DISTRIBUTION. Fianarantsoa.

LOOKALIKES. *Triticum* is related to *Hordeum*, has similar inflorescences, and is also cultivated on the High Plateau; its spikelets are single, not arranged in groups of 3.

Viguierella has a similar overall appearance but it is restricted to coastal habitats, and its spikelets are single, not in groups of 3.

NOTES. Cultivated in the Antsirabe area for production of the beer brands “THB” and “SKOL”. Not known in the wild and no escapes have been recorded.



Humbertochloa

Humbertochloa bambusiuscula, endemic (genus of two species, in Madagascar and Tanzania)

DESCRIPTION. Stiff slender decumbent woody perennial, branched. Ligule a cilliate membrane. **Leaf blades with a false petiole, sagittate, ovate, 2–5 cm long, apically acuminate, stiffly ciliate on the margins.**

Male false spikes and female false spikes separate, composed of small racemes partly enclosed within a foliaceous inflorescence axis. Male spikelets: lower glume subulate; upper glume ovate or elliptic; lower lemma coriaceous, 3–7-nerved; upper lemma chartaceous, 5–7-nerved. Female spikelets: lower glume subulate; upper glume lanceolate to ovate-oblong; upper lemma as long as the spikelet, thinly coriaceous. No awns.

HABITAT. Dry forest shade; 0–500 m elevation.

DISTRIBUTION. Antsiranana, Mahajanga, Toliara.

LOOKALIKES. Unique in the grasses. The only other genus with superficially similar hooded racemes is *Thuarea*, a slender creeping plant with lanceolate leaves and no pseudopetiole (unlike the ovate pseudopetiolate leaves of *Humbertochloa*). *Stenotaphrum* also has a foliaceous inflorescence axis but it has a creeping habit.

NOTES. Does not look like a grass. The sagittate leaf bases are a distinctive feature.



Hyparrhenia

12 species, not endemic (pantropical genus centred in Africa)

DESCRIPTION. Tall erect annuals or perennials. Ligule membranous. Leaf blades linear, never aromatic.

Inflorescence composed of paired racemes, each pair supported on a peduncle and subtended by a sheathing spatheole, creating a large leafy false panicle; racemes short, slender, each borne upon a short stalk which is **often deflexed at maturity**, and with up to 2 of the lowermost spikelet pairs (homogamous pairs) male or barren, awnless and tardily deciduous; internodes and pedicels linear. Spikelet with 2 florets.

Sessile spikelet narrowly lanceolate to lanceolate-oblong, dorsally compressed or terete;

callus applied obliquely to the apex of the internode with its tip free; lower glume

coriaceous, broadly convex across the back and sides; upper glume awnless;

upper lemma bidentate, passing between the teeth into a stout awn with pubescent or hirtellous column. Pedicelled spikelet male or barren, usually a little longer than the sessile spikelet.

HABITAT. Highland grassland and savanna, dry roadsides; 200–2,300 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. The other erect savanna grasses with more than one awned raceme are *Andropogon*, *Cymbopogon*, and *Hyperthelia*.

Hyperthelia has only two awns per raceme pair, and a grooved lower glume of the sessile spikelet (almost always more than two awns per raceme pair and a smooth lower glume in *Hyparrhenia*).

Cymbopogon leaves are aromatic when crushed (never aromatic in *Hyparrhenia*), the plant colour is more white-green (brighter colour in *Hyparrhenia*).

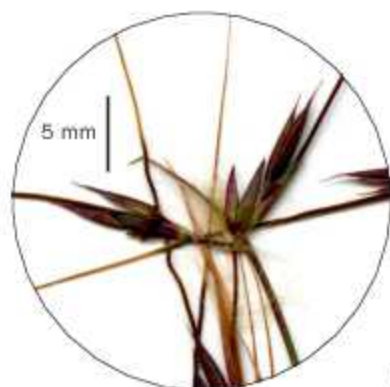
Andropogon racemes are longer, there are usually more than two racemes, and racemes of *Andropogon* are erect and never reflexed.

Themeda has a more complex inflorescence structure condensed into raceme clusters, often with tubercle-based hairs.

Bothriochloa, *Dichanthium*, and *Euclesta* have more than two racemes per inflorescence.

MALAGASY NAMES. Andrantsiky, Danga, Fakaka, Fatakana, Kitrofoka or Kitrofony or Kotrofony, Kalafa, Kitrambero, Kitsanjy, Kiverovato, Kolafa, Sihy, Siky, Sy, Vero, Verobe, Verofehana, Verofotsy, Verombato, Veromanga, Verotsanga or Verotsangana, Verotsanjy, Vohitara, Verofehana, Veromena.

NOTES. The familiar roadside species *Hyparrhenia rufa* is the most common member of this genus, of shorter stature than the others and has yellow-brown spikelets and red spatheoles when fresh. Straw hats are made from *Hyparrhenia hirta*.



Hyparrhenia newtonii



Hyperthelia

Hyperthelia dissoluta (African genus)

DESCRIPTION. Erect perennial 1–2 m tall. Ligule scarious. Leaf blades linear.

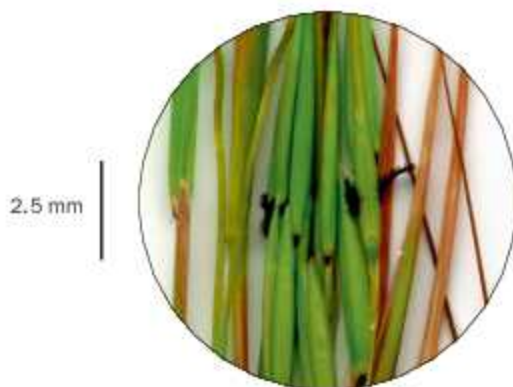
Inflorescence of paired racemes subtended by reddish spatheoles and crowded into a large leafy false panicle; racemes short, with 2 sessile spikelets per pair, deflexed or not, with a single homogamous spikelet pair at the base of the inferior raceme; raceme-bases unequal, terete, the apex oblique and produced into a scarious appendage; internodes and pedicels linear. Spikelet with 2 florets. Sessile spikelet terete, yellow; callus pungent, applied obliquely to the apex of the internode. **Lower glume coriaceous, with a median longitudinal groove**; upper glume with or without an awn; **upper lemma 2-toothed, passing between the teeth into a stout awn with a hirsute column**. Pedicelled spikelet male, yellow, sometimes with a minute awn.

HABITAT. Dry grassland and savanna, 0–1,300 m.

DISTRIBUTION. All provinces.

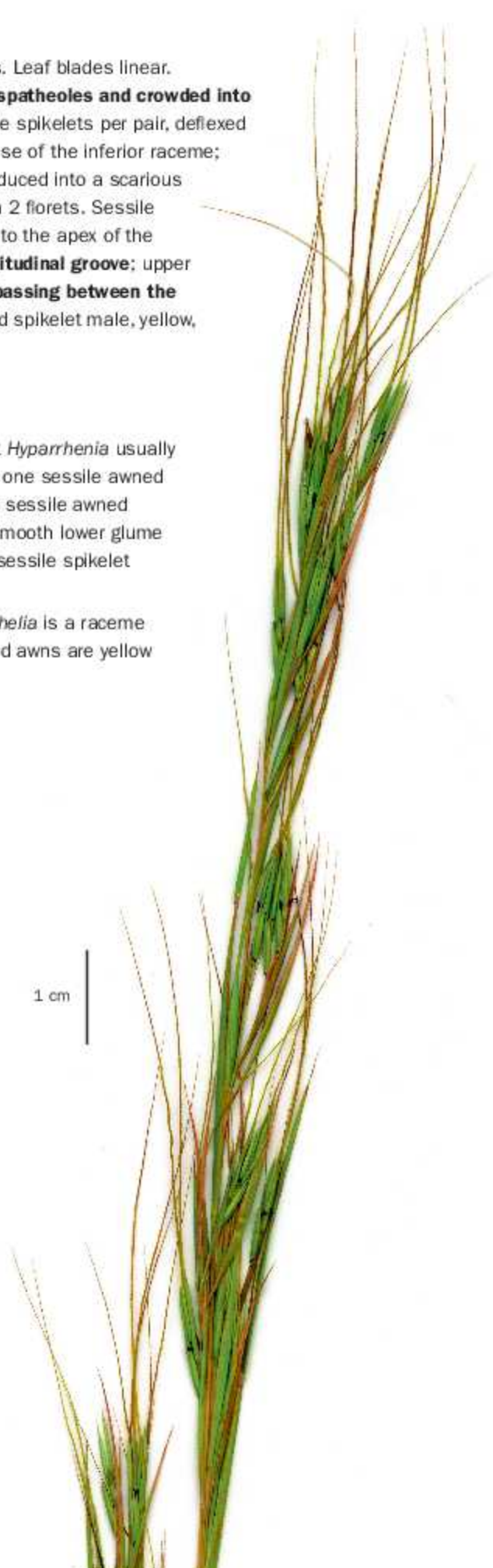
LOOKALIKES. Resembles *Hyparrhenia* in all respects, but *Hyparrhenia* usually has more than two awns per raceme pair, i.e. more than one sessile awned spikelet per raceme (only two awns per raceme pair, one sessile awned spikelet per raceme in *Hyperthelia*). *Hyparrhenia* has a smooth lower glume of the sessile spikelet (long groove in the middle of the sessile spikelet lower glume in *Hyperthelia*).

NOTES. The diagnostic identification character for *Hyperthelia* is a raceme appendage but this is difficult to recognise. Spikelets and awns are yellow and spatheoles are reddish.



1 cm

Hyperthelia dissoluta



Imperata

Imperata cylindrica (small tropical genus)

DESCRIPTION. Erect perennial 10–120 cm tall, **aggressively invasive with scaly rhizomes**. Leaves mostly basal, **culm and leaves often red**. Ligule a cilliate membrane. Leaf blades linear. Inflorescence a single terminal dense panicle which looks like **a spike, 3–22 cm long, hidden under soft white hairs**. Spikelets pedicelled, arranged in pairs, spikelets similar in each pair, 2–6 mm long, 2-flowered, difficult to see underneath the white hairs. Hairs originate from the callus and glumes. No awns.

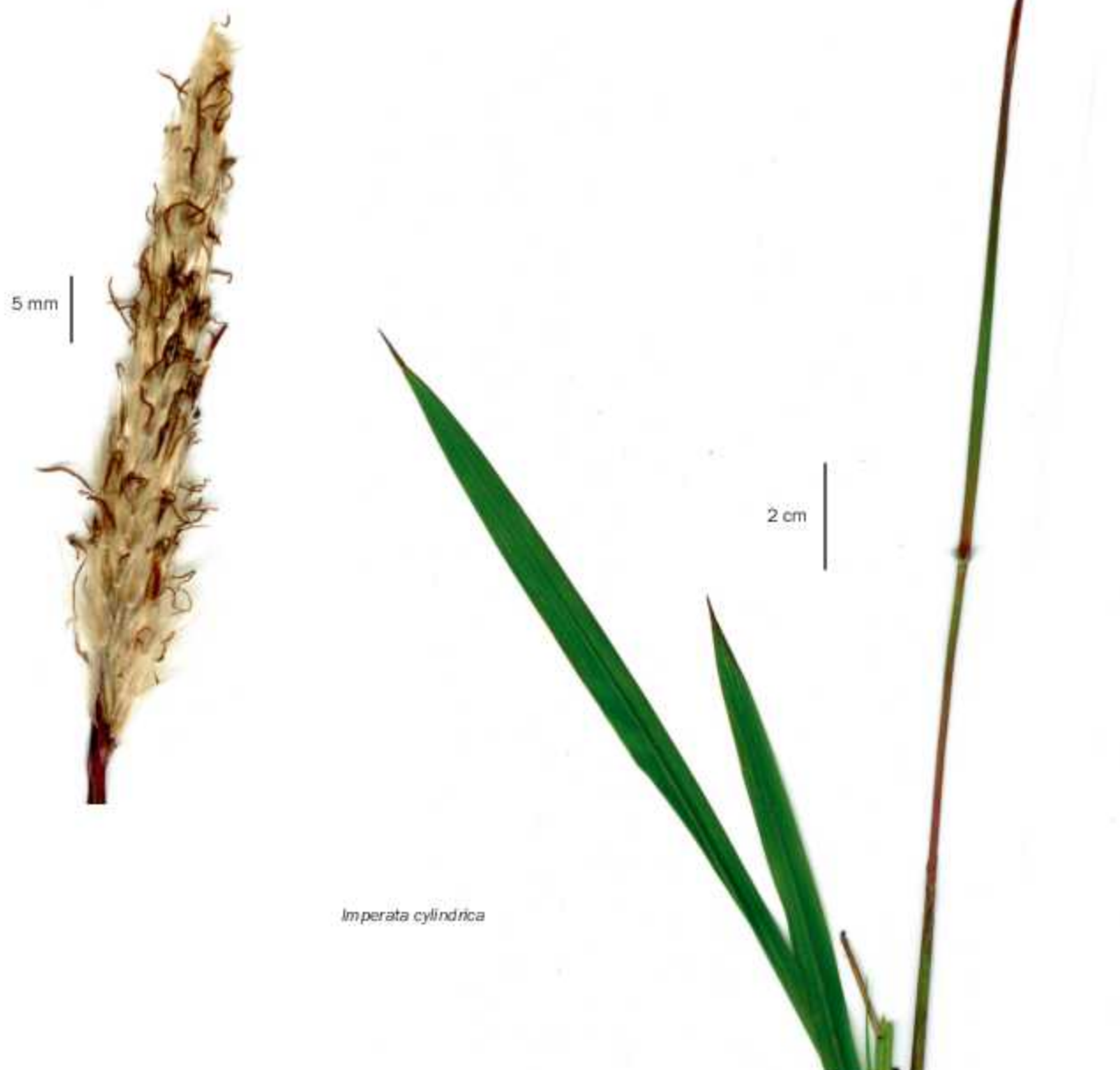
HABITAT. Old cultivation and burned places, 0–1,700 m.

DISTRIBUTION. All provinces.

LOOKALIKES. Some *Andropogon* also have soft furry white inflorescences, but the spikelets are arranged in racemes, not a single dense inflorescence.

MALAGASY NAMES. Antsoro, Bozaka, Fakatenina, Fehana, Horona, Manevika or Maneviky, Tenina, Tenona, Tsevoka.

NOTES. Easy to recognise by its fluffy white inflorescences. Rhizomes can reach a depth of 1 m under the ground. This species is thought to be native in Madagascar but is a dangerous weed in many parts of the world. Common after fire across Madagascar except in the south where it is less frequent. Traditional medicinal uses have been reported for the rhizomes.



Imperata cylindrica

Isachne

6 species, 5 of these endemic (tropical genus)

DESCRIPTION. Perennials with long prostrate or scrambling culms. Leaf blades linear to lanceolate or ovate. Inflorescence an open or contracted panicle. Spikelets 2-flowered, separated by a short internode, with the florets similar or dissimilar, the lower male or hermaphrodite, the upper female or hermaphrodite; rachilla disarticulating below each floret. Glumes subequal, two-thirds to as long as the spikelet, membranous. Lemmas elliptic-oblong to orbicular, obscurely 5–7-nerved, obtuse, **both the lower and the upper lemma hardened, chartaceous to coriaceous.** No awns.

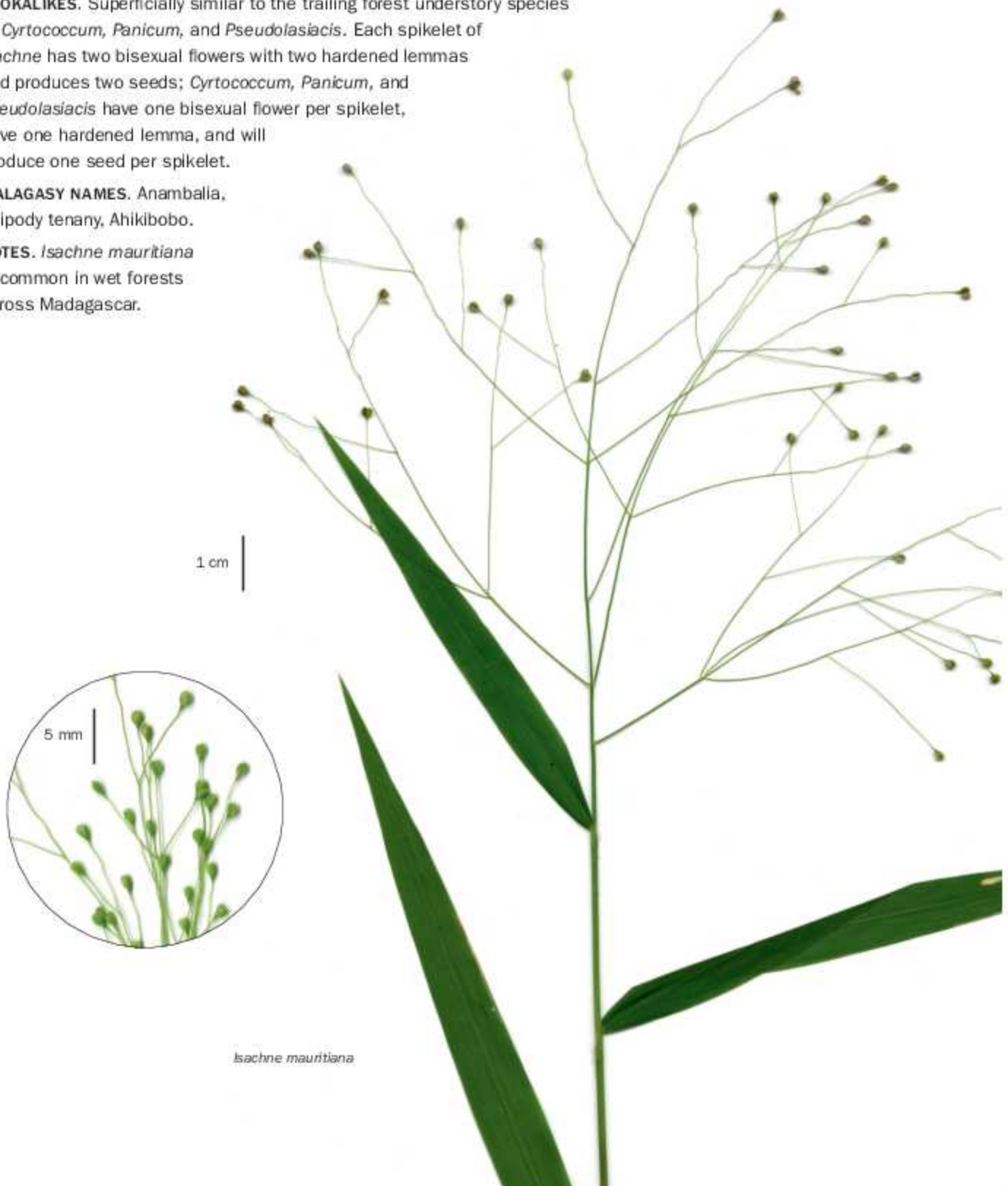
HABITAT. Humid forest understory at a range of altitudes; 0–2,500 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. Superficially similar to the trailing forest understory species of *Cyrtococcum*, *Panicum*, and *Pseudolasiacis*. Each spikelet of *Isachne* has two bisexual flowers with two hardened lemmas and produces two seeds; *Cyrtococcum*, *Panicum*, and *Pseudolasiacis* have one bisexual flower per spikelet, have one hardened lemma, and will produce one seed per spikelet.

MALAGASY NAMES. Anambalia, Ahipody tenany, Ahikibobo.

NOTES. *Isachne mauritiana* is common in wet forests across Madagascar.



Isachne mauritiana

Ischaemum

5 species, not endemic (tropical genus)

DESCRIPTION. Medium-sized annuals or perennials, often decumbent. Ligule membranous. Leaf sheaths often with auricles. Leaf blades linear. **Inflorescence of paired or digitate, 1-sided racemes, those of a pair often interlocked back-to-back and mimicking a solitary raceme**, often hairy; **rhachis internodes and pedicels exposed on the back of the raceme as a U- or V-shaped segment**. Spikelet with 2 florets. Sessile spikelet dorsally compressed; callus obtuse and inserted in the concave top of the internode. Lower glume chartaceous to coriaceous, convex to concave on the back, laterally 2-keeled, often rugose; upper glume awned or awnless; **upper lemma bifid, passing between the teeth into a glabrous awn**. Pedicelled spikelet as large as the sessile spikelet or much smaller.

HABITAT. Damp places near water, secondary vegetation and roadsides; 0–1,500 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. The best way to recognise *Ischaemum* is to look at the back of the racemes where the pedicels and the rhachis internodes form a flat curve. The racemes are thicker than those of the other Andropogoneae genera with several awned racemes: *Bothriochloa*, *Dichanthium*, and *Euclasta*. A reliable but difficult way to distinguish *Ischaemum* from *Andropogon* (and from *Cymbopogon*, *Schizachyrium*, *Hyparrhenia*, and *Hyperthelia*) is to find the lower floret of the sessile spikelet: on *Ischaemum* the lower floret produces a male flower and has a palea, while in *Andropogon* (and other genera) this floret produces no flower and has a lemma only, with no palea. *Andropogon* is an unusually erect plant of dry grassland and savanna, while *Ischaemum* often has creeping stems and is usually found near water.

MALAGASY NAMES. Taimboriky, Tskalabana.

NOTES. *Ischaemum rugosum* is easy to recognise by its sculpted lower glume of the sessile spikelet, and yellow racemes.



Ischaemum polystachyum



Lasiorhachis

3 species (endemic genus)

DESCRIPTION. Erect tufted perennials with solid culms 0.5–2 m tall. Ligule scarious. Leaf blades linear. **Inflorescence a contracted or open panicle 10–30 cm long** with 2 florets, with paired similar spikelets, one sessile, the other pedicelled. Internodes slender. **Spikelets lanceolate, glabrous or hairy, but without long callus hairs, with 2 florets.** Glumes thin. **Awn absent or up to 15 mm long.** Pedicelled spikelets either similar to sessile spikelets or variably reduced.

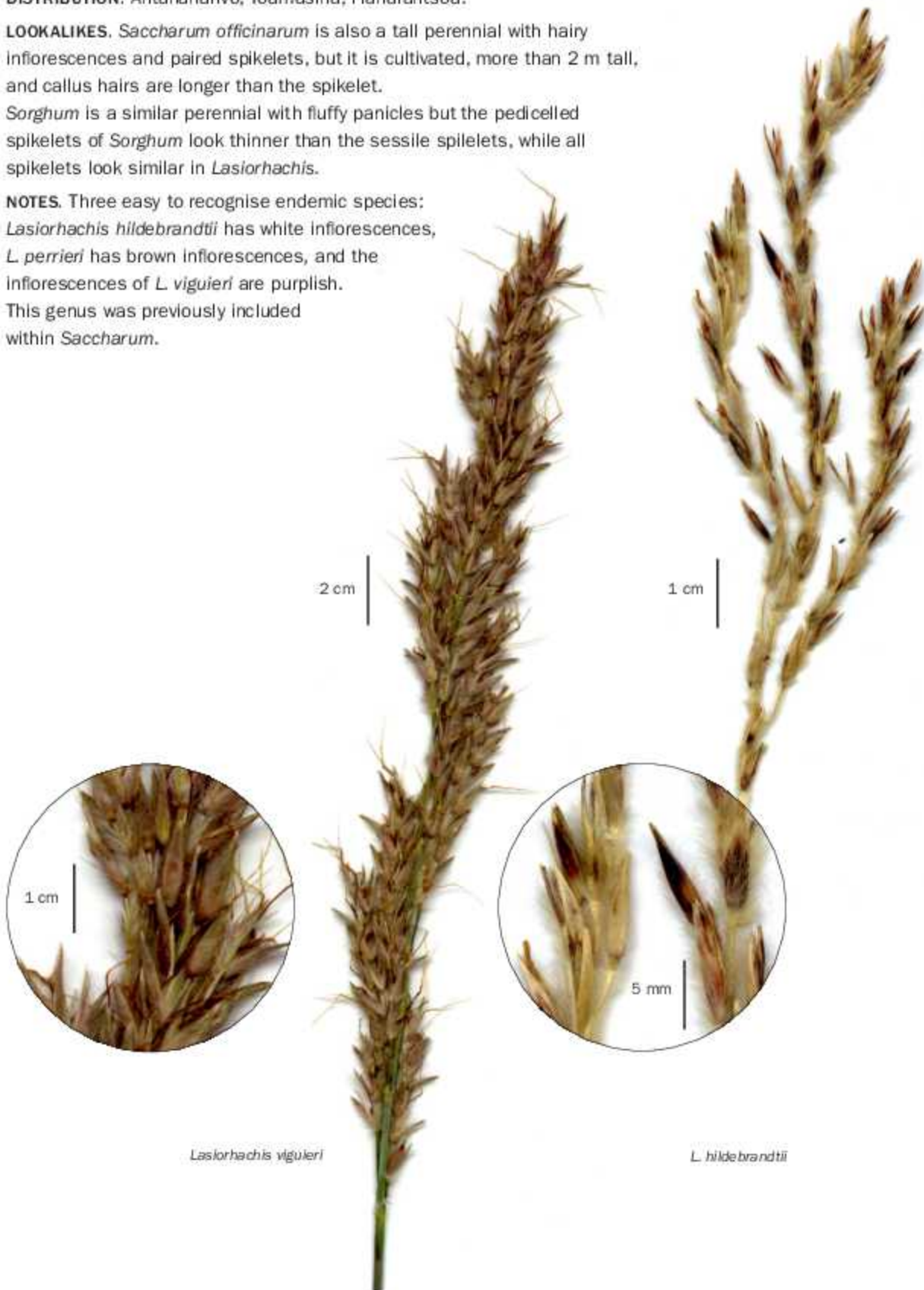
HABITAT. Wet forest understory, riversides and valley bottoms; 1,000–2,500 m elevation.

DISTRIBUTION. Antananarivo, Toamasina, Fianarantsoa.

LOOKALIKES. *Saccharum officinarum* is also a tall perennial with hairy inflorescences and paired spikelets, but it is cultivated, more than 2 m tall, and callus hairs are longer than the spikelet.

Sorghum is a similar perennial with fluffy panicles but the pedicelled spikelets of *Sorghum* look thinner than the sessile spikelets, while all spikelets look similar in *Lasiorhachis*.

NOTES. Three easy to recognise endemic species: *Lasiorhachis hildebrandtii* has white inflorescences, *L. perrieri* has brown inflorescences, and the inflorescences of *L. viguieri* are purplish. This genus was previously included within *Saccharum*.



Lasiorhachis viguieri

L. hildebrandtii

Lecomtella

Lecomtella madagascariensis (endemic monotypic genus)

DESCRIPTION. Perennial with thick bamboo-like scandent culms 1–2 m long. Ligule a fringe of hairs. Leaf blades lanceolate, apically attenuate. Inflorescence an oblong contracted panicle 5–6 cm, with male spikelets on lower parts of the panicle branches and one bisexual spikelet at the tip of each branch. Bisexual spikelets pedicelled, 2-flowered. Glumes shorter than spikelet. Lower floret male, the lemma similar to upper glume. **Upper floret female, the callus with two apical wings 0.5 mm long, the upper lemma oblong, dorsally compressed, coriaceous, pubescent, the lemma apex obtuse, tuberculate.** No awns.

HABITAT. Streams, rocks and at forest margins; 1,200–2,500 m elevation.

DISTRIBUTION. Fianarantsoa.

LOOKALIKES. The habit appears bamboo-like, the leaves resemble those of larger *Setaria*, while the panicle could resemble other high elevation pool genera with large spikelets such as *Helictotrichon*. The hairy fertile upper lemma, subtended by winged callus appendages and tuberculate at the apex, is unique in the grasses.

MALAGASY NAMES. Fataka, Fatakamanga.

NOTES. Restricted to the Andringitra area.



Lecomtella madagascariensis

Leersia

2 species, including 1 endemic (genus of tropical and warm temperate regions)

DESCRIPTION. Small straggling annuals or stoloniferous perennials, 20–90 cm long. Ligule membranous. Leaf blades flat, 2.5–10 mm wide. Inflorescence a slender open or contracted panicle. **Spikelets shortly pedicelled or sessile, 1-flowered, laterally compressed.** Glumes absent. Lemma thick, strongly keeled. Palea similar to lemma. No awn (*Leersia hexandra*) or straight awn 5–6 mm long (*Leersia perrieri*).

HABITAT. Always in damp places often partly submerged; 500–2,000 m elevation.

DISTRIBUTION. Mahajanga, Antananarivo, Toamasina, Fianarantsoa.

LOOKALIKES. Spikelets resembling those of rice (*Oryza*) but smaller, on a smaller scandent plant (*Oryza* plants are erect). Can be superficially similar to other small aquatic grasses e.g. *Brachiaria* and *Coelachne*; the spikelet shape needs to be examined: *Leersia* has flat oblong spikelets with both lemma and palea folded once, while *Brachiaria* and *Coelachne* spikelets are rounded and have at least one glume and two florets each.

MALAGASY NAMES. Ahikongona, Ahitsiriry, Hosihosy, Merakapaha, Tsiriry, Vilonahosihosy, Vilonaomby.

NOTES. *Leersia* spikelets look like miniature versions of rice spikelets, but without any small glumes/sterile lemmas at the bottom. The structure is the simplest of any grass: every spikelet has one lemma, one palea, a bisexual flower, and nothing else. There are three genera of rice relatives in Madagascar: *Maltebrunia* (forest plant with large tough leaves), *Leersia*, and *Oryza*.



2 cm

Leersia hexandra

Leptaspis

Leptaspis zeylanica (genus of Old World tropics)

DESCRIPTION. Perennial rhizomatous erect plants to 1 m. Ligule a ciliate membrane. **Leaf blades oblong, 10–30 x 2.5–6 cm, asymmetric, the venation unusual with secondary nerves diverging from the midvein**, with cross nerves, born on a pseudopetiole. Inflorescence a loose panicle, containing male and bisexual spikelets, with the females in a group at the base and the males terminal on the branchlets. Spikelets 1-flowered. Male spikelets smaller than the bisexual. Bisexual spikelets subsessile, shaped like a shell, inflated. Glumes shorter than the spikelet. **Lemma of bisexual spikelet shell-shaped, closed except for a tiny pore through which the stigmas and tip of the palea protrude, inflated, covered with stiff short hooked hairs.**

No awns.

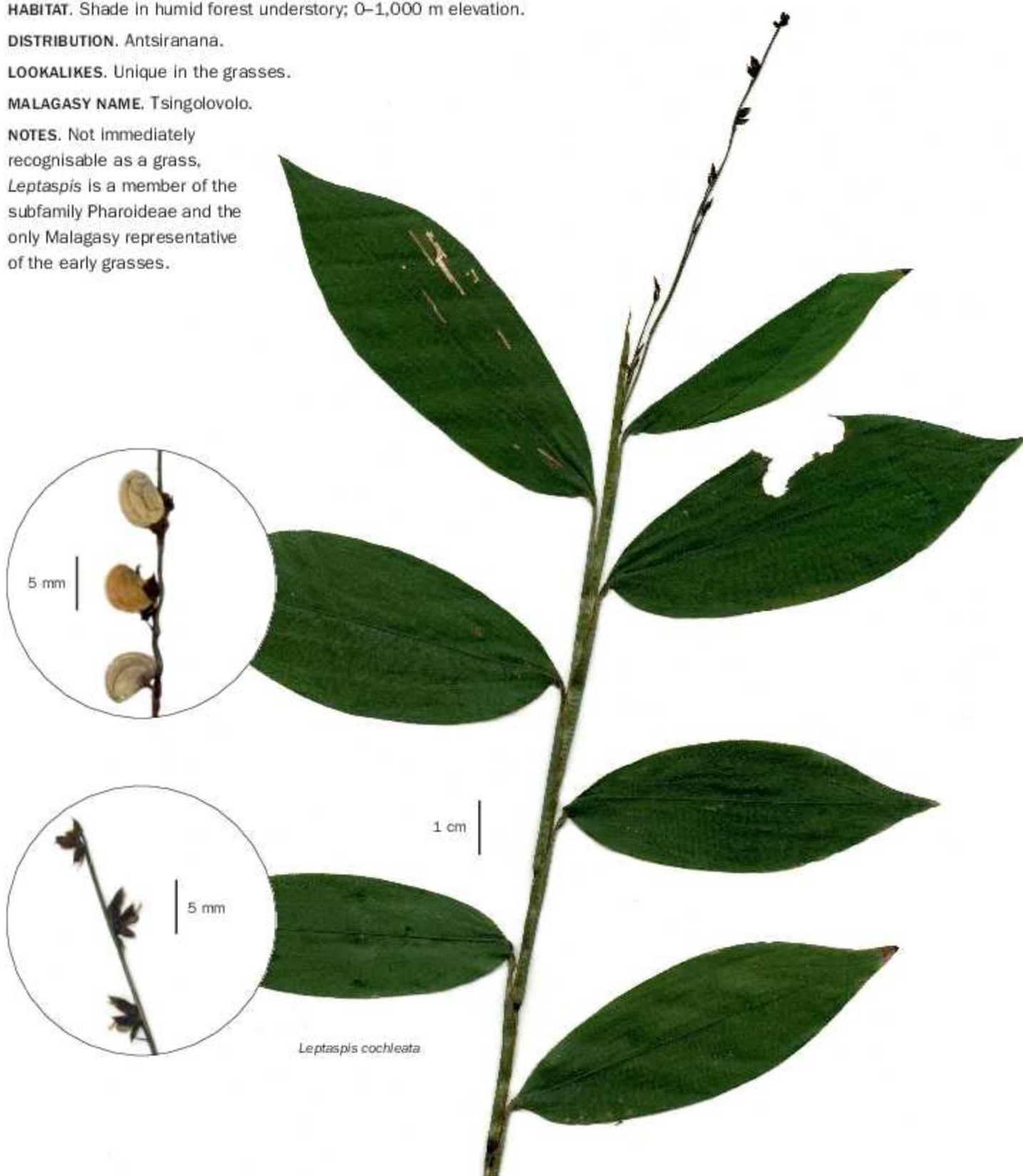
HABITAT. Shade in humid forest understory; 0–1,000 m elevation.

DISTRIBUTION. Antsiranana.

LOOKALIKES. Unique in the grasses.

MALAGASY NAME. Tsingolovolo.

NOTES. Not immediately recognisable as a grass, *Leptaspis* is a member of the subfamily Pharoideae and the only Malagasy representative of the early grasses.



Leptaspis cochleata

Leptocarydion

Leptocarydion vulpiastrum (monotypic African genus)

DESCRIPTION. Erect or geniculately ascending annual 0.1–1.2 m. Ligule a ciliate membrane. **Leaf blades ovate or lanceolate, 6–20 mm wide. Inflorescence a dense hairy panicle with many crowded racemes.** Spikelets shortly pedicelled, several-flowered, subsessile, laterally compressed, imbricate, appressed to the very slender rhachis of the spike-like racemes. Glumes shorter than the spikelet. Lemmas keeled, awned, **the lateral nerves silky-ciliate.**

Awn straight, filiform, 2.5–5 mm long.

HABITAT. Savanna and dry forest; 500–1,000 m elevation.

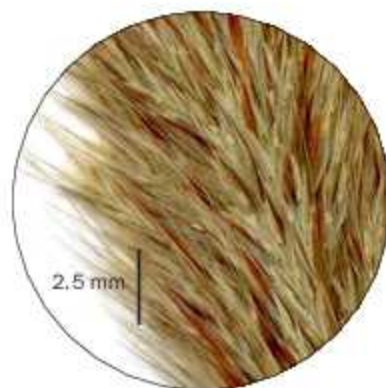
DISTRIBUTION. Mahajanga, Tollara.

LOOKALIKES. *Enneapogon* has similar whitish fluffy panicles, but in *Enneapogon* the fluffiness is caused by numerous awns arising from each lemma, while each lemma of *Leptocarydion* only has one awn and the additional hairs are much finer and arise from the lemma nerves.

Similarly whitish fluffy panicles can be found on *Neyraudia* and *Phragmites*, but both *Neyraudia* and *Phragmites* are much larger perennial plants.

MALAGASY NAMES. Ahipotsy, Volotsiriry.

NOTES. Rare. Found in more sheltered habitat than the related arid genera *Eragrostis*, *Dinebra* and *Diplachne*, demonstrated by its broader leaves.



Leptocarydion vulpiastrum

Lepturus

7 species, including 5 endemics (pantropical genus)

DESCRIPTION. Small creeping or ascending stoloniferous or caespitose perennials. Ligule membranous with ciliate margin. Leaf blades linear to narrowly lanceolate. **Spike cylindrical, disarticulating transversely or obliquely at the nodes. Spikelets 1-flowered, alternate, embedded in hollows on the opposite sides of the cylindrical rhachis**, subulate, lanceolate, or oblong. Lower glume adaxial, usually suppressed; upper glume 5–12-nerved, cartilaginous, thick and indurated, truncate, acute, or tapering into a straight awn. Lemma boat-shaped. **No awns.**

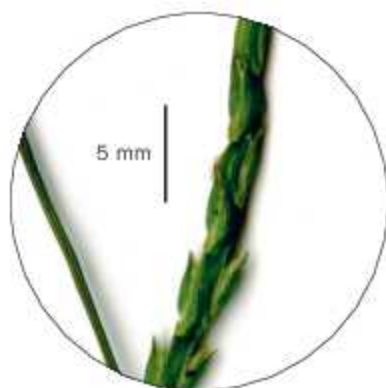
HABITAT. Sand, grassland and dry forest understory near sea shores; 0–500 m elevation.

DISTRIBUTION. All except Antananarivo.

LOOKALIKES. *Lepturus* is a member of the subfamily Chloridoideae with single, not paired, spikelets and 3-nerved lemmas, but the condensed inflorescence of *Lepturus* is unique among the Malagasy Chloridoideae and superficially similar to that of Andropogoneae genera with single terminal tubular awnless racemes: *Hemarthria*, *Elionurus*, *Oxyrhachis*, and *Rottboellia*. *Hemarthria* is also a creeping plant with deceptively similar racemes, but *Hemarthria* racemes are numerous in a large false panicle, and the whole plant has a reddish colour (*Lepturus* usually has one raceme per culm and the whole plant is green with green or brown racemes). *Rottboellia* and *Elionurus* are larger erect plants.

MALAGASY NAMES. Ahipody, Tsilavonomby.

NOTES. The spike can disintegrate after collection; drying the specimens quickly can prevent this.



Lepturus humbertianus

Loudetia

2 species (tropical genus)

DESCRIPTION. Erect caespitose perennials to 1.5 m. Ligule a ciliate fringe. Leaf blades linear, flat or rolled. **Inflorescence an open panicle. Spikelets solitary, 2-flowered, brown, 6–13 mm long, often with trichomes arising from dark brown tubercles.** Glumes as long as the spikelet. Lower lemma similar to the upper glume. Upper lemma thick, awned. **Awn geniculate, 2–4 cm long. Callus oblong to linear, truncate or 2-toothed.**

HABITAT. Mature grassland and savanna; 100–2,000 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. *Loudetia* is usually easy to recognise by its large grey-brown panicles, long awn on each spikelet, and the commonly present prominent tubercle-based hairs. The related *Tristachya* has similar spikelets but the spikelets of *Tristachya* are fused in groups of 3 on one pedicel, so there are 3 awns arising from each spikelet group, while *Loudetia* spikelets are solitary with one awn arising from each pedicelled spikelet. *Chrysopogon* can be similar in general habit in open grassland but it has a triad of spikelets subtended by reddish hairs at the tip of every panicle branch (or racemes of paired spikelets in *C. zizanioides*; one spikelet on every pedicel in *Loudetia*).

The spikelet structure is similar to that of the erect caespitose marsh grass *Arundinella*, but *Arundinella* spikelets are much shorter and the awn is barely visible.

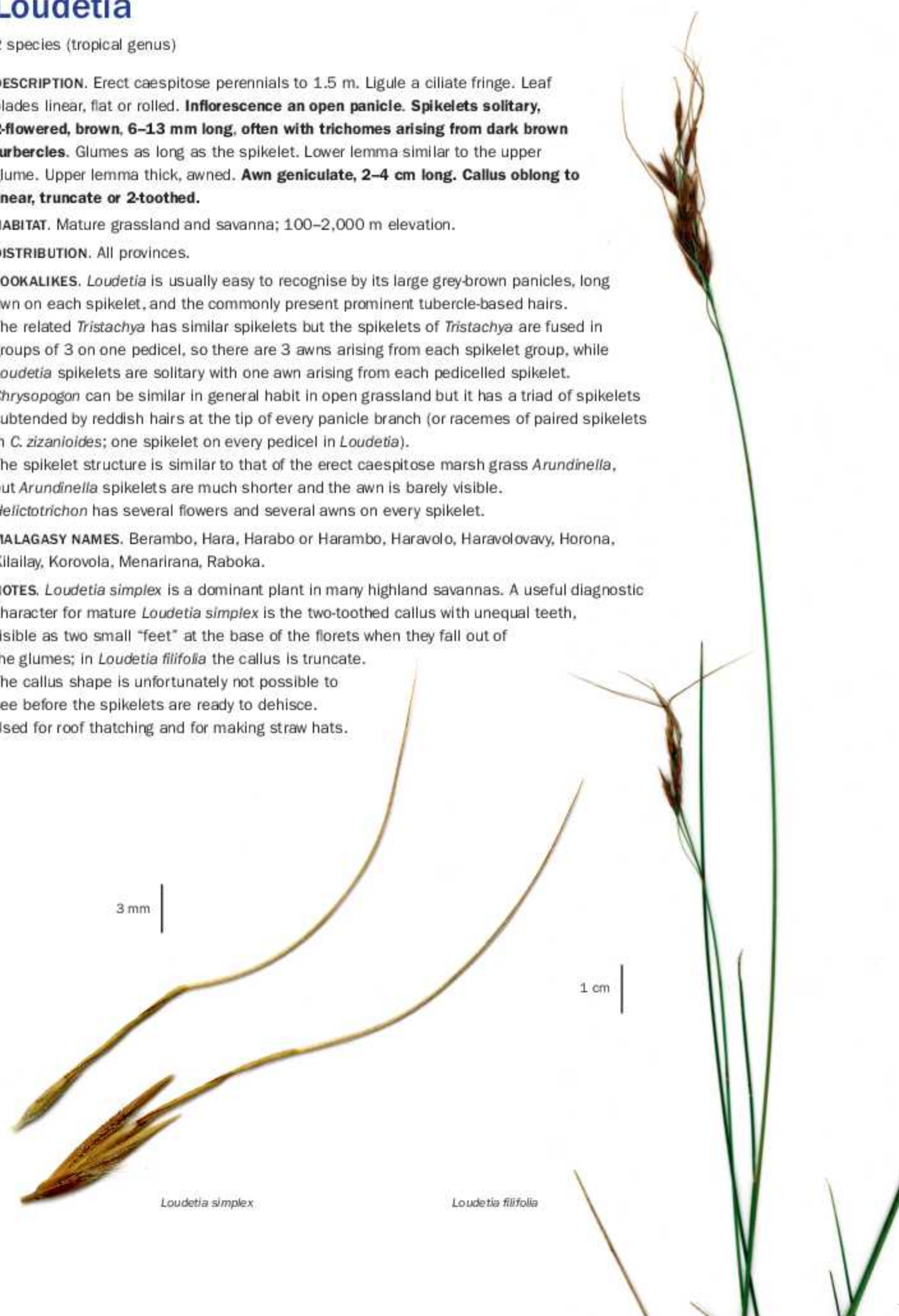
Helictotrichon has several flowers and several awns on every spikelet.

MALAGASY NAMES. Berambo, Hara, Harabo or Harambo, Haravolo, Haravolovavy, Horona, Kilailay, Korovola, Menarirana, Raboka.

NOTES. *Loudetia simplex* is a dominant plant in many highland savannas. A useful diagnostic character for mature *Loudetia simplex* is the two-toothed callus with unequal teeth, visible as two small “feet” at the base of the florets when they fall out of the glumes; in *Loudetia filifolia* the callus is truncate.

The callus shape is unfortunately not possible to see before the spikelets are ready to dehisce.

Used for roof thatching and for making straw hats.



Loudetia simplex

Loudetia filifolia

Maltebrunia

Maltebrunia leersioides, endemic (African genus)

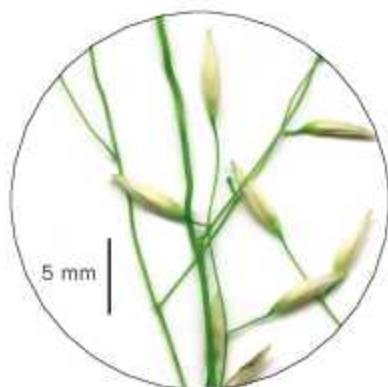
DESCRIPTION. Erect perennials to 70 cm, arising from short rhizomes. Ligule a membrane. **Leaf blades thick, lanceolate to elliptic, 10–25 cm long, with transverse nerves, on a false petiole 3–12 cm. Inflorescence a panicle.** Spikelets 3-flowered, narrowly lanceolate, laterally compressed, acuminate, **awnless, white to pale yellow.** Glumes persistent, vestigial. **Two lower florets represented only by narrow sterile lemmas and are hard to see under the much larger hermaphrodite floret.** Upper floret hermaphrodite; lemma firmly membranous or chartaceous, 5-nerved, clasping the palea. No awns.

HABITAT. Shade in forest understory; 0–800 m elevation.

DISTRIBUTION. Antsiranana, Toamasina, Fianarantsoa, Toliara.

LOOKALIKES. *Maltebrunia* does not look like a typical Poaceae and no other grasses resemble it closely. Forest understory habitat and long thin inflorescences can be mistaken for *Poecilostachys*, but *Poecilostachys* does not have pseudopetioles and has racemes rather than a panicle. Pseudopetiolate thick leaves of *Maltebrunia* can be similar to those of *Leptaspis*, but *Leptaspis* has noticeably inflated hairy lemmas while *Maltebrunia* has spikelets similar to those of rice.

NOTES. *Maltebrunia* and *Leersia* are relatives of rice (*Oryza*). These three genera share rice-like flat spikelets with one hardened bisexual floret, with the lemma and palea folded once. The two sterile lemmas at the base of the bisexual floret are sometimes interpreted as two glumes; they occur in all *Maltebrunia* and some *Oryza* but never in *Leersia*.



Maltebrunia leersioides



Megastachya

2 species, 1 of these endemic (tropical African genus)

DESCRIPTION. Erect weakly tufted annual or short-lived perennial. Ligule a short membrane. **Leaf blades lanceolate, 1–3 cm wide**, with cross nerves. **Inflorescence an open panicle. Spikelets pedicelled, solitary, 8–18(–31)-flowered, laterally compressed.** Rhachilla easily disarticulating above the glumes and between the florets. Florets all fertile and hermaphrodite. Glumes slightly unequal, both shorter than the following floret, 3(–5)-nerved, chartaceous. Lemmas 7-nerved, chartaceous, with the apex shortly 2-fid or rarely entire and the middle nerve running out into a short mucro. **No awns.**

HABITAT. Forest understory, often on sand, 0–1,300 m elevation.

DISTRIBUTION. All except Antananarivo.

LOOKALIKES. Panicles and spikelets of *Megastachya* are commonly mistaken for *Eragrostis* but *Eragrostis* has narrow leaves and grows in open habitats.

The related forest understory genus *Centotheca* is similar in habit but has only 1–4 florets per spikelet and the lemmas have retrorse bristles (*Megastachya* has over 8 florets per spikelet at maturity and the lemmas are smooth).



Megastachya mucronata

Melinis

3 species, none endemic (genus of tropical Africa)

DESCRIPTION. Erect medium-sized annuals or perennials. Ligule a ciliate rim. Leaf blades flat. **Inflorescence a panicle with capillary branches. Spikelets 2-flowered, slightly laterally compressed, glabrous or silky hairy.** Lower glume small or suppressed; upper glume as long as the spikelet, membranous to chartaceous, 5–7-nerved, straight on the back or inflated below the middle, emarginate to bilobed, **sometimes awned** from the sinus; lower floret usually sterile, its lemma narrower than the upper glume and usually awned; upper lemma smaller than the lower, cartilaginous, smooth, laterally compressed.

HABITAT. Open weedy habitats, 0–2,000 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. *Melinis* with awns can resemble *Setaria*, but with spikelets smaller than those of *Setaria* and awns originating from the glumes (*Setaria* bristles are thicker and originate from below the spikelets).

MALAGASY NAMES. Ahikongona, Ahipody, Ahitsiriry, Ahitsolika, Menapaka, Menakapaha, Sandrahiriky.

NOTES. *Melinis repens* with pink fluffy spikelets is omnipresent in disturbed areas of Madagascar; it was previously called *Rhynchelytrum repens* or *R. roseum*. *Melinis minutiflora* is also a common weed recognisable by its sticky glandular leaves and stems and a noticeable smell. Lateral compression of the floret (i.e. so the lower and the upper florets are side by side, not one behind the other) is unusual in the Paniceae.



Merxmuellera

3 species, including 2 endemics (genus of Africa and Madagascar)

DESCRIPTION. Erect tufted perennial 0.3–1 m tall. Ligule a line of hairs. **Leaf blades tough, rolled.** Inflorescence a contracted panicle. **Spikelets with 3–8 fertile florets. Glumes slightly shorter than the florets or longer than the florets, 7–18 mm, membranous, drying orange.** **Lemmas 3-lobed, with tufts of white hair protruding behind the glumes,** side lobes sometimes extended into awns. Central lemma lobe extended into an **awn 4–10 mm long.**

HABITAT. Montane savanna and rocks, 1,500–2,500 m elevation.

DISTRIBUTION. Antsiranana, Mahajanga, Fianarantsoa, Toliara.

LOOKALIKES. *Helictotrichon* is a montane genus with similar spikelets, but its glumes are slightly shorter than the lowest lemma and it has no hair tufts on the lemmas.

Pentameris is a related montane genus with similar long glumes, but it has a more delicate open panicle and smaller spikelets with 2 florets per spikelet.

NOTES. *Merxmuellera ambalavaoensis* (endemic), *M. tsaratananensis* (endemic), and *M. macowanii* (also in Southern Africa) have previously been placed under *Danthonia* and *Rytidosperma*.



1 cm

Merxmuellera ambalavaoensis

Microchloa

Microchloa kunthii (pantropical genus)

DESCRIPTION. Small tufted perennials with slender wiry culms to 60 cm, the base clothed in fibrous remains of leaf sheaths. Ligule a very short membranous rim. Leaf blades narrow, stiff, convolute, the leaves mostly crowded at base. **Inflorescence a solitary terminal slender curved 1-sided purple spike 2–15 cm long. Spikelets 1-flowered or with a second well-developed male floret**, subterete. Glumes enclosing the florets. Lemma acute. **No awns.**

HABITAT. Open grassland and savanna, often on sand or rocks; 1,000–2,200 m elevation.

DISTRIBUTION. Antananarivo, Fianarantsoa, Toliara.

LOOKALIKES. Other genera with single terminal racemes and no awns include *Elionurus*, *Hemarthria*, and *Lepturus*, all of which have larger spikelets and lack the distinctive curved shape of *Microchloa* racemes. Terminal curved racemes are also found in *Ctenium*, a larger plant with obvious multiple awns on the raceme.

NOTES. Recognisable by its single gently curved terminal raceme and compact densely tufted habit.



Microchloa kunthii

Microstegium

Microstegium nudum (tropical Asian genus)

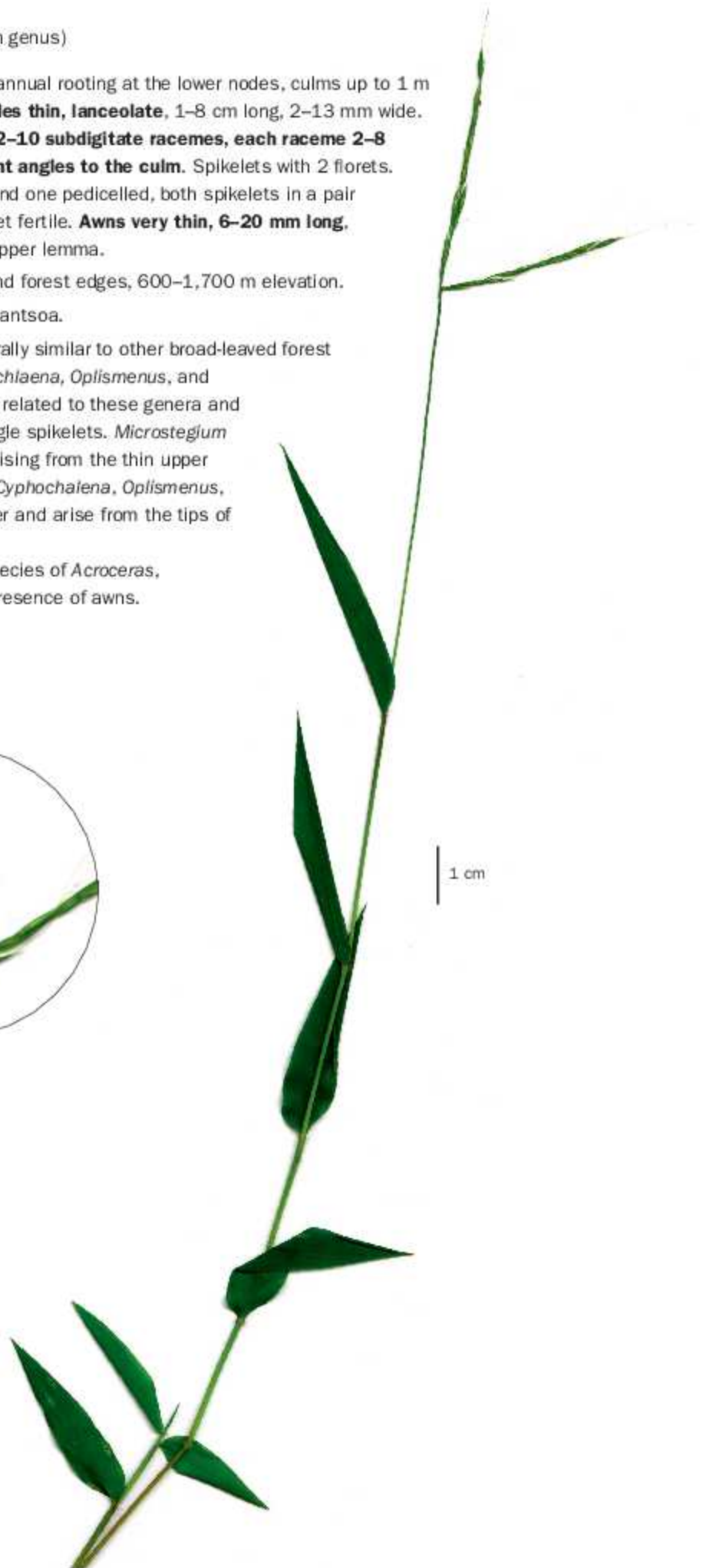
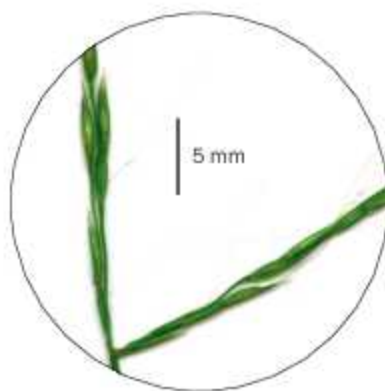
DESCRIPTION. Creeping ascending annual rooting at the lower nodes, culms up to 1 m long. Ligule a membrane. **Leaf blades thin, lanceolate**, 1–8 cm long, 2–13 mm wide. **Inflorescence a terminal group of 2–10 subdigitate racemes, each raceme 2–8 cm long and often spreading at right angles to the culm.** Spikelets with 2 florets. Spikelets paired with one sessile and one pedicelled, both spikelets in a pair 2.5–5 mm long, with the upper floret fertile. **Awns very thin, 6–20 mm long**, arising from the tip of the hyaline upper lemma.

HABITAT. Shady places in forests and forest edges, 600–1,700 m elevation.

DISTRIBUTION. Antananarivo, Fianarantsoa.

LOOKALIKES. *Microstegium* is generally similar to other broad-leaved forest grasses with awns including *Cyphochlaena*, *Oplismenus*, and *Poecilostachys*, but it is not directly related to these genera and has paired spikelets instead of single spikelets. *Microstegium* also has very thin and soft awns arising from the thin upper lemma, different from the awns of *Cyphochlaena*, *Oplismenus*, and *Poecilostachys* which are thicker and arise from the tips of the glumes.

Microstegium differs from forest species of *Acroceras*, *Cyrtococcum* and *Panicum* by the presence of awns.



Microstegium nudum

Moorochloa

Moorochloa eruciformis (genus of Africa and Asia)

DESCRIPTION. Erect loosely tufted annual 10–60 cm tall. Ligule a line of hairs. Leaf blades linear to narrowly lanceolate, 2–6 mm wide. **Inflorescence composed of erect racemes appressed to a common axis.** Spikelets overlapping, elliptic, 2-flowered, 1.7–2.7 mm long, hairy, acute. Lower glume a small scale. Upper glume as long as the spikelet. **Upper lemma hardened, smooth, shiny, obtuse. No awns.**

HABITAT. Dry secondary vegetation, savanna, 0–500 m elevation.

DISTRIBUTION. Mahajanga, Toliara.

LOOKALIKES. *Urochloa* (including *Brachiaria*, where this species was previously placed) is difficult to distinguish; its racemes are usually not appressed to the central axis, and the upper lemma ends in a fine point.



1 cm

Moorochloa eruciformis

Nastus

10 species all endemic (genus of Madagascar and Le Réunion)

DESCRIPTION. Clumping bamboo with pachymorph rhizomes and short or relatively long necks. **Culms erect with scrambling or climbing upper parts, generally solid** (rarely with a small lumen), internodes smooth, usually glabrous. Branches borne below supranodal ridge where the sheath scar curves downward, **several to many at each node, middle branch often dominant and elongating**, bearing branches at each node. Young shoots pale green, slender, glabrous. Culm sheaths stramineous, usually glabrous, blades linear-lanceolate. Leafy branches not more than 20 cm long. **Leaf blades linear or linear-lanceolate, tapering to long tips**, 4–12 cm long, glabrous or pubescent, midrib often prominent on upper surface, auricles not prominent with long fimbriae. Inflorescences terminating leafy branches, **spicate or racemose**, determinate, with or without subtending bracts, up to 25 cm long. Spikelets laterally compressed, usually sessile, 4–9(15) mm long, comprising 4–6 glumes, one fertile floret, and a rachilla extension with much reduced floret.

HABITAT. Wet montane forest throughout Madagascar, 500–2,000 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. *Nastus* differs from *Hickelia* by its narrow (lanceolate to linear-lanceolate) leaf blades.

Sirochloa has long auricles and grows at low elevations.

MALAGASY NAMES. Volosarona, Voloandotra.

NOTES. *Nastus* is probably the most common bamboo genus in Madagascar's montane forests. It can be recognized by its fine leaf blades, several to many branches at each node, raceme or spike inflorescences at the ends of leafy branches, and by laterally compressed spikelets. *Nastus elongatus* is widely distributed in montane forests; the culms are erect at the lower part, then scrambling or leaning over nearby vegetation or trees, to 10 m long, with a diameter of 0.7–3 cm; branches 20–80 at each node; leafy branches are about 40 cm long, and leaf blades linear-lanceolate, 10–15 cm long. *Nastus* species, especially *N. elongatus*, are eaten by bamboo lemurs. The South-East Asian species are not true *Nastus*, and will be renamed in the future.



Neostapfiella

3 species (genus endemic to Madagascar)

DESCRIPTION. Ascendant perennial to 30 cm long, usually stoloniferous. **Leaf sheaths flat at base.** Ligule a ciliate membrane. **Leaf blades linear or lanceolate, fairly broad and apically obtuse or rounded, pale white-green.** **Inflorescence composed of 1–2(3) erect flat terminal racemes.**

Spikelets sessile, in 2 rows. Spikelets comprising 2 fertile florets, broadly triangular; laterally compressed, 3–5.5 mm long, disarticulating below each fertile floret. Glumes shorter than spikelet, gaping. Fertile lemma elliptic or obovate, laterally compressed, coriaceous, keeled, awned. **Awn straight, 2–15 mm long.**

HABITAT. Sand, dry forest and savanna; 0–500 m elevation.

DISTRIBUTION. Antsiranana, Mahajanga, Toliara.

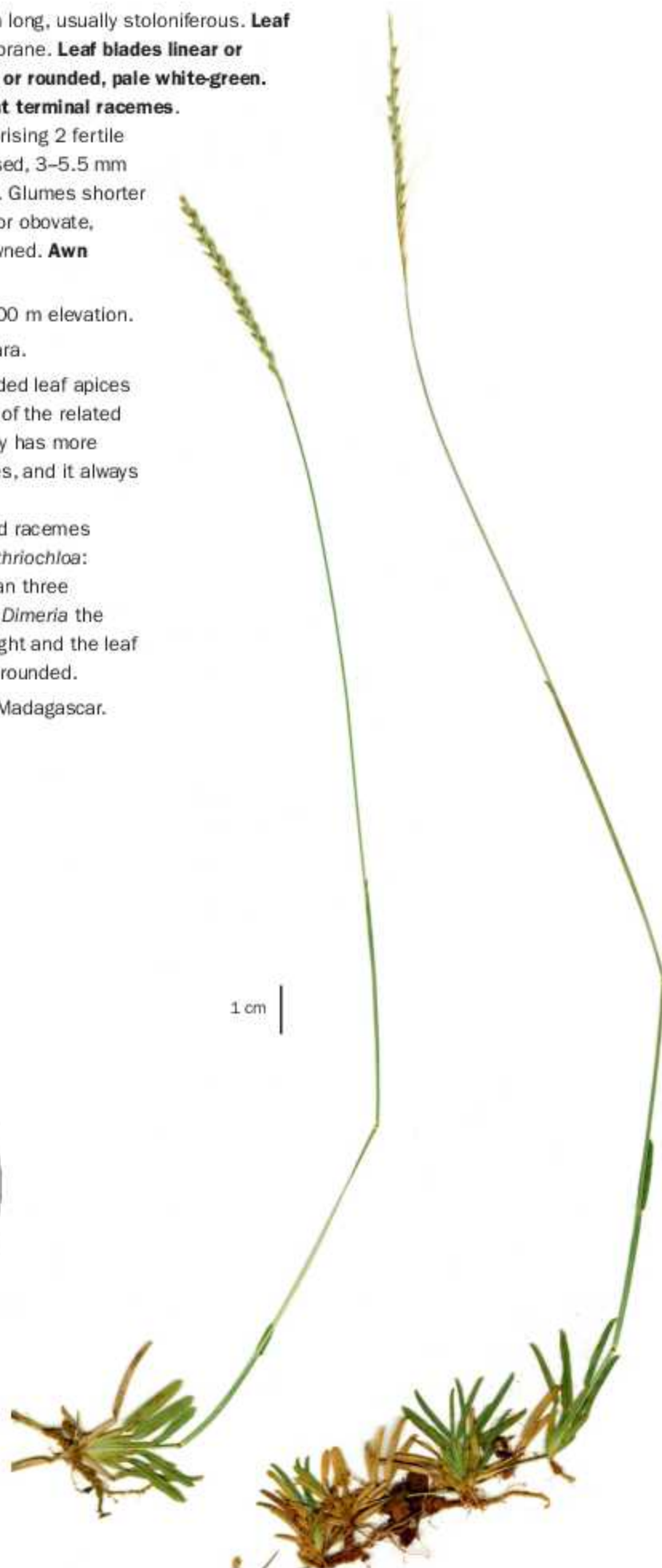
LOOKALIKES. The flat branching points, rounded leaf apices and triangular spikelets are similar to those of the related common weedy genus *Chloris*. *Chloris* usually has more numerous and more densely packed racemes, and it always produces only one seed per spikelet.

The small habit in dry areas and erect awned racemes can resemble *Dimeria*, *Dichanthium*, and *Bothriochloa*: *Dichanthium* and *Bothriochloa* have more than three racemes while *Neostapfiella* has 1–2(–3); in *Dimeria* the awn is geniculate on drying rather than straight and the leaf apices are acuminate rather than obtuse or rounded.

NOTES. Common ground cover in northwest Madagascar.



Neostapfiella chloridantha



Neyraudia

Neyraudia arundinacea (genus of Old World tropics)

DESCRIPTION. Erect perennials 2–4 m tall with stems up to 1 cm in diameter, leaves arising all the way up the stems. Ligule a fringe of hairs. Leaf blades broad and flat or rolled, firm, deciduous from the sheath.

Inflorescence a large plumose panicle. Spikelets 2–7-flowered, the florets well exerted from the glumes, disarticulating above the glumes and between the florets, all florets bisexual or the lowermost sterile and lacking a palea. Glumes membranous, unequal, acuminate or drawn out into a short awn-point. **Lemmas long-ciliate on the lateral nerves**, with a recurved awn from the sinus.

HABITAT. Stream banks and rocky places, grassland; 700–1,700 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. The habit and inflorescence are similar to *Phragmites* with which it is frequently confused, but *Neyraudia* is usually smaller and grows higher up in drier places. To distinguish between *Neyraudia* and *Phragmites* remove one spikelet, pull off the glumes, and examine the florets with a hand lens to see where the hairs originate. In *Phragmites*, all hairs originate from the bottom of the rachilla and the lemmas are glabrous; in *Neyraudia*, the hairs arise higher up, from the upper part of the lemma itself.

In the cultivated ornamental *Cortaderia* all leaves arise from the base of the plant.

MALAGASY NAMES. Andrasika or Andrasiko, Fantaka, Fantakabe or Fatakambe, Fatakana, Fatakandahy.

NOTES. Common but less frequent than the omnipresent *Phragmites*, occurs in higher and better-drained areas than *Phragmites*.



Oldeania

Ca. 6 endemic species (genus of Africa and Madagascar)

DESCRIPTION. Bamboo with pachymorph rhizomes, the rhizomes with long necks. **Culms erect**, about 2–7 m tall, with the diameter up to 1.5 cm, internodes smooth, with relatively thick walls, nodes swollen or not swollen.

Branches erect at the node, few to several at each node, more or less of the same size. Culm leaves usually hairy, blades erect, narrow with pointing tips. Leaf blades narrowly lanceolate or ovate-lanceolate, rigid or not rigid, 2–15 cm long, up to 1 cm wide, lower surface above the petiole densely hairy, otherwise glabrous.

Inflorescence determinate, panicle, up to 20 cm long, axis glabrous or hairy. Spikelet 2–5 cm long, comprising 2 glumes and 3–6 florets, rachilla internodes 6–8 mm long, glabrous or hairy; glumes glabrous; lemma glabrous, ovate, acute, palea bimucronate; lodicules present, 3; stigmas 3; stamens 3.

HABITAT. Forest clearings, streams, rocks, 750–2,200 m elevation.

DISTRIBUTION. Antananarivo, Antsiranana, Fianarantsoa, Toamasina, Toliara.

LOOKALIKES. Differs from the other native bamboos of Madagascar (*Cathariostachys*, *Decaryochloa*, *Nastus*, *Sirochloa*, *Valiha* and *Sokinochloa*) by its spikelets with 2 glumes, 4–6 florets, 3 stigmas and 3 stamens.

Oldeania culms are more erect than the other native bamboos, and the bases of its branches are erect and appressed to the culm (the bases of branches in other native bamboos spread away from the culm). *Oldeania* plants are smaller than the introduced *Bambusa*, *Dendrocalamus*, and *Gigantochloa*.

NOTES. Previously classified in the genus *Arundinaria*, and in *Yushania*. The true genus *Arundinaria* is found only in North America. The species included here in *Oldeania* are different from the true *Arundinaria* in having sympodial rhizomes with long necks.

Used for making roofs in Ranomena, near Ambositra.

5 mm

1 cm

Oldeania itremoensis

Olyra

Olyra latifolia (genus with centre of diversity in South America)

DESCRIPTION. Scandent long-stemmed bamboo-like woody perennials to 4 m, with leaves on the upper part of the stem. Ligules thinly membranous. **Leaf blades ovate to oblong, asymmetric**, chartaceous, 10–20 cm long and 3–6 cm wide, on a short twisted pseudopetiole. Inflorescence a terminal panicle 7–25 cm long, purple when young. Spikelets 1-flowered. Male spikelets more numerous and smaller than the female. Female spikelets large, conspicuous, in the upper part of the inflorescence above the male spikelets. **Glumes with a tail 3–20 mm long. Lemma bony, rounded, white. No awns but glume apices look like awns.**

HABITAT. Forest understory; 0–1,800 m elevation.

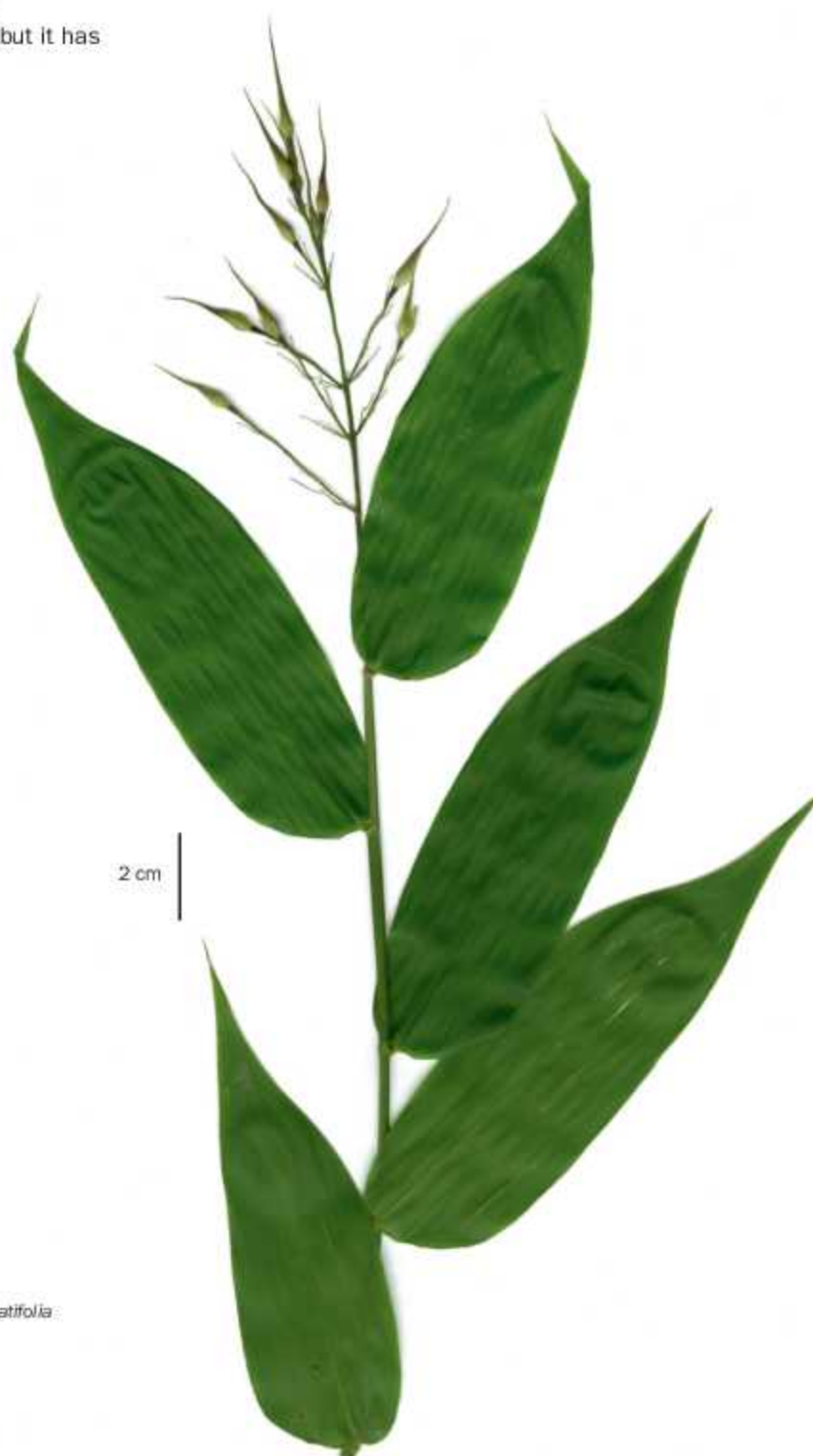
DISTRIBUTION. All provinces except Antananarivo.

LOOKALIKES. Commonly collected plant of unusual appearance; unique in the grasses. Basally rounded asymmetric leaves on a twisted pseudopetiole are easy to recognise as are the hard white mature female lemmas inside the long-tailed female glumes.

Pseudolasiacis is also a scandent forest plant but it has symmetric leaf bases.

MALAGASY NAMES. Maheritola, Tsigegolovolo, Tsipipitra, Valoriotrabe or Voloriotrabe, Viko, Voavalotra, Volovavy, Volopoko, Voloko.

NOTES. Common component of wet forest across Madagascar.



Olyra latifolia

Oplismenus

5 species including 1 endemic (tropical and subtropical genus)

DESCRIPTION. Annuals or perennials with weak trailing culms. Ligule short, membranous, with ciliate fringe. Leaf blades broadly linear to ovate, membranous. **Inflorescence composed of short racemes along a central axis;** rhachis bearing paired spikelets. Spikelets lanceolate with weak lateral compression. 2-flowered. **Glumes subequal, shorter than the spikelet, usually awned.** Lower floret sterile, the lemma acute or with a short awn-point. Upper lemma subcoriaceous, smooth, shining.

HABITAT. Wet forest understory and shady weedy places. Often found on shady roadsides and lawns in Antananarivo. 0–2,500 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. *Poecilostachys* is difficult to separate from some species of *Oplismenus*: it has a similar forest understory habit and racemes but it lacks the long awns appearing basal to each spikelet cluster, and its racemes are generally longer.

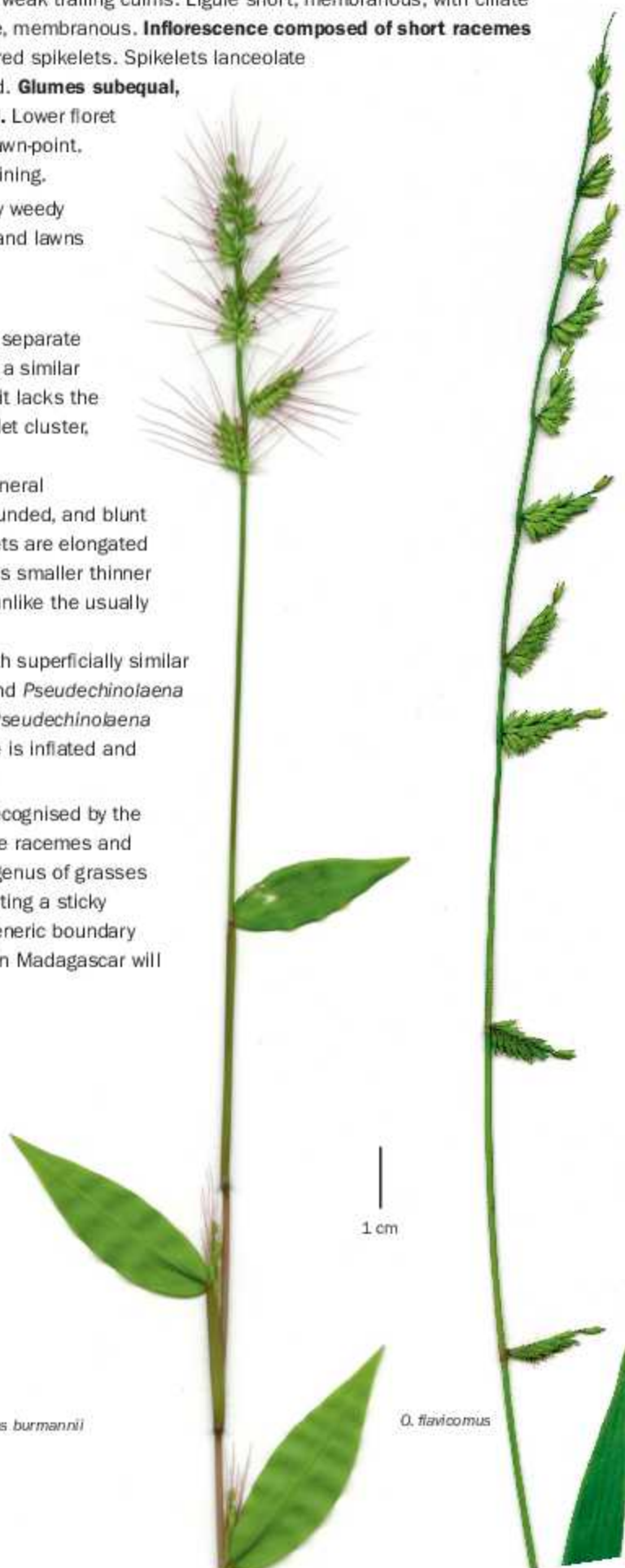
Cyphochlaena is similar in habitat and general appearance but its spikelets are hard, rounded, and blunt at the apex, while the *Oplismenus* spikelets are elongated and apically acute; *Cyphochlaena* also has smaller thinner awns which are not immediately visible, unlike the usually prominent awns of *Oplismenus*.

Other weak forest understory grasses with superficially similar racemes include *Acroceras*, *Brachiaria*, and *Pseudechinolaena* but unlike *Oplismenus* these lack awns; *Pseudechinolaena* sometimes has awns but its upper glume is inflated and bears appendages at maturity.

NOTES. Common. Most species can be recognised by the clusters of spikelets equidistant along the racemes and prominent awns. *Oplismenus* is the only genus of grasses with glandular awns (in *O. hirtellus*), excreting a sticky substance to help seed dispersal. The generic boundary between *Oplismenus* and *Poecilostachys* in Madagascar will need to be reassessed.



Oplismenus burmannii



O. flavicomus

Oryza

3 species (tropical and subtropical genus)

DESCRIPTION. Erect or floating annuals or perennials to 1.5 m tall. Culms often spongy, usually hollow between the nodes. Ligule membranous. **Inflorescence a many-flowered erect or drooping open panicle. Spikelets 3-flowered (look 1-flowered), strongly laterally compressed**, falling entire from the pedicel in wild plants. Glumes absent. Two lower florets represented only by narrow lemmas. Upper floret hermaphrodite, 5–10 mm long. Lemma coriaceous, strongly keeled, prominently 5-nerved, **with or without an awn to 6 cm long**. Palea like lemma, keeled, 3-nerved. Edible caryopsis (rice grain) develops between the lemma and the palea.

HABITAT. Moist habitats, edges of rivers, below 2,000 m elevation.

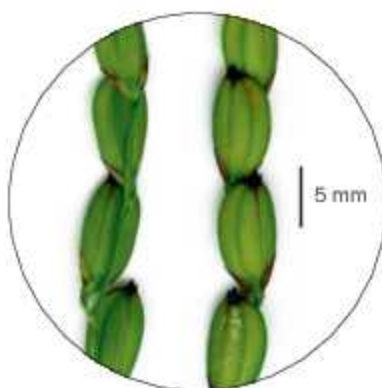
DISTRIBUTION. All provinces.

LOOKALIKES. *Leersia* has similar spikelets, but the spikelets are smaller, and it is a smaller scandent plant.

MALAGASY NAMES. *Oryza longistaminata*: Behatoka, Jama, Varijao, Varinandriananahary, Vary andrianahary.

Oryza sativa: Angeka, Angeky, Angika, Boritika, Botrivaventy, Fampitanana, Kallia, Karaokana, Kelimidina, Ketsa, Kiriminy, Kiritika, Lambambary, Lantsidaty, Lohambitro, Maintisomotra, Masonkibobo, Rojo, Tsipala, Vary.

NOTES. The cultivated rice, *Oryza sativa*, is the most common crop in Madagascar and includes numerous cultivars. All varieties and cultivars of *O. sativa* have been imported from Asia. The two native wild species of rice, *O. longistaminata* and *O. punctata*, differ by always having awns (*O. sativa* can be awned or awnless) and by their perennial habit (*O. sativa* is annual); these produce a small number of seeds that are not eaten except during famines.



Oryza sativa



Oxyrhachis

Oxyrhachis gracillima, monotypic African genus

DESCRIPTION. Erect perennial 10–60 cm tall. Ligule a short membrane. Leaf laminas rolled. **Inflorescence a solitary erect purplish cylindrical raceme 5–16 cm long;** the spikelets borne singly on alternate sides of the rachis; internodes strongly oblique at base and apex. Spikelet sessile, sunk in the internode, oblong, 2-flowered. Callus obtuse. Lower glume smooth. **Upper lemma entire. Pedicels and pedicelled spikelet absent. No awns.**

HABITAT. Plateau marshes above 1,000 m elevation.

DISTRIBUTION. Antananarivo only.

LOOKALIKES. *Rhynchacne* has similar habit and similar single racemes, but transverse raceme joints, and pedicels.

Elionurus is also erect with similar racemes but its racemes droop and it has pedicelled spikelets.

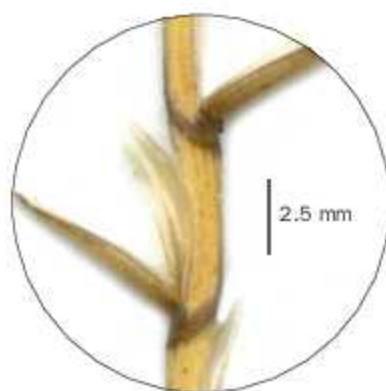
Hemarthria and *Lepturus* have similar racemes but they are creeping plants, not erect.

Rottboellia is a much larger plant, with a pedicelled spikelet present.

Schizachyrium appears similar but always has awns.

MALAGASY NAME. Ahitsorohitra.

NOTES. Small plant with inflorescences that are difficult to notice.



5 mm

Oxyrhachis gracillima



'Panicum'

30 species, the majority endemic (species-rich pantropical genus)

DESCRIPTION. Annuals or perennials, prostrate or erect. Ligule a short ciliate membranous rim. Leaf blades variable in shape. **Inflorescence a panicle, usually very branched. Spikelets usually on pedicels, spherical, ovate or oblong, 2-flowered.** Glumes hyaline to membranous, usually the lower shorter than, and the upper as long as the spikelet. Lower floret male or barren, its lemma usually resembling the upper glume. Upper floret fertile. **Upper lemma as long as the spikelet, hardened, not crested, the margins inrolled and clasping only the edges of the palea.** No awns.

HABITAT. All habitats, although usually not coastal or aquatic; 0–2,800 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. *Acroceras*, *Brachiaria*, and *Urochloa* have spikelets in racemes (*Panicum* has spikelets in a panicle) and a pointed upper floret (*Panicum* usually has a rounded upper floret); the exception is *Urochloa maxima* which has a panicle with whorls of branches.

Cyrtococcum: strongly asymmetric and laterally compressed spikelets (*Panicum* has symmetric or weakly asymmetric spikelets which are dorsally compressed).

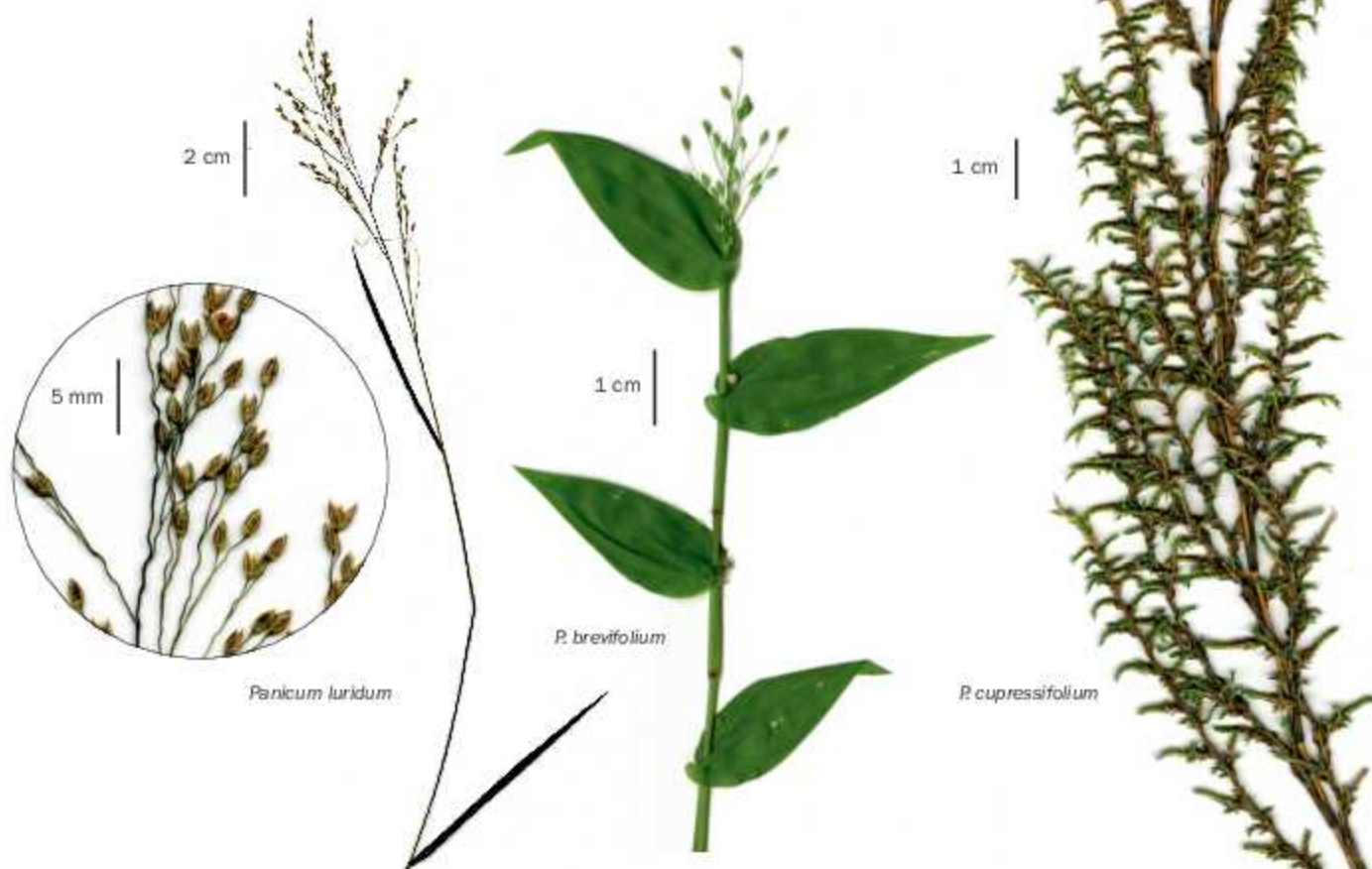
Eriochloa: lower glume reduced to a swelling below the spikelet (variable size lower glume in *Panicum* but never reduced to a bead-like swelling under the spikelet).

Isachne: two seeds produced per spikelet in two hardened florets (in *Panicum* one seed is produced per spikelet and every spikelet has only one hardened upper floret).

Pseudolasiacis is a woody climber with larger spikelets.

MALAGASY NAMES. Ahibarira, Ahibaritra, Ahibelo, Ahidahy, Ahitoto, Ahipisaka, Ahimianara, Ahimanara, Ahipoly, Kilefo, Kiafotsa, Kiahipody, Famo, Fandridahy, Fantaka, Fataka, Tsimparefare, Tsimparifary, Verotsanga, Verotsangana, Volonondry.

NOTES. All grasses with simple panicoid spikelets arranged in a panicle have been traditionally included in *Panicum*. 'Panicum' as described here represents several evolutionary lineages and will be divided into different genera when sufficient research data are available. The new name for *Panicum hymenochilum* is *Adenochloa hymenochila*; new names for *Panicum brazzavillense* and *Panicum parvifolium* are *Trichanthecium brazzavillense* and *Trichanthecium parvifolium*, respectively. Boundaries with *Brachiaria* and *Acroceras* are currently not clear. The abundant roadside weed previously known as *Panicum maximum* is now called *Urochloa maxima*.



Paratheria

Paratheria prostrata, genus of Africa, West Indies and South America

DESCRIPTION. Prostrate to ascendant perennial 15–60 cm long. Culm nodes hairy. Ligule a cilliate membrane. Leaf blades flat, 2–7 cm long. **Inflorescence a loose raceme, bearing deciduous branches appressed to the axis, each branch composed of a single spikelet subtended by a stout bristle.** Spikelets lanceolate, 2-flowered. Glumes tiny. Inferior lemma as long as spikelet, sometimes undulate. Superior lemma cartilaginous with flat thin margins. No awns.

HABITAT. Damp places, 0–1,500 m elevation.

DISTRIBUTION. Antsiranana, Toamasina, Antananarivo.

LOOKALIKES. *Setaria* can have long bristles subtending the spikelets, but it has smaller rounded spikelets.

Cenchrus can have long bristles subtending the spikelets but it is usually an erect plant and usually has more than one bristle subtending one spikelet or a group of spikelets.

NOTES. Each inflorescence branch extending into a long foliaceous bristle subtending each spikelet is a unique feature in Madagascar grasses, and has some similarity to the bristles in the related *Cenchrus* and *Setaria*. It appears that the inflorescence has awns, but it is important to notice that the bristles are different from awns as they originate below the spikelet and are thicker than awns.

5 mm

Paratheria prostrata

Paspalum

12 species, pantropical genus

DESCRIPTION. Erect annuals or perennials up to 60 cm tall (rarely 150 cm tall). Ligule short, membranous. Leaf blades flat, linear to narrowly lanceolate. **Inflorescence of digitate racemes**, the racemes sometimes on an elongated central axis, rarely solitary; **rhachis flat, narrow or broadly winged. Spikelets usually round and flat**, 2-flowered. Lower glume usually absent, upper glume usually as long as the spikelet. Lower lemma similar to the upper glume. Upper lemma coriaceous to crustaceous, usually obtuse, its margins inrolled and clasping only the edges of the palea. No awns.

HABITAT. Weedy species and good forage grasses of high nitrogen soils. Common by the roadsides and near human habitation; 0–2,000 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. *Axonopus*, *Cynodon*, and *Digitaria* are also small weedy roadside species with digitate racemes and no awns; *Paspalum* is taller and its spikelets are clearly round.

MALAGASY NAMES. Ahipisaka, Ahipisakalahy, Ahitsoavaly, Ahiviv, Fandrokalana, Menavavy, Tsiyongonomb, Tsiplina.

NOTES. Usually immediately recognisable by its circular spikelets neatly arranged on a broad rhachis.



Paspalum scrobiculatum



Paspalum conjugatum

Pentameris

3 species, including 2 endemics (African and Malagasy genus)

DESCRIPTION. Erect to ascendant tufted perennials up to 1 m tall. Ligule a line of hairs. **Leaf blades tough, rolled.** Inflorescence an open panicle. Spikelets on filiform pedicels, with 2 bisexual florets. **Glumes longer than the florets**, 5–8 mm long, membranous, drying orange-brown. **Lemma dorsally pilose, 3-lobed and 3-awned, one awn from each lobe.** Long hairs originating between the lobes and the central awn. Central awn geniculate, longer than the lemmas and glumes.

HABITAT. Montane savanna, 1,500–2,500 m elevation.

DISTRIBUTION. Antananarivo and Fianarantsoa.

LOOKALIKES. *Merxmüllera* is a related montane genus with similar long glumes, but it has 3–8 fertile florets per spikelet, and the panicle is more contracted with larger spikelets.

Helictotrichon has more than 2 florets per spikelet, and more than 2 awns per spikelet. *Arundinella* has much smaller spikelets.

NOTES. Previously placed in the genus *Pentaschistis*.



Pentameris andringitrensis

Perotis

4 species including 2 endemics (genus of Old World tropics)

DESCRIPTION. Weakly tufted geniculately ascending annual or sometimes short-lived perennial, with culms up to 60 cm long. Ligule a short membranous rim. **Leaf blades flat, amplexicaul, usually ovate or lanceolate but sometimes linear. Inflorescence a delicate fluffy spike, the spikelets sessile on the main axis.** Spikelets single, 2-flowered, all alike, linear-lanceolate, with or without a stipitate basal callus. Glumes subequal, lanceolate to narrowly lanceolate, membranous, 1-nerved, **each glume tipped by a long slender awn prettily tinged with violet**, (except for *Perotis arenacea* with no awns). Lemma usually $\frac{1}{3}$ – $\frac{1}{2}$ as long as the spikelet, hyaline, 1-nerved.

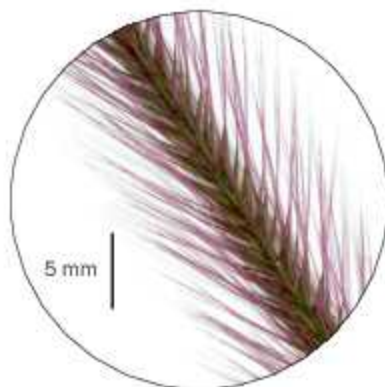
HABITAT. Savanna, spiny forest and open secondary vegetation; 0–1,500 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. *Cenchrus* (some species previously in the genus *Pennisetum*) has superficially similar fluffy spike-like inflorescences but it is an erect perennial (*Perotis* is usually a sprawling annual) and *Cenchrus* has broader inflorescences with bristles arising from the bases of spikelet clusters (awns arising from glume tips or absent in *Perotis*). *Viguierella* has generally similar appearance but its leaves are always narrow and linear (leaves usually lanceolate to ovate in *Perotis*) and its awns are thicker; *Viguierella* has 4 or more thick awns per spikelet as the lemmas are awned as well as the glumes (*Perotis* only has 0–2 awns per spikelet arising from the glumes but not the lemmas).

MALAGASY NAME. Haltsy.

NOTES. Attractive plant with soft purple spikes. *Perotis* now includes the endemic *Perotis arenacea* with no awns, originally described as the genus *Toliara*.



2 cm

Perotis patens



Perrierbambus

2 species (endemic genus)

DESCRIPTION. Open clumping bamboo with pachymorph rhizomes and relatively long necks. **Culms erect, with drooping** tips hanging downwards and sometimes reaching the ground, hollow or with a small lumen, 5–10 m tall, up to 2 cm in diameter, generally glabrous. **Branches many at each node**, borne below or on the supranodal ridge where the sheath scar curves downward. **Leaf blades linear or linear-lanceolate, turning into ovate lanceolate or ovate below the inflorescences.** Inflorescences terminating leafy branches with **one spikelet**.

HABITAT. Dry lowland forest in the northwest part of Madagascar (Loky, Mahajanga); 0–200 m elevation.

DISTRIBUTION. Antsiranana, Mahajanga.

LOOKALIKES. Branches can resemble *Nastus* but *Perrierbambus* grows in drier places. Habit resembles *Valiha*. The inflorescence in *Perrierbambus* consists of one spikelet, while in *Valiha* it is panicle bearing few to many spikelets. The culms of *Valiha* are usually larger and taller (6–10 m tall, diameter 6–8 cm) than those of *Perrierbambus* (3–7 m tall, diameter 1–2 cm), and the middle branches in *Valiha* are markedly dominant and long.

NOTES. *Perrierbambus* can be recognized by having a single spikelet in every inflorescence, and by ovate or ovate-lanceolate leaf blades in the inflorescences. *Hitchcockella* may need to be included within *Perrierbambus*; more collections need to be made to confirm this.



Phragmites

Phragmites mauritianus; global genus

DESCRIPTION. Common stout aquatic perennial 3–6 m tall, with long rhizomes, leaves arising all the way up the stems. Ligule a short membrane, ciliate along the apex. Leaf blades linear to narrowly lanceolate, flat, 1–3 cm wide, deciduous. **Panicles dense, 30–60 cm long, silky hairy.** Spikelets pedicelled, with 3–11 flowers, disarticulating between the florets, the lower floret male or infertile. **Rhachilla with abundant white hairs longer than the lemmas.** Glumes 3–5-nerved. Lowest lemma much longer than the glumes, 3–7-nerved, $\pm$ persistent; fertile lemmas acuminate, 1–3-nerved, glabrous. No awns.

HABITAT. Common along the rivers and in open wet places.

DISTRIBUTION. All provinces.

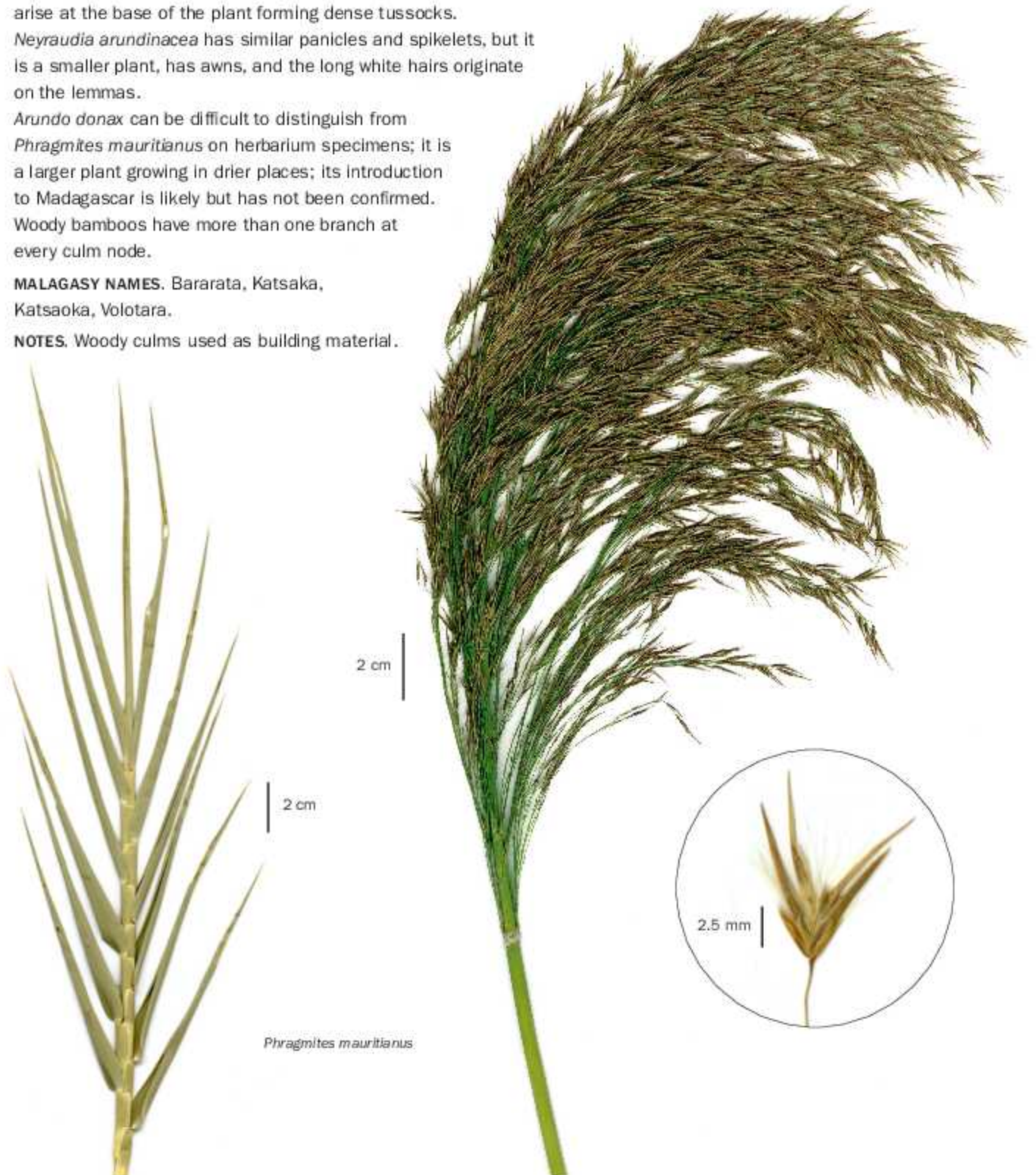
LOOKALIKES. *Cortaderia* in Madagascar is only known in cultivation; all leaves arise at the base of the plant forming dense tussocks.

Neyraudia arundinacea has similar panicles and spikelets, but it is a smaller plant, has awns, and the long white hairs originate on the lemmas.

Arundo donax can be difficult to distinguish from *Phragmites mauritianus* on herbarium specimens; it is a larger plant growing in drier places; its introduction to Madagascar is likely but has not been confirmed. Woody bamboos have more than one branch at every culm node.

MALAGASY NAMES. Bararata, Katsaka, Katsaoka, Volotara.

NOTES. Woody culms used as building material.



Phragmites mauritianus

Phyllostachys

Phyllostachys aurea (Introduced; Asian genus)

DESCRIPTION. Bamboo with running leptomorph rhizomes. Culm erect, 3–5 m tall, with thick walls, **internodes with a channel on the same side as the branches, branches usually two at each node.** Culm sheaths covered with short white hairs, blades lanceolate, erect or spreading. **Leaf blades yellowish.** Not known to flower in Madagascar.

HABITAT. Invasive in the wastelands, mesic and dry environments, mid-elevation and high elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. *Phyllostachys aurea* has a more pronounced yellow leaf colour than other bamboos. Culms the same height as *Oldeania* but with only two branches at each culm node.

MALAGASY NAMES. Volovezona, Volotsangana.

NOTES. *Phyllostachys aurea* was introduced to Madagascar. It is now naturalized and becoming an invasive plant across the island, and is commonly grown as fences. The culms are used for making furniture. Both *Phyllostachys aurea* and other members of the genus *Phyllostachys* are problematic invasive plants in many parts of the world.



Phyllostachys aurea

Poa

3 species, including 2 endemics (temperate genus)

DESCRIPTION. Erect or ascending tufted annuals or perennials, 5–60 cm tall. **Ligule membranous, 1.5–5 mm long.** Leaf blades flat or rolled, typically with a blunt or hooded tip. Inflorescence an open panicle. **Spikelets with 3–5 flowers, 3–10 mm long, laterally compressed.** Glumes 1–3-nerved, keeled, glabrous. Lemmas keeled, membranous often with hyaline margins, 5–7-nerved, often with white woolly hairs at the base. **No awns.**

HABITAT. Montane mesic environments or a weed of human habitation at 1,000–2,500 m elevation.

DISTRIBUTION. Antananarivo, Fianarantsoa, Toamasina.

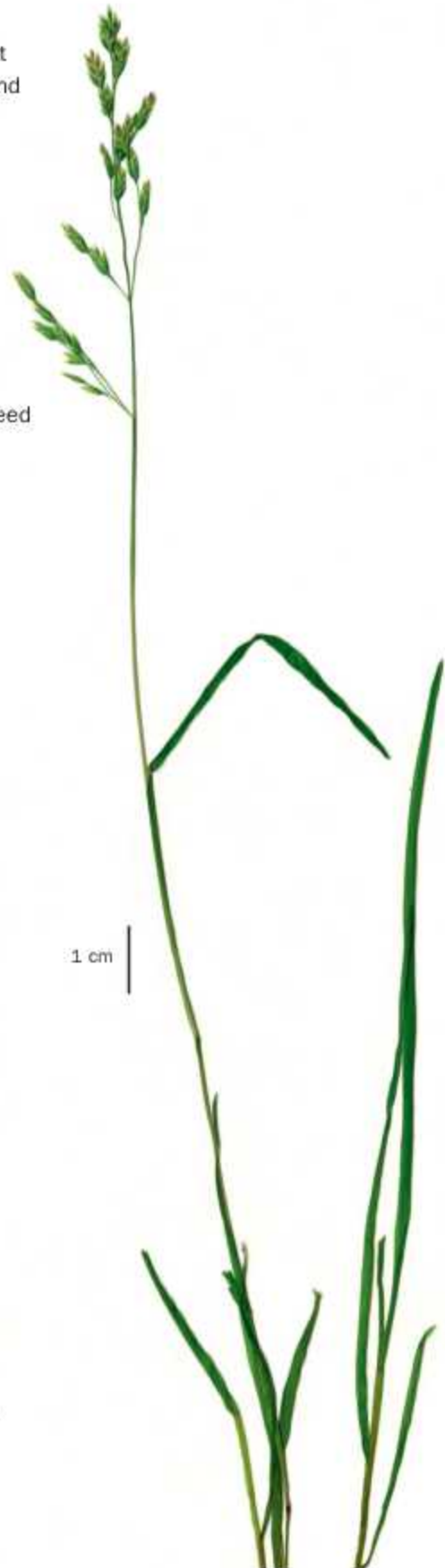
LOOKALIKES. *Eragrostis* has a similar habit and similar spikelets, but it occupies hotter drier places, the ligule is usually a line of hairs, and the lemmas have only 3 nerves each, and its leaf tips are never hooded.

Brachypodium, *Bromus*, and *Festuca* are related to *Poa* and share the wetter montane habitat and membranous ligules; they all have larger spikelets and usually have awns.

Pentameris has similarly small spikelets but it has visible awns.

Coelachne is an aquatic with only two flowers per spikelet and a ligule of hairs which is sometimes absent.

NOTES. *Poa annua* is a extremely common weed and lawn grass throughout temperate regions of the world; in Madagascar, it is a weed near human habitation in damp upland areas.



Poa annua

Poecilostachys

Around 15 species, likely all endemics (genus of Africa and Madagascar)

DESCRIPTION. Trailing stoloniferous perennials rooting at the nodes, up to 50 cm tall. Ligule a ciliate membrane. Leaf blades linear to lanceolate, 10–25 cm long, 0.5–3 cm wide. **Inflorescence of lax racemes along a central axis**, the spikelets in pairs or little clusters. Spikelets narrow-lanceolate, laterally compressed, 1.7–4.5 mm long, 2-flowered. **Glumes $\frac{1}{3}$ – $\frac{3}{4}$ length of spikelet, the inferior often awned.** Upper lemma strongly laterally compressed, membranous to cartilaginous with flat or involute margins. Awns present or absent.

HABITAT. Forest undergrowth, often densely covering the forest floor, 1,000–2,500 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. *Oplismenus* has a similar vegetative appearance, is closely related to *Poecilostachys*, and has shorter racemes and prominent long awns, awns often on reduced spikelets at the base of each raceme. *Brachiaria* never has awns, and the upper glume is usually as long as the spikelet.

Microstegium has thinner softer awns than *Poecilostachys*.

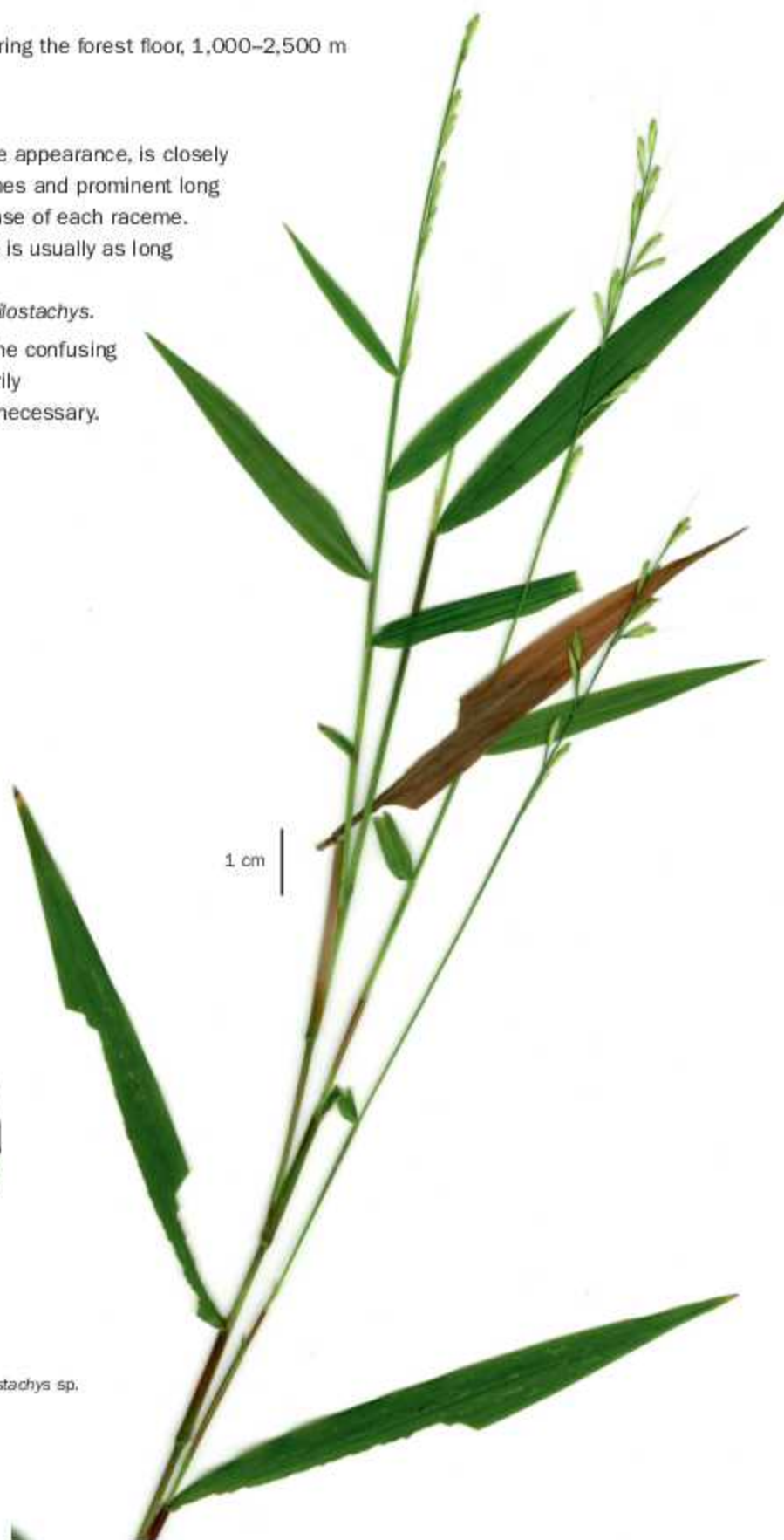
NOTES. Almost omnipresent in the wet forests, the confusing *Poecilostachys* diversity has not been satisfactorily delineated into species yet. Further research is necessary.



Poecilostachys sp.



Poecilostachys sp.



Pogonatherum

Pogonatherum paniceum introduced from Asia (Asian genus)

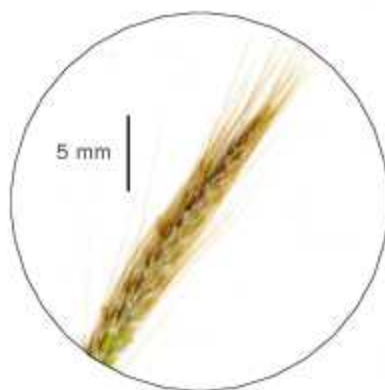
DESCRIPTION. Bamboo-like much-branched perennial, erect to trailing, stiff culms 30–60 cm tall, 1–2 mm wide. Ligule a line of hairs. Leaf blades stiff, linear, 1.5–5.5 × 0.15–0.4 cm, apex acuminate. **Inflorescences single terminal yellowish racemes 1.3–3 cm**, with sessile and pedicelled spikelets. **Rachis internodes and pedicels with long silky white hairs.** Spikelet with 2 florets. Sessile spikelet 2.3–3 mm, the upper glume and upper lemma with fine awns 1.5–2 cm. Pedicelled spikelet similar to the sessile, both bisexual.

HABITAT. Cultivated.

DISTRIBUTION. Antananarivo.

LOOKALIKES. Woody bamboos in Madagascar have more than one branch in every branch complement on the culm; *Pogonatherum* culms have single branching only. Woody bamboos also have larger leaves.

NOTES. Cultivated as an ornamental plant. The only member of Andropogoneae in Madagascar with a bamboo-like growth habit. Recorded as escaping into the wild at La Réunion, Mauritius and Mayotte.



Pogonatherum paniceum

Pseudechinolaena

6 species including 5 endemics (Malagasy genus apart from one pantropical species)

DESCRIPTION. Small mat-forming annuals with trailing culms less than 50 cm long, rooting from the nodes. Leaf blades lanceolate, membranous. Ligule membranous, truncate. **Inflorescence composed of racemes loosely borne along a central axis.** Spikelets obliquely ovoid, laterally compressed, often gaping with 2 florets. Glumes as long as the spikelet or a little shorter, the lower almost flat and acute to long-awned, **the upper glume inflated, armed with tubercle-based bristles or with wings**, acute. Upper lemma hard, acute. No awns.

HABITAT. Wet, dry, or littoral forest understory and open weedy places; 0–1,500 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. Other small forest understory grasses with multiple racemes include *Acroceras*, *Brachiaria*, *Cyphochlaena* and *Oplismenus*. *Pseudechinolaena* can be distinguished by its upper glume which is inflated after fertilisation making the spikelet shape asymmetric, and the upper glume surface developing unusual hairs, appendages, or wings. Young plants prior to upper glume development can be harder to separate; useful features include acuminate spikelet shape (unlike *Cyphochlaena* and *Brachiaria*) and the normal lack of awns (unlike *Oplismenus*).

NOTES. Hairs and appendages develop on the upper glume after fertilisation and function to aid seed dispersal: the spikelets attach to dispersal agents by the appendages and detach from the rachis. The structures vary between species. The endemic species are rare while the variable and pantropical *Pseudechinolaena polystachya* is common in wet forest understory.



Pseudechinolaena polystachya

Pseudobromus

Ca. 3 endemic species (genus of Africa and Madagascar)

DESCRIPTION. Loosely tufted drooping perennials, 40–80 cm tall. Leaf sheaths glabrous. Ligule a membrane. **Leaf blades linear, 5–14 mm wide, with indistinct transverse nerves.** Inflorescence a lax panicle. Spikelets pedicellate, with 2–5 flowers. Glumes shorter than the lowest lemma. **Rhachilla hairy.** Lemma narrowly rounded on the back, 3–5-nerved, scabrous. **Awn 5–15 mm.** Callus ciliate. Ovary with no apical appendage.

HABITAT. Forest edges, mesic habitat, 1,000–2,000 m elevation.

DISTRIBUTION. Mahajanga, Antananarivo, Toamasina, Fianarantsoa.

LOOKALIKES. Both *Festuca* and *Bromus* have a closely similar appearance and habit and are often hard to distinguish. *Festuca* has more narrow leaves, no branching venation in the leaves, a glabrous or scabrous rhachilla, and often no awns. *Bromus* has larger spikelets and hairy leaf sheaths. *Helictotrichon* has geniculate awns.

NOTES. Placed within *Festuca* by some authors. The branching venation in the leaves is difficult to see.



1 cm

Pseudobromus breviligulatus

Pseudolasiacis

3 species (genus endemic to Madagascar and Comoros)

DESCRIPTION. **Branched perennial woody climber** resembling a bamboo. Ligule a short ciliate membranous rim. Leaf blades linear to lanceolate. **Inflorescence a branched panicle** with single spikelets on long pedicels. **Spikelets rounded, 2.5–6 mm long with 2 florets.** Lower glume half as long to as long as the spikelet, 7–11-nerved. Upper glume as long as the spikelet, 7–11-nerved. Lower floret sterile. Upper floret fertile. Upper lemma as long as the spikelet, hardened, not crested, the margins inrolled and clasping only the edges of the palea. **No awns.**

HABITAT. Forest understory 900–1,700 m elevation.

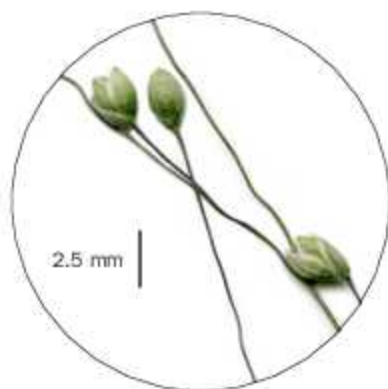
DISTRIBUTION. All provinces.

LOOKALIKES. *Panicum* and *Adenochloa* are smaller plants with shorter spikelets, and fewer nerves on the glumes.

Olyra is also a forest understory climber but it has asymmetric leaf bases, glumes with a tail, and a hard white mature lemma.

Isachne is also a scandent forest understory grass but it produces two seeds per spikelet while *Pseudolasiacis* produces one.

NOTES. Previously included within *Panicum*.



Pseudolasiacis leptolomoides

Rhytachne

Rhytachne rottboellioides (pantropical genus)

DESCRIPTION. Erect tufted perennial 40–90 cm tall. Ligule a short membrane. Leaf blades narrow, rolled.

Inflorescence a single terminal cylindrical raceme 8–15 cm long and 1.2–2 mm wide. Internodes clavate, transversely jointed. Spikelets with 2 florets. Sessile spikelet 4–6 mm long. Callus truncate, with prominent central peg. Lower glume smooth or rugose. Upper lemma entire and awnless. Pedicelled spikelet reduced or absent; **pedicel curved and subfoliaceous.**

No awns.

HABITAT. Savanna 800–2,000 m elevation.

DISTRIBUTION. Antananarivo, Fianarantsoa.

LOOKALIKES. *Oxyrhachis* has similar awnless single racemes but the joints between the internodes are oblique, and there is no pedicel present. The pedicel can be hard to see on *Rhytachne*: bending and breaking the raceme can help.

Elionurus has an obliquely jointed raceme and a well-developed pedicelled spikelet.

Schizachyrium has awns.

MALAGASY NAMES. Forona, Horondany, Horondrano, Kifafadrano, Kifafandrano, Kifafarano, Kifofofano.

NOTES. Common component of higher elevation grassland and savanna.



Rhytachne rottboellioides

Rottboellia

Rottboellia cochinchinensis (Old World genus)

DESCRIPTION. Erect annual 0.4–2 m with stinging hairs on the leaf sheaths. Ligule a short membrane. Leaf blades flat, 1–3 cm wide. **Inflorescence a single cylindrical raceme, terminal or aggregated into a spatheate false panicle.** Internodes clavate, fused to the adjacent pedicel. Spikelet with 2 florets. Sessile spikelet sunk in the internode, ovate. Callus truncate, with prominent central peg. Lower glume smooth. Upper lemma entire. **Pedicelled spikelet green, smaller than the sessile; pedicel flattened, fused to the internode.** No awns.

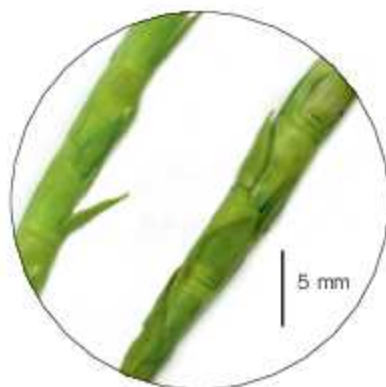
HABITAT. Weed of hot subhumid places up to 1,000 m elevation.

DISTRIBUTION. Antsiranana, Toamasina, Antananarivo, Fianarantsoa, Toliara.

LOOKALIKES. Other genera with single terminal cylindrical inflorescences with no awns include *Elionurus*, *Oxyrhachis* and *Rhytachne*, which are smaller plants without the green foliaceous pedicelled spikelet.

MALAGASY NAME. Kalay.

NOTES. Weedy species introduced throughout tropical regions. Sometimes incorrectly identified as *Chasmopodium*; *Chasmopodium* has pedicels which are fully separate from the internodes and has not been recorded in Madagascar.



Rottboellia cochinchinensis

Saccharum

Saccharum officinarum (pantropical genus)

DESCRIPTION. Erect tufted perennials with solid culms 2–6 m tall. Leaf blades linear. Ligule a ciliate membrane. **Inflorescence a panicle 40–60 cm long with a large strong central axis, with many racemes crowded on the primary panicle branches, with silver-white hairs;** racemes flexuous, the rachis fragile with paired similar spikelets, one sessile, the other pedicelled. Internodes slender. Spikelets lanceolate, 2-flowered, 3.5–4 mm long, glabrous, enveloped in long silky hairs from the callus, **the hairs longer than the spikelets.** Glumes thin. No awns.

HABITAT. In cultivation.

DISTRIBUTION. All provinces.

LOOKALIKES. The robust erect stems and large fluffy panicles of *Saccharum officinarum* resemble those of *Phragmites* and *Neyraudia*, but *Saccharum* has paired sessile and pedicelled spikelets, while all the spikelets of *Phragmites* and *Neyraudia* are pedicelled.

Lasiorrhachis plants are smaller, with shorter panicles, lacking the long callus hairs.

MALAGASY NAMES. Andrafo, Betsa or Betsabetsa, Farimainty or Farimaintsy, Farimanga, Fary, Fiapary, Fisika or Fisiky, Lailay or Laim-pary, Lengompany, Mavotohana or Mavotohona.

NOTES. *Saccharum officinarum* is the cultivated sugarcane, grown throughout Madagascar, and previously grown commercially near Brickaville. The genus *Saccharum* previously included the Malagasy endemic genus *Lasiorrhachis*.



Saccharum officinarum

Sacciolepis

10 species, ca. 2 endemics (tropical genus)

DESCRIPTION. Prostrate, ascending or erect annuals or perennials, 0.1–1.5 m tall. Ligule short, membranous. Leaf blades narrowly lanceolate to convolute. **Inflorescence typically a dense spiciform panicle, rarely open. Spikelets oblong to lanceolate, asymmetrical, 2-flowered. Glumes herbaceous to membranous, prominently nerved**, the lower mostly shorter than the spikelet, the upper gibbous and as long as the spikelet. Upper lemma usually shorter than the spikelet, smooth, gibbous, the margins inrolled and clasping only the edges of the palea. No awns.

HABITAT. Damp places, rice paddies, streams, 0–1,500 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. Spikelets more beak-shaped, more inflated, and with more pronounced nerves than the related Panicoideae genera *Panicum*, *Brachiaria*, *Cyrtococcum*, *Trichanthecium* and *Adenochloa*.

MALAGASY NAMES. Ahidronono, Ahipody, Goana, Tsimparifary or Tsiparifary, Tsingarivary.

NOTES. *Sacciolepis* is recognised by the characteristic asymmetric shape of its spikelets and the dark prominent nerves on the upper glume and lower lemma.

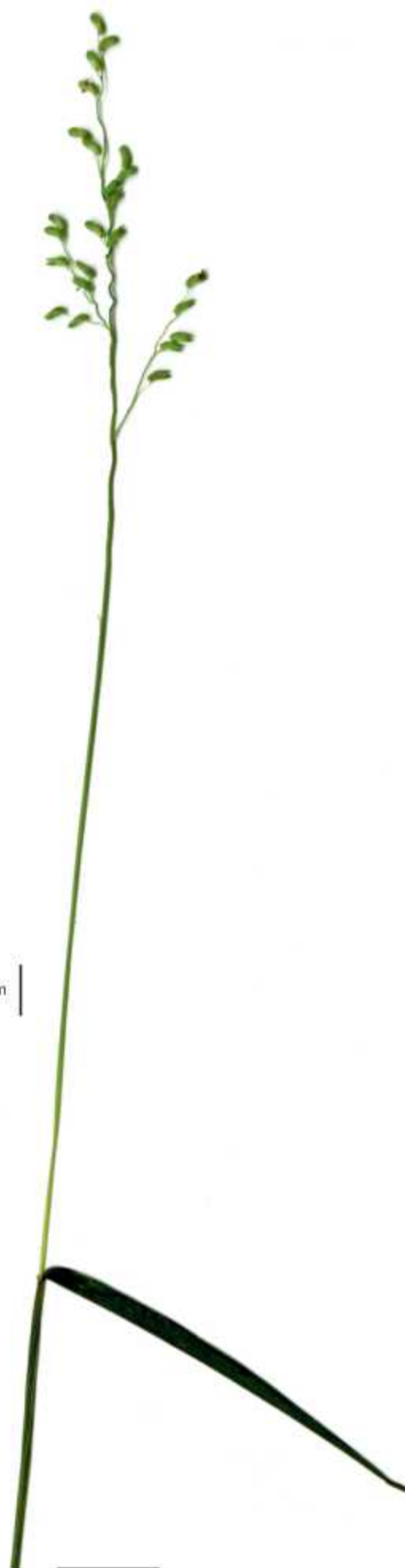


Sacciolepis leptorrhachis



5 mm

Sacciolepis curvata



Sartidia

2 species, endemic (genus of Southern African savanna grasses)

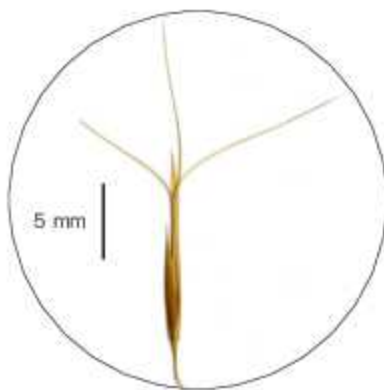
DESCRIPTION. Tufted erect perennial 30–60 cm tall. Ligule a fringe of hairs. Leaf blades linear to filiform, stiff, becoming curled with age. **Panicle dense, narrow, 6–20 cm long.** Spikelets solitary, pedicelled, 1-flowered, subterete, 20–27 mm long. Floret callus elongated, pungent. **Glumes narrow, longer than the florets, acute or acuminate, 3-nerved.** Lemma subcylindric, somewhat dorsally compressed, becoming hard at maturity, awned from the apex of the lemma. **Awns 3-branched, each branch 20–22 mm long, scabrid, spirally contorted at the base.**

HABITAT. Open highland savanna and rocks, 800–1,900 m elevation.

DISTRIBUTION. Antananarivo, Fianarantsoa.

LOOKALIKES. The only other genus with a 3-branched awn is the related *Aristida*. *Aristida* glumes are smaller and narrower, with only one nerve in every glume; *Sartidia* glumes are longer and wider, with 3 nerves in every glume.

NOTES. Very rare. *Sartidia perrieri* is known from a single collection near Antsirabe and is now most likely extinct. *Sartidia isaloensis* is a smaller plant difficult to distinguish from *Aristida*.



Sartidia isaloensis



Schizachyrium

5 species including 1 endemic (pantropical genus)

DESCRIPTION. Creeping or erect annuals or perennials, 0.1–1.2 m tall, **drying dark red**. Ligule membranous. Leaf blades linear. **Inflorescence composed of single slender terminal racemes in a false panicle.** Internodes and pedicels linear to clavate. Spikelet with 2 florets. Sessile spikelet linear to lanceolate. Callus inserted in the crateriform top of the internode. Lower glume convex, 2-keeled or sharply inflexed. **Upper lemma bilobed, with an awn 1–3.5 cm long from the sinus.** Pedicelled spikelet male or sterile, usually smaller than the sessile.

HABITAT. Open savanna at 0–2,000 m elevation.

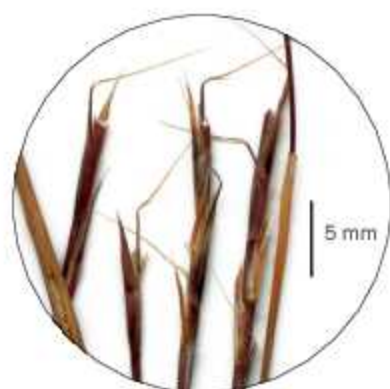
DISTRIBUTION. All provinces.

LOOKALIKES. Distinguished from *Elionurus*, *Hemarthria*, *Oxyrhachis* and *Rhytachne* by the presence of well-developed awns.

Diectomis, *Heteropogon*, and *Trachypogon* also have single racemes but their awns are longer.

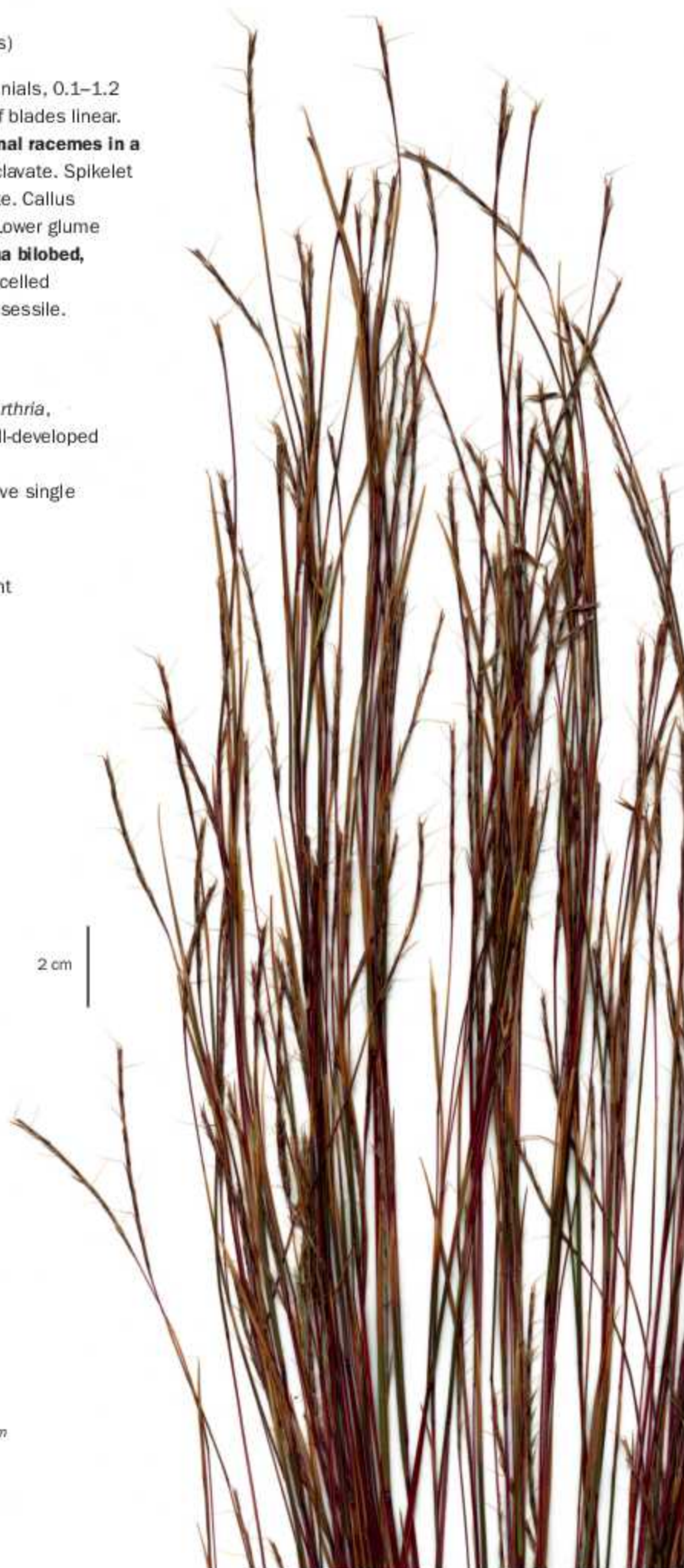
MALAGASY NAMES. Ahiborisoa, Ahitsorohitra.

NOTES. *Schizachyrium sanguineum* is an important component of highland grasslands.



2 cm

Schizachyrium sanguineum



Schoenefeldia

Schoenefeldia gracilis (genus of Africa and India)

DESCRIPTION. Erect tufted annual up to 1 m tall. Ligule a line of hairs. Leaf blades linear. **Inflorescence of (1–) 2–4 digitate slender 1-sided spikes 8–18 cm long.** Spikelets imbricate, with 1 flower. Glumes lanceolate, keeled, mucronate or short-awned. Lemma shorter than the glumes, ovate-elliptic, ciliate, with a **fine long curved awn 2–3.5 cm long.**

HABITAT. Arid roadsides and secondary vegetation at low elevations.

DISTRIBUTION. Mahajanga.

LOOKALIKES. There are several genera with a broadly similar appearance: *Neostapfiella* has shorter straight awns and visible triangular spikelets. *Chloris* has more numerous, shorter, usually more stout racemes with shorter straight awns.

Ctenium and *Enteropogon* have single racemes and shorter awns.

NOTES. The long filiform curved awns give this genus a distinctive appearance.

5 mm

Schoenefeldia gracilis

Sclerodactylon

Sclerodactylon macrostachyum (monotypic genus of coastal Africa and oceanic islands)

DESCRIPTION. Coarse erect tufted perennial 30–80 cm tall. Ligule a line of hairs.

Leaves very stiff, flat to rolled. **Inflorescence of 2–4 bulky digitate racemes**

with imbricate sessile spikelets, terminating in a reduced sterile spikelet.

Spikelets with 7–20 flowers, laterally compressed, disarticulating between the florets or several florets falling together, shiny. Glumes shorter than lemmas. Lemmas 3-nerved, keeled, coriaceous, acute.

No awns.

HABITAT. Coastal sands and rocks with sea salt; low elevations.

DISTRIBUTION. Fianarantsoa, Tollara.

LOOKALIKES. Inflorescence structure similar to the related *Eleusine* which is a smaller plant with smaller racemes and spikelets that are not shiny.

MALAGASY NAME. Tsibotsiboka.

NOTES. Recognisable by the large bulky shiny racemes.



2 cm

Sclerodactylon macrostachyum

Setaria

18 species, including ca. 10 endemics (global genus)

DESCRIPTION. Erect or creeping annuals or perennials 0.1–2 m tall. Ligule a line of hairs. Leaf blades flat or folded, sometimes pleated. Inflorescence a panicle, open or spike-like, **the spikelets almost always subtended by 1 or more bristles which stay on the axis after the spikelets fall.** Spikelets 2-flowered, asymmetric, appearing a little inflated. Glumes unequal, the lower generally much smaller. Lower lemma herbaceous, sometimes hardened. Upper lemma rugose or smooth, the margins inrolled. No awns.

HABITAT. Broad range of habitats at all elevations.

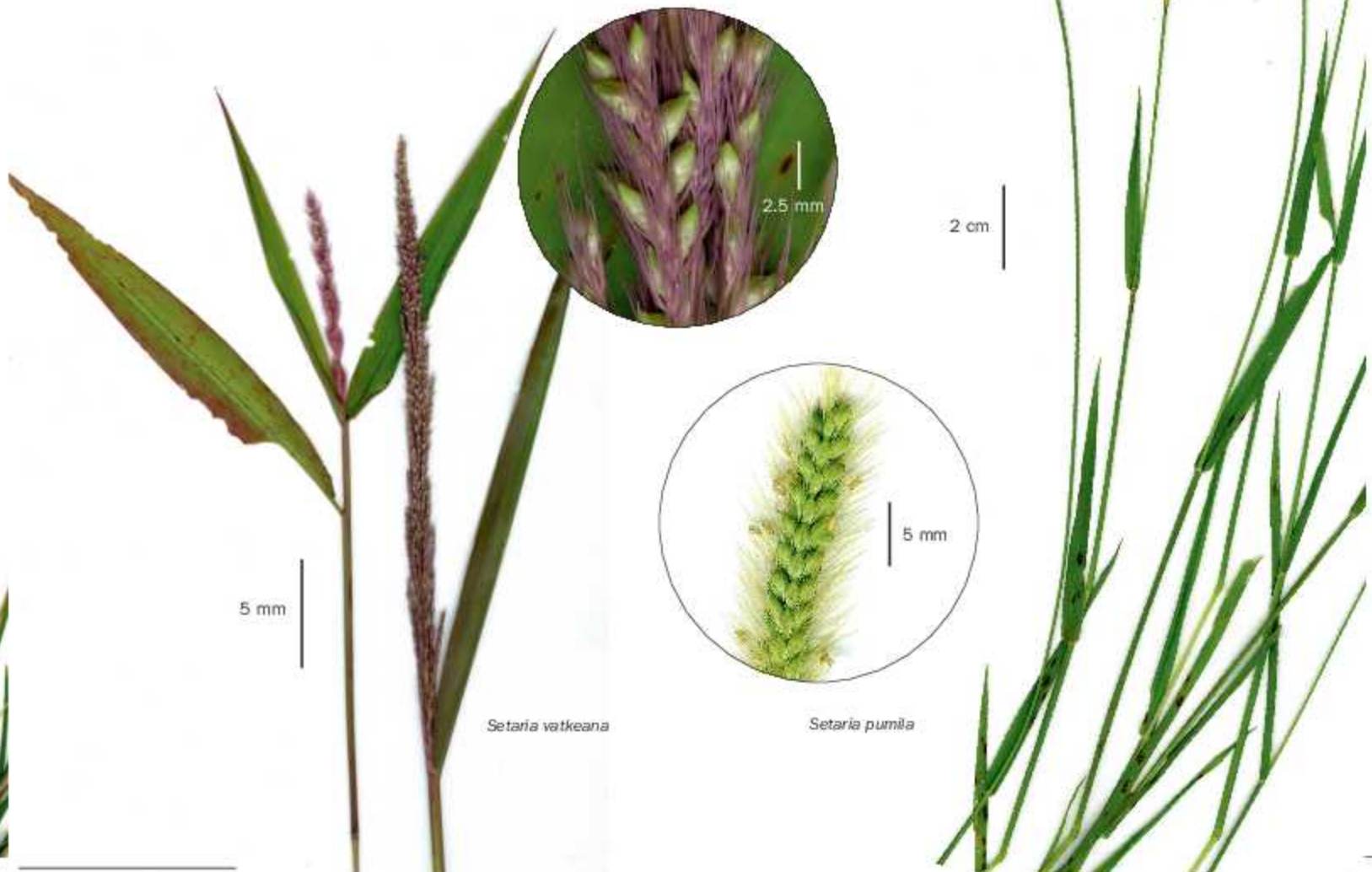
DISTRIBUTION. All provinces.

LOOKALIKES. *Cenchrus* (including *Pennisetum*) also has bristles below the spikelets, but its bristles fall off together with the spikelets, and there is a generally larger quantity of more prominent bristles.

MALAGASY NAMES. Ahipatana, Ahipoly, Ahitokotoko, Kiahipody, Tsikasakasa, Taindalika, Taindalitra, Taindambo, Tenindalitra, Tsikasakasa.

NOTES. A variable genus with difficult to separate species, ranging from the small annual weed *Setaria pumila* to the tall forest understory *Setaria megaphylla* with palm-like pleated leaves. Easy to recognise when the bristles are clearly visible, but it is important to notice that the bristles originate below the spikelets rather than from the spikelets and are different to awns.

This large genus includes groups previously segregated as separate genera: *Paspalidium* with numerous short racemes and no bristles, *Camusiella vatkeana* with a hard textured lower lemma as well as a hard upper lemma, and *Cymbosetaria* with sagittate leaves.



Sirochloa

Sirochloa parvifolia (monotypic genus endemic to Madagascar and Comoro Islands)

DESCRIPTION. Open clumping bamboo with pachymorph rhizomes. Culms erect at first, upper parts scrambling, about 10 m long, straight; **internodes solid or with small lumen, very hard (like wire)**, 15–20 cm long, up to 5 mm diameter, glabrous and smooth, nodes not swollen, sheath scar or nodal line more or less horizontal. Branch bud one at each node, borne above the sheath scar, the bud developing into **many branches with the primary branch dominant**, dormant or developing and elongating to quite a considerable length, hanging from the main culm or scrambling and leaning on nearby vegetation, secondary branches short, the same length. Culm sheath glabrous, blade linear, spreading. Leafy branches 8–22 cm long, bearing 8–10 leaf blades. Leaf blades lanceolate, 3–8(–13) cm long, 4–9 mm wide, glabrous above, hairy below; sheaths glabrous; **auricles slender, linear, 3–5 mm long, with long bristles along the edges, bristles about 5 mm long**; ligule very short. Inflorescence determinate, racemose, with the presence of subtending bracts, terminating a leafy branch, 7–17 cm long. Spikelet slender, 15–19 mm long, consisting of 4 glumes, one fertile floret and a rachilla extension, second to fourth glume and lemma with long tips or awns, **awns 1.5–8 mm long**. Caryopsis cylindrical, 7 mm long, pericarp thin, easily removed from the seed.

HABITAT. Very common in beach forests on white sand at low altitude, especially along the east coast of Madagascar, occasionally found a long way from the shore at up to 70 m elevation.

DISTRIBUTION. Antsiranana, Toamasina and Comoro Islands (Mayotte).

LOOKALIKES. The dense branches and narrow leaf blades can also be found in *Nastus* (montane forest bamboos) but *Sirochloa* is only found in the lowlands.

NOTES. *Sirochloa* can be recognised by its almost solid and hard culms with branches borne above the sheath scar, small leaf blades, and the long slender auricles of the leaf blades with long bristles. The inflorescence is usually green and is not easily visible. The flowering behaviour is not known. The strong slender culms are often used for making rough baskets.



5 mm

2 cm



5 mm

Sirochloa parvifolia



Sokinochloa

Ca. 7 species (endemic genus)

DESCRIPTION. Climbing bamboo with pachymorph rhizomes, **culm zig-zag or geniculate, solid**, internodes smooth or rough, usually glabrous, **nodes slightly swollen**, curved downward at one side. Branch bud one at each node, borne on the curved part of the node; **primary branch dominant**, dormant or elongate; secondary branches few at each node. Young shoots glabrous, light green or purplish. Culm sheaths consisting of two parts, lower part forming a tube, hard and rugose, concealing branch buds, upper part smooth, and glabrous, blades linear. Leafy branches 30–60 cm long, bearing 7–19 leaves; leaf blades smooth and usually glabrous, 10–17 cm long, not more than 3 cm wide. Inflorescences on the ends of leafy branches, **rounded or oval capitula, concealed or wrapped in modified leaf blades**.

HABITAT. Lowland forest to mountain forest, forest margins, up to 1,600 m elevation.

DISTRIBUTION. Antsiranana, Fianarantsoa, Mahajanga, Toamasina, Tollara.

LOOKALIKES. *Sokinochloa* in montane forest is often found growing together with other climbing bamboos, *Decaryochloa diadelpha* and *Nastus*.

Sokinochloa can be differentiated from *D. diadelpha* by the zig-zag or geniculate culm, solid internodes, globose inflorescences, and by the absence of large auricles on culm leaves. *Sokinochloa* can be differentiated from *Nastus* by having long leafy branches and large leaf blades.

NOTES. These bamboos flower gregariously or sporadically, and the plants die after flowering. Individuals without flowers can be seen in forests or forest margins climbing trees, and when they are flowering, the globose inflorescences (wrapped in uppermost leaf blades) can be found hanging from the trees. Previously placed in the genus *Cephalostachyum*.



Sokinochloa chapelieri

Sorghastrum

Sorghastrum incompletum (African and tropical American genus)

DESCRIPTION. Loosely tufted decumbent or erect annual 0.5–2 m long, with hollow stems. Ligule a membrane. Leaf blades linear. Inflorescence a panicle. **Each sessile spikelet with a pair of pedicels; no pedicelled spikelet present.** Sessile spikelet dark brown, 4–5.5 mm long, 2-flowered, convex, dorsally compressed. Callus with white hairs. Upper lemma bidentate with a geniculate awn 2.5–4 cm long. Pedicels with white hairs.

HABITAT. Arid savanna at low elevations.

DISTRIBUTION. Mahajanga.

LOOKALIKES. The more common *Sorghum* has clearly visible pedicelled spikelets.

MALAGASY NAME. Varinakanga.

NOTES. Rare. The key to recognising *Sorghastrum* is noticing the two sterile pedicels by the side of every spikelet.



1 cm



Sorghastrum incompletum

Sorghum

Ca. 5 species (pantropical genus)

DESCRIPTION. Erect robust annuals or perennials 1–3 m tall. Ligule membranous, rarely a line of hairs. **Leaf blades linear, 1–8 cm wide. Inflorescence a large terminal panicle 15–50 cm long, with short racemes. Racemes with 1–7 spikelet pairs, yellow to orange.** Internodes and pedicels filiform. Spikelet with 2 florets. Sessile spikelet ovate, dorsally compressed. Lower glume convex. Upper lemma bidentate, usually with an awn 5–15 mm long. Pedicelled spikelet male or sterile, more narrow than the sessile, with no awn.

HABITAT. Wet and hot places on fertile soils, 0–2,000 m elevation.

DISTRIBUTION. Probably all provinces.

LOOKALIKES. *Saccharum* and *Lasiarhachis* are also big plants with large panicles and sessile and pedicelled spikelets, but the sessile and pedicelled spikelets in these genera appear the same; the pedicelled spikelets in *Sorghum* are visibly more narrow than the sessile ones.

The rare *Sorghastrum* has a sessile spikelet with a pair of pedicels and no pedicelled spikelets.

MALAGASY NAMES. Ampembambazaha, Ampembimasombika, Ampemba or Ampemby, Bekaka, Bakaky, Benaka, Femba, Fembamboloky, Honkona, Morama, Morona, Pembamboloky, Tsimangetahilia, Variampemba or Variampemby, Varifemba, Vero.

NOTES. A complex genus of cultivated plants (spikelets retained in panicles), native wild plants (spikelets fall at maturity), and hybrids. Grown for food in smallholdings in Antananarivo, Antsirabe, and in the south of Madagascar. Edible forage grasses.



1 cm

Sorghum arundinaceum



Sporobolus

25 species (including 4 endemics; pantropical genus)

DESCRIPTION. Erect tufted annuals or perennials, 0.1–2.5 m tall. Ligule a line of hairs. Leaf blades flat to rolled. Inflorescence an open or contracted panicle, the branches whorled or not. **Spikelets 1-flowered, small, 1–4.5 mm, usually grey to brown or reddish, elliptic, glabrous.** Upper glume longer than the lower and resembling the lemma. Lemma thinly membranous, 1(–3)-nerved. No awns. **Fruit commonly swelling when wet.**

HABITAT. Usually arid open places, sometimes on coastal saline soils, all elevations.

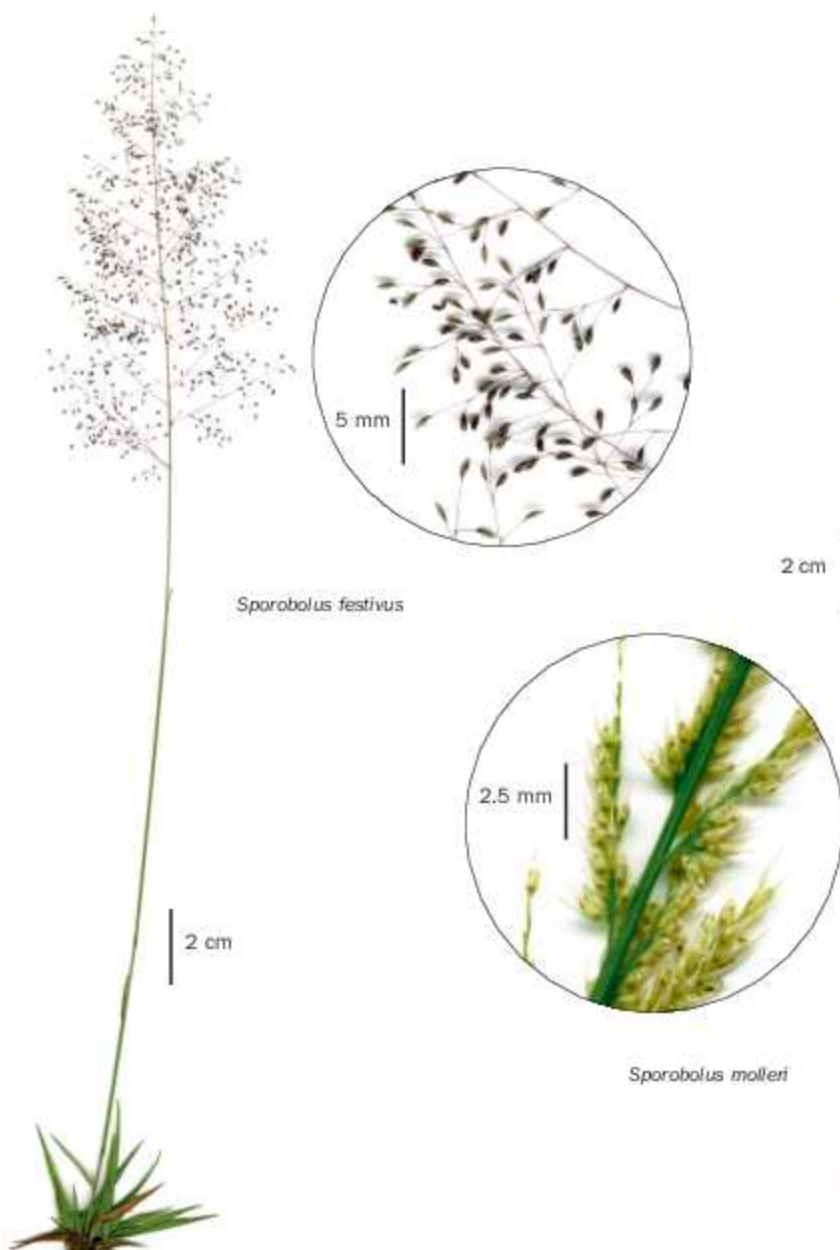
DISTRIBUTION. All provinces.

LOOKALIKES. *Zoysia* has similar panicles and simple spikelets, but it has a hardened upper glume wrapped around the spikelet, and no visible lower glume.

Panicum and *Brachiaria* have harder, broader spikelets with a hardened upper floret that pops out when the spikelet is pressed.

MALAGASY NAMES. Ahibe, Ahibelo, Ahidahy, Ahikongona, Ahimanara, Ahipody, Ahitsiporitika, Angapody, Angavopody, Agnapodikely, Fandroalakana, Fataka, Horompotsy, Horomainty, Hosihosy, Kifanjy, Kilky, Kilangy, Kitaratasy, Kodrodritsa, Mahitsia, Matsia, Lanjy, Langonaombe, Merakapaha, Tohiana, Tsiana, Tsindordrotra, Tsindrota, Tsindrotra, Verotsanjy, Vilopoko, Voloritro.

NOTES. *Sporobolus pyramidalis* is a common weed of disturbed places. Used for making paper and hats.



Stenotaphrum

4 species (Including 2 endemics; pantropical genus)

DESCRIPTION. **Mat-forming creeping stoloniferous perennials.** Ligule a line of hairs.

Leaf blades linear to narrowly lanceolate, 3–12 mm wide, **apically rounded**.

Inflorescence of several short racemes embedded in a thick flat leaf-like central axis 2.5–6 mm wide. Spikelets lanceolate to ovate, plump, whitish, 2-flowered.

Lower glume much shorter than the spikelet. Lower lemma thickened, smooth, acute; upper lemma smaller and thinner than the lower. No awns.

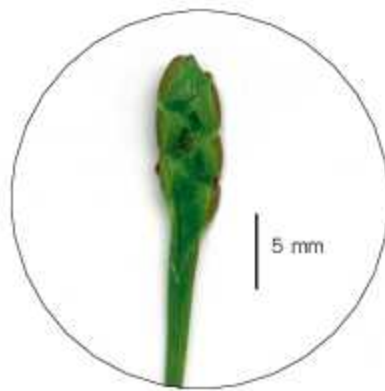
HABITAT. Coastal dunes, montane grasslands, forest edges, secondary vegetation; 0–2,000 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. The foliaceous inflorescence axis is distinctive, resembling *Humbertochloa* (an erect shrubby plant) and *Thuarea* (with apically acute leaves).

MALAGASY NAMES. Ahidrindra, Ahipisaka.

NOTES. The short racemes embedded in a leaf-like axis are distinctive. *Stenotaphrum dimidiatum* is a common planted lawn grass.



1 cm

Stenotaphrum oostachyum



Styppeiochloa

Ca. 5 endemic species (genus of South Africa and Madagascar)

DESCRIPTION. Tufted erect perennials, 20–75 cm tall, basal sheaths fibrous. Ligule a fringe of hairs. Leaf blades rolled. Inflorescence a contracted panicle. **Spikelets with 2–5 flowers, laterally compressed, 4–6 mm long.** Glumes shorter than the spikelet. Lemmas keeled, sharply acute, bilobed at the apex, sometimes with short awns from the lobes and with no central awn, or a short straight central awn up to 2.5 mm long.

HABITAT. Open rocky areas, 800–2,500 m elevation.

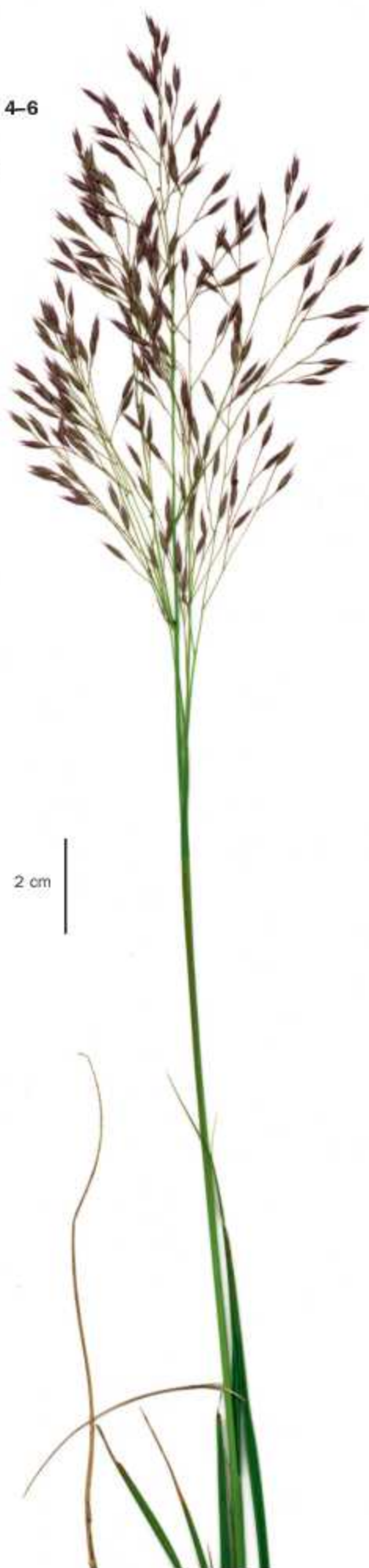
DISTRIBUTION. Fianarantsoa, Toliara.

LOOKALIKES. *Poa* is also a montane grass with panicles and laterally compressed spikelets with more than one floret, but its florets are apically obtuse.

Eragrostis has similar panicles but it usually has more florets per spikelet.

Centotheca can have similar spikelets but it has broader leaves and it is a forest understory species.

NOTES. Previously thought to be a single broadly distributed species, *Styppeiochloa hitchcockii*; unpublished research suggests this may include several local endemic species. This description includes a contribution from Jordan Teisher (Missouri Botanical Garden). Previously placed in *Redfieldia*.



Styppeiochloa hitchcockii

Themeda

2 species (genus of Old World tropics)

DESCRIPTION. Erect tufted annual or perennial 0.2–1.5 m tall. Ligule a short membrane. Leaf blades flat, linear. **False panicle 15–50 cm long, with tight triangle-shaped complex clusters. Clusters of racemes subtended by several layers of red-brown leaf-like bracts, often with tubercle-based hairs.** Two homogamous pairs of spikelets present at the base of the raceme, forming an involucre. Internodes linear. Spikelet 2-flowered. Sessile spikelet terete. Lower glume dark brown, with small hairs. Upper lemma linear and passing into a **pubescent geniculate awn 3.5–4.5 cm long.** Pedicelled spikelet narrowly lanceolate, awnless.

HABITAT. Grassland and secondary vegetation, 0–1,000 m elevation.

DISTRIBUTION. Antsiranana, Mahajanga, Fianarantsoa.

LOOKALIKES. *Cymbopogon*, *Hyperthelia* and *Hyparrhenia* also have groups of awned racemes subtended by reddish spatheoles, but these have less complicated inflorescences with 2 clear racemes subtended by each bract, and no tubercle-based hairs.

MALAGASY NAMES. Simena, Sindambo, Verokely.

NOTES. The structure of the dense raceme clusters is complicated but they are a distinctive feature allowing the genus to be recognised easily. *Themeda quadrivalvis* is annual while *Themeda triandra* is perennial.



Themeda quadrivalvis

Thuarea

2 species including 1 endemic (Indian Ocean genus)

DESCRIPTION. Prostrate mat-forming annual or perennial with stems to 50 cm long, rooting from the nodes. Ligule a fringe of hairs. Leaf blades lanceolate, apically acute.

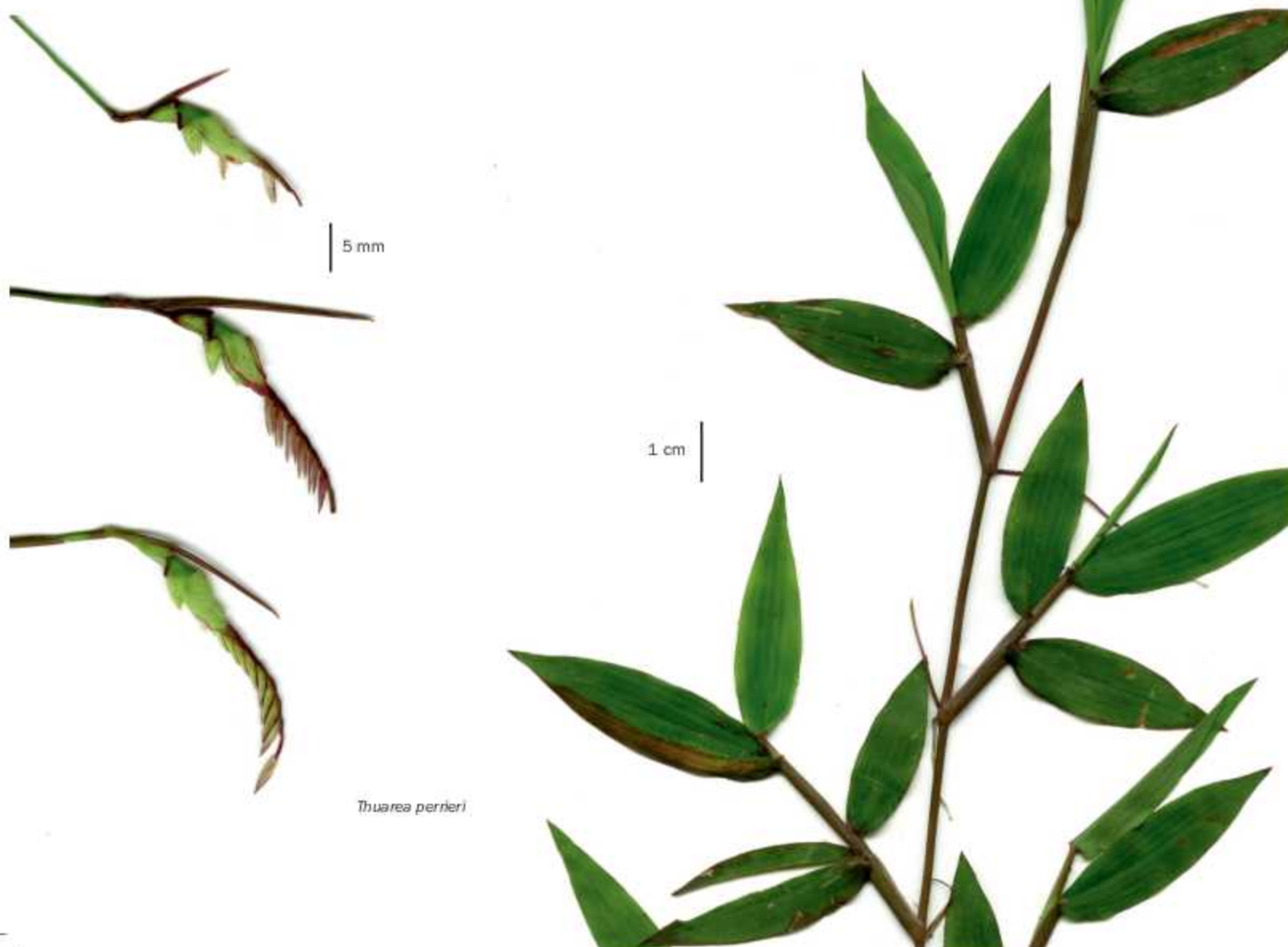
Inflorescence of a single erect unilateral raceme 1–2 cm long, sometimes hidden within a hood-like leaf, deciduous as a whole. Each raceme with 1–2 fertile spikelets at the base and male spikelets at the apex. Rhachis broadly winged, foliaceous. Spikelet with 2 florets. Fertile spikelets with a basal sterile floret and an apical fertile floret, elliptic or ovate. Upper glume longer than the florets. Fertile lemma hard, acute. No awns.

HABITAT. Sandy sea shores and dry forest; 0–1,500 m elevation.

DISTRIBUTION. All provinces except Antananarivo.

LOOKALIKES. The small hooded racemes of *Thuarea* are distinctive and the only other genus with similar racemes is *Humbertochloa*, a woody plant with stiff ovate leaves, a pseudopetiole and sagittate leaf bases; *Thuarea* is herbaceous with thinner lanceolate leaves and no pseudopetiole. *Stenotaphrum* is creeping with racemes embedded in a thick flat leaf-like central axis; it has apically rounded leaves.

NOTES. The endemic *Thuarea perrieri* is almost glabrous with small racemes on long graceful pedicels, and grows inland. The more widespread *Thuarea involuta* is a densely hairy sea shore plant.



Thysanolaena

Thysanolaena latifolia (Asian plant brought in as an ornamental)

DESCRIPTION. Erect decorative perennial 2–4 m tall, the culms solid inside. Ligule a membrane. Leaf blades 3–7 cm wide, fresh green colour, falling off at the base. Inflorescence an open panicle 30–60 cm long, the branches branched again. Spikelets contracted around panicle branches, lanceolate, laterally compressed, 1.5–2 mm long, 2-flowered, falling with the pedicel. Glumes similar to one another, shorter than the spikelet, 1-nerved. Lemmas membranous, apically acute, 1–3-nerved, with ciliate margins. No awn.

HABITAT. Cultivation and roadsides.

DISTRIBUTION. Fianarantsoa.

LOOKALIKES. Differs from *Phragmites* and *Neyraudia* by its culms which are solid inside, and inflorescences with no hairs or awns.

NOTES. Naturalised in the Ranomafana area; common on La Réunion, Mauritius and the Seychelles.



Trachypogon

Trachypogon spicatus (genus of Africa and tropical America)

DESCRIPTION. Erect tufted perennial 0.5–1.2 m tall. Ligule a membrane. Leaf blades linear to rolled. **Inflorescence of 1 (sometimes 2–5) digitate racemes 10–30 cm long with paired spikelets.** Internodes and pedicels linear. Spikelet with 2 florets. Subsessile spikelet male or sterile and awnless, persistent on the rachis. Pedicelled spikelet like the subsessile but hermaphrodite, narrowly oblong to terete. Lower glume convex, grey-brown, obtuse. Upper lemma linear passing into a **white hairy geniculate awn 4–8 cm long.**

HABITAT. Savanna; 300–2,500 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. *Heteropogon* is also a common savanna grass with a single terminal raceme, paired spikelets, and hairy awns; its racemes are clearly asymmetric and its awns are dark brown.

Diectomis has an awned foliaceous pedicelled spikelet and a lower glume which is orange at maturity.

MALAGASY NAMES. Danga, Horo, Horondahy.

NOTES. More difficult to understand than other members of the Andropogoneae because none of the spikelets are clearly sessile: every spikelet pair contains one spikelet on a short pedicel (subsessile, with no awn) and one spikelet on a long pedicel (pedicelled, with an awn). Different from most Andropogoneae because the pedicelled spikelet is bisexual, has an awn, and produces a seed; in most other genera this function is carried out by the sessile spikelet (or both spikelets equally in *Saccharum* and *Eulalia*). Used for making brushes.



1 cm

Trachypogon spicatus

Tragus

2 species (pantropical genus)

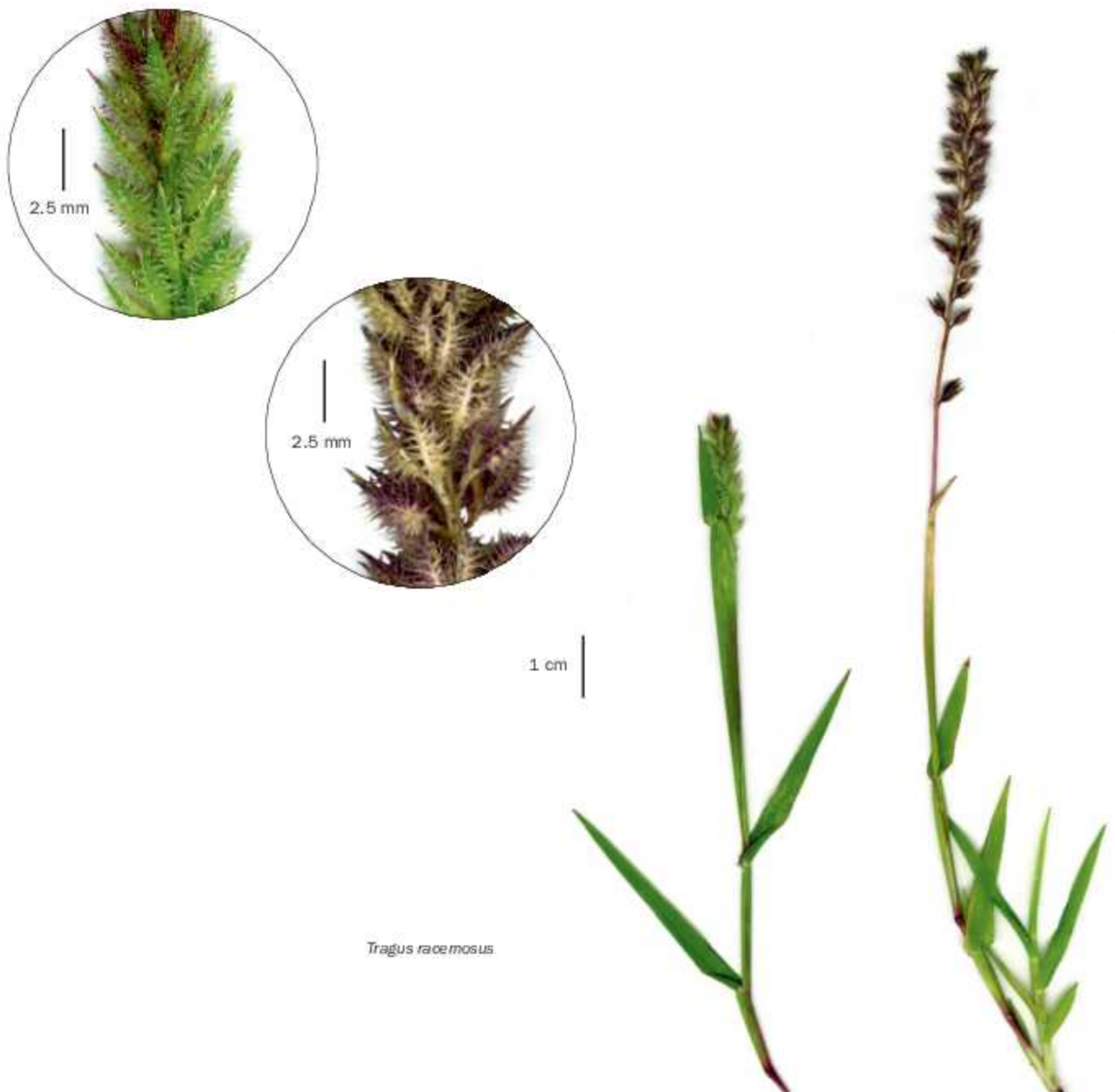
DESCRIPTION. Loosely tufted spreading annual, 10–50 cm tall. Ligule a line of hairs. **Leaf blades ovate, with bulbous-based hairs on the margins**, 1–5 mm wide. Inflorescence stiff, dense, cylindrical, spike-like. Spikelets sessile, falling entire, with 1 flower, 2–4 mm long, lanceolate to ovate, sticky, with hooked prickles. Lower glume a tiny scale or absent. **Upper glume as long as the spikelet, with many stout hooked prickles 0.6–1 mm long on the nerves.** Lemma almost as long as the glume, ovate. No awns.

HABITAT. Arid areas on sand or rock; low elevations.

DISTRIBUTION. Almost all records from Toliara, but also recorded in Mahajanga and Fianarantsoa.

LOOKALIKES. *Pseudechinolaena* is also an annual which can have prominent hooked bristles on its upper glume, but the bristles are on one side of the spikelet only, and the spikelets are arranged in distinct racemes rather than a dense spike-like structure.

NOTES. The hooked prickles attach themselves to passing animals to achieve seed dispersal. The cylindrical spike-like racemes of prickly spikelets which stick to human skin usually enable instant recognition of this genus.



Trichanthecium

2 species (genus of Africa and South America)

DESCRIPTION. Erect or creeping, tufted or stoloniferous perennials up to 70 cm tall or 1 m long. **Ligule a membrane.** Leaf blades filiform to narrowly ovate, 1.5–15 cm long, becoming reflexed at maturity in *Tricanthecium parvifolium*. Panicles ovate, 1–10 cm long. Spikelets **rounded**, 2-flowered, 1–2 mm long, often pliose in *T. brazzavillense*. Lower glume $\frac{1}{2}$ – $\frac{4}{5}$ as long as the spikelet. **Upper lemma with fine bicellular microhairs which are difficult to see without a microscope. No awns.**

HABITAT. Seasonally damp open areas and swamps, 0–1,900 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. *Panicum* is difficult to distinguish from *Trichanthecium*: *Panicum* does not have any bicellular microhairs on the upper lemma, but they can be too small to see with a hand lens. Unlike *Trichanthecium*, most *Panicum* species have ciliate ligules.

NOTES. The genus is named after the microhairs on the upper lemma. It has been recently separated from *Panicum*, and contains Malagasy species not directly related to one another: the erect tufted *Trichanthecium brazzavillense* (previously *P. brazzavillense*) of the High Plateau and the creeping glaucous green *T. parvifolium* (previously *P. parvifolium*) common across Madagascar. Recognising the two species separately can be easier than recognising the genus *Trichanthecium*.



Trichanthecium parvifolium

Tricholaena

Tricholaena monachne (genus of Old World tropics)

DESCRIPTION. Erect tufted perennials 0.3–1.2 m. Ligule a ciliate membrane. Leaf blades flat or rolled, pale white-green. **Inflorescence a panicle. Spikelets oblong, lightly compressed laterally, yellow or purple, 1.5–3 mm long, 2-flowered.** Lower glume small or suppressed. Upper glume as long as the spikelet, membranous. Upper lemma smaller than the lower, hardened, smooth and shining, white, acute. No awns.

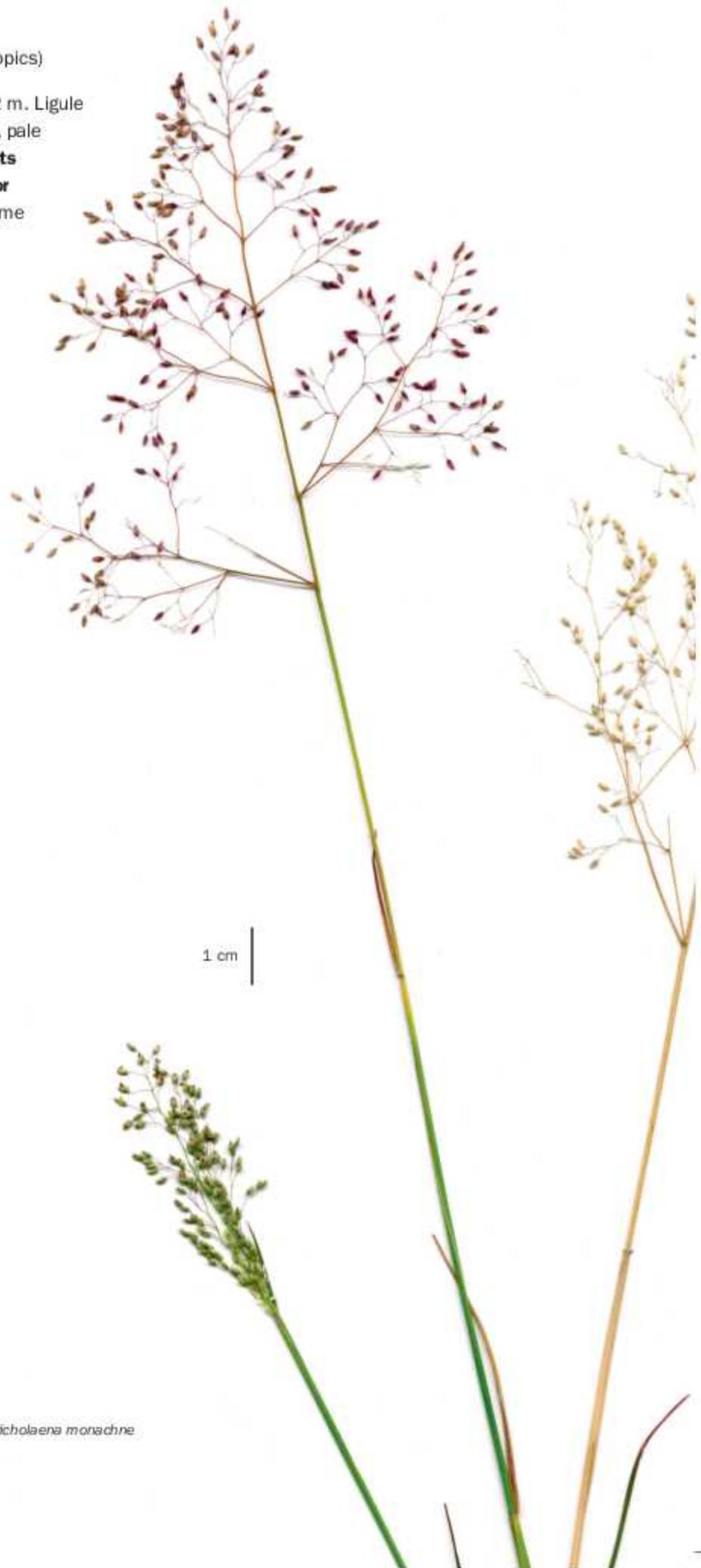
HABITAT. Dunes and open rocky areas, 0–1,500 m elevation.

DISTRIBUTION. Antsiranana, Mahajanga, Antananarivo, Fianarantsoa.

LOOKALIKES. Looks like a typical *Panicum*, and there is no easy way to tell the difference. The spikelets are compressed laterally so the upper glume appears to be to one side of the flat surface, and the lower glume is minute.

MALAGASY NAME. Ahipody.

NOTES. Related to *Melinis* and *Eriochloa*.



Tricholaena monachne

Trichopteryx

Trichopteryx dregeana (African genus)

DESCRIPTION. Prostrate or ascending rhizomatous perennial, the culms long and wiry, 1–3 mm wide. Ligule a ciliate membrane. Leaf blades linear-lanceolate, only 1–3 cm long, often pointed backwards. Inflorescence a panicle. Spikelets with 2 flowers each, brown, disarticulating beneath each floret. Glumes apiculate, the upper as long as the spikelet, the lower half as long. Lower lemma as long as the spikelet. **Upper lemma thin, with tufts of long white hairs below the two lobes, and with 3 awns, the central awn 4–7 mm long.**

HABITAT. Wet places, marshes and near streams, fertile soils; 700–1,800 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. Related to *Loudetia* and *Tristachya* which grow erect; *Loudetia* and *Tristachya* have much larger spikelets.



1 cm

Trichopteryx dregeana

Tripogon

Tripogon minimus (genus of Old World tropics)

DESCRIPTION. Small delicate tufted perennial 5–30 cm tall. Ligule a ciliate membrane. Leaf blades filiform. Inflorescence a terminal spike, the spikelets alternate on either side of the rachis, appressed to the rachis. Spikelets with 3–10 flowers, linear, laterally compressed. Glumes narrow, keeled, shorter than the lower lemma. Lemmas rounded or obtusely keeled, with two apical lobes and a thin awn 0.1–1.5 mm long.

HABITAT. Grassland and rocky outcrops, 0–1,700 m elevation.

DISTRIBUTION. Fianarantsoa, Toliara.

LOOKALIKES. *Dinebra* has similar racemes but it is a larger plant with numerous racemes on a rachis.

NOTES. The awns can be difficult to see without magnification.



Tripogon minimus

Tripsacum

Tripsacum andersonii (Central American genus)

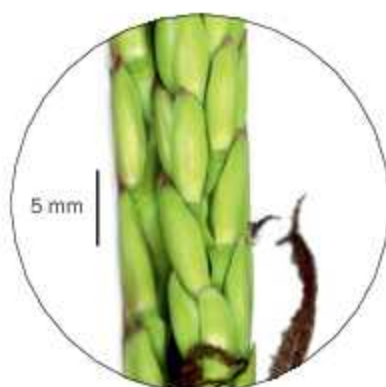
DESCRIPTION. Erect robust perennial 3–5 m tall, 2–3 cm wide. Ligule a ciliate membrane. Leaf blades lanceolate, 4–10 cm wide. **Inflorescence composed of 3–8 terminal digitate racemes 15–20 cm long.** The lower half of each raceme is cylindrical, with female spikelets sunk into the internodes, somewhat resembling *Rottboellia* racemes. **The upper half of each raceme with clearly visible sessile and pedicelled male spikelets.** Spikelet with 2 florets. No awns.

HABITAT. Usually cultivated.

DISTRIBUTION. Not known.

LOOKALIKES. *Zea* is also a robust erect cultivated grass but its racemes are even throughout, and the male and female inflorescences are separate.

NOTES. The racemes cylindrical in the lower part and with free spikelets in the upper part are unique among Madagascar grasses. Introduced as a fodder crop called “Guatemala grass”; sometimes found outside cultivation. Members of this genus are the closest known wild relatives of the cultivated genus *Zea*, maize, which is not known in the wild.



1 cm

Tripsacum andersonii

Tristachya

3 endemic species (pantropical genus)

DESCRIPTION. Tufted perennials with erect or ascending culms to 1 m long. Ligule a ciliate fringe. Leaf blades linear, flat or filiform. Panicle open or contracted, **the spikelets held in groups of 3, each group of 3 spikelets on a single fused pedicel. Spikelets large, 2-flowered, brown to straw-coloured**, disarticulating beneath each floret. Glumes usually with **long hairs arising from brown tubercles**, the upper glume as long as the spikelet. Lower lemma similar to the upper glume. Upper lemma thick, with tufts of white hairs at the base of two lobes, **awned. Awn geniculate when dry, 12–15 mm long. Callus conical, pungent, pubescent.**

HABITAT. Open rocky grassland and savanna, tapia forest; 300–1,300 m elevation.

DISTRIBUTION. Fianarantsoa, Tollara.

LOOKALIKES. The spikelets resemble those of the common savanna genus *Loudetia*, but *Loudetia* is a taller plant which is always erect, and each spikelet of *Loudetia* is on a separate pedicel with one awn from each pedicelled spikelet, while *Tristachya* is smaller, erect to ascending, and there are three awns protruding from each group of three spikelets held on one pedicel. When a mature floret with an awn is pulled out, its base (callus) has a single sharp end in *Tristachya*, but ends in two teeth which are less sharp and would not puncture skin in *Loudetia simplex*.

MALAGASY NAMES. Ahikibobo, Kifafavola.

NOTES. Each group of three spikelets resembles one spikelet but has three geniculate awns protruding from it. Members of this genus were previously placed in *Isalus* and *Danthaniopsis*. Used for making brooms.



5 mm

Tristachya betsileensis



Triticum

Triticum aestivum, bread wheat (genus from Europe and Asia)

DESCRIPTION. Erect loosely tufted annual 0.6–1 m tall. Ligule a membrane. Leaf blades flat, linear, 10–15 mm wide. **Inflorescence a single terminal raceme 5–18 cm long with spikelets densely packed on either side of the rachis.** Spikelets with 2–4 flowers, laterally compressed, somewhat inflated, **shiny orange-brown at maturity.** Glumes thick, obtuse, shorter than the lowest lemma. Lemma thick and shiny. **Awn absent or up to 15 cm long; awn presence often variable within one plant.**

HABITAT. Human cultivation.

DISTRIBUTION. In cultivation, occasionally escapes.

LOOKALIKES. *Hordeum* is related to *Triticum*, has similar inflorescences, and is also cultivated near Antsirabe; its spikelets are in groups of three, not single.

MALAGASY NAME. Varimbazaha.

NOTES. Grown for bread production.



Triticum aestivum

Urelytrum

Urelytrum agropyroides (African genus)

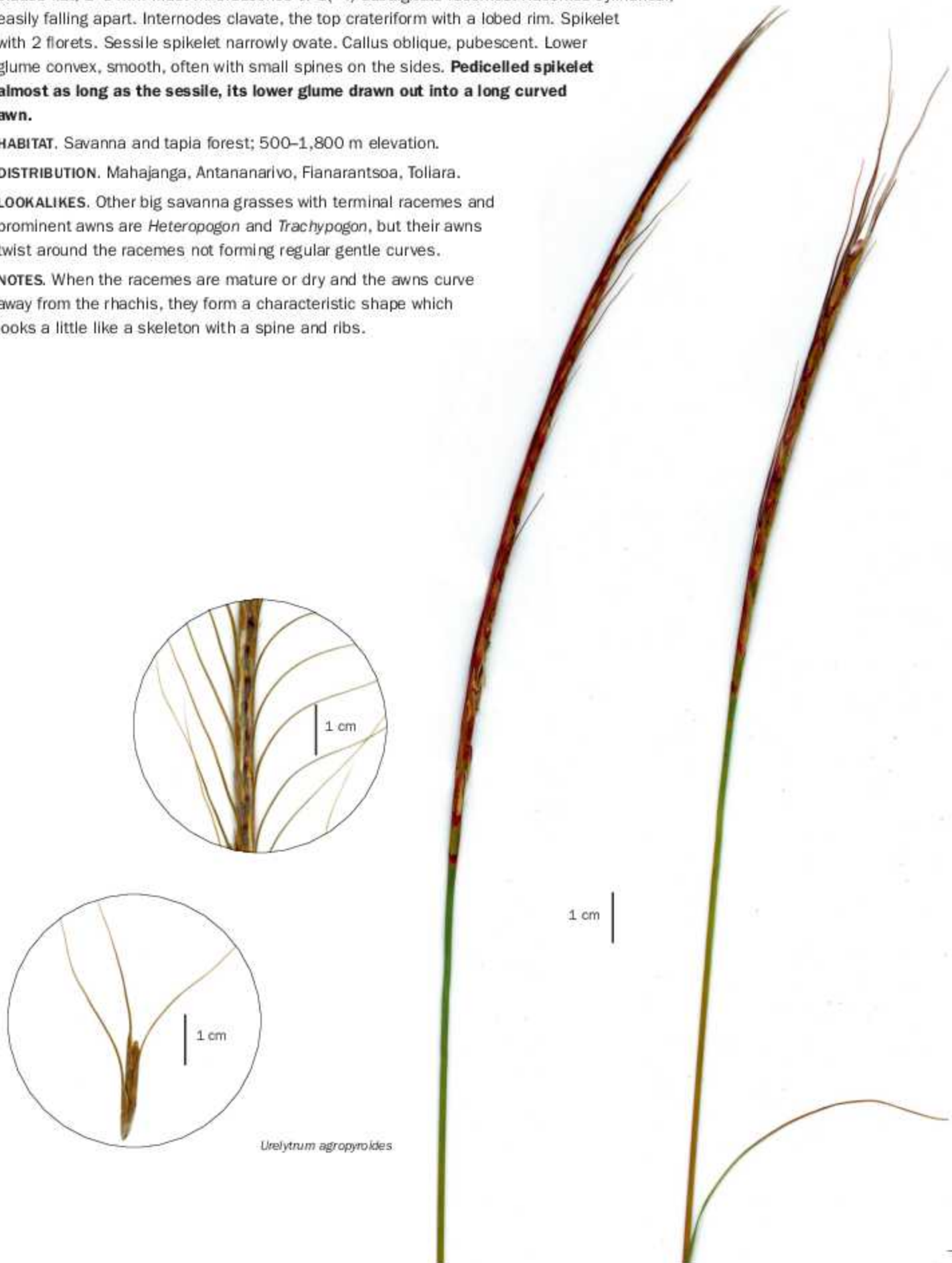
DESCRIPTION. Erect tufted perennial 0.5–2 m tall. Ligule membranous, acute, 2–6 mm long. Leaf blades flat, 1–6 mm wide. Inflorescence of 1(–4) subdigitate racemes. Racemes cylindrical, easily falling apart. Internodes clavate, the top crateriform with a lobed rim. Spikelet with 2 florets. Sessile spikelet narrowly ovate. Callus oblique, pubescent. Lower glume convex, smooth, often with small spines on the sides. **Pedicelled spikelet almost as long as the sessile, its lower glume drawn out into a long curved awn.**

HABITAT. Savanna and tapia forest; 500–1,800 m elevation.

DISTRIBUTION. Mahajanga, Antananarivo, Fianarantsoa, Tollara.

LOOKALIKES. Other big savanna grasses with terminal racemes and prominent awns are *Heteropogon* and *Trachypogon*, but their awns twist around the racemes not forming regular gentle curves.

NOTES. When the racemes are mature or dry and the awns curve away from the rachis, they form a characteristic shape which looks a little like a skeleton with a spine and ribs.



Urelytrum agropyroides

Urochloa

Ca. 15 species in Madagascar (large pantropical genus)

DESCRIPTION. **Creeping or erect annuals or perennials, 0.1–1.5 m tall.** Ligule a line of hairs. Leaf blades linear to lanceolate. **Inflorescence composed of racemes on a common axis (or a panicle in *Urochloa maxima*).** Spikelets ovate to oblong, plump, obtuse to acute or apiculate, 2-flowered. Lower glume usually shorter than the spikelet; upper glume as long as the spikelet. Lower lemma like the upper glume. Upper lemma hardened, obtuse to acute, usually rugulose with a fine point. No awns.

HABITAT. Mesic damp open locations, forest edges, roadsides; 0–2,500 m elevation.

DISTRIBUTION. All provinces.

LOOKALIKES. *Brachiaria* species have been moved to *Urochloa*, but some species of *Brachiaria* do not have a definite generic placement yet; most species of *Urochloa* have an ornamented upper lemma and a fine point at the apex of the lemma, while species still in *Brachiaria* usually have a smooth upper lemma with no apical point. *Moorochloa* is similar but has erect racemes tightly appressed to the central axis and its upper lemma is obtuse.

Panicum: similar habit and similar spikelets, but arranged in a panicle.

Acroceras: similar thin creeping stems and spikelets arranged in racemes, but apices of the glumes and lemmas thickened and pinched at the apex.

NOTES. This is a typical panicoid genus with distinctive panicoid spikelets (hard upper lemma protecting the caryopsis and becoming easily detached from the soft herbaceous and glume-like lower lemma). *Urochloa maxima* (previously called *Panicum maximum* or *Megathyrsus maximus*) is an omnipresent weed all over Madagascar, and its inflorescence is an open panicle, not a raceme. *Urochloa brizantha* and *U. ruziziensis* have been introduced from Africa as fodder.

Urochloa now includes many members of the genus *Brachiaria*. Species originally placed in *Urochloa* are: *Urochloa glumaris*, *U. mosambicensis*, *U. panicoides*. Species moved from *Brachiaria* to *Urochloa*: *U. arrecta*, *U. brizantha*, *U. distachya*, *U. mutica*, *U. plantaginea*, *U. reptans*, *U. ruziziensis*. Some species remain in *Brachiaria* in this treatment as it is not certain what genus they will be moved to.



Urochloa reptans

Valiha

2 species (endemic genus; *Valiha diffusa* and *Valiha perrieri*)

DESCRIPTION. Open clumping bamboo with pachymorph rhizomes and long necks. **Culms erect, with arching tips, medium to relatively large**, with moderately thin walls, internodes smooth, sheath scar or nodal line dipping markedly below the bud. Young shoots hairy. Branch bud one at each node, borne below the supranodal ridge where the sheath scar curves downwards or dipping markedly, **primary branch dominant, elongating, surrounded by small secondary branches bearing leaf blades**. Culm sheaths densely hairy when young, especially at the base, hairs dark brown; blades linear, spreading, with scattered dark brown hairs; ligule lacinate with long bristles. Leafy branches up to 30 cm long. Leaf blades lanceolate to ovate-lanceolate, glabrous or with scattered white hairs; sheaths glabrous; auricles not present; ligule lacinate. Inflorescences about 6 cm long, terminating leafy branches, determinate, axis segmented, sheaths or subtending bracts and a prophyll present, bearing several spikelets, of which the terminal one matures first followed by the rest. Spikelet cylindrical when young becoming diffuse or open in maturity, up to 3.5 cm long, consisting of 4–6 transitional glumes, one fertile floret and a much reduced rachilla extension; glumes, lemma and palea chartaceous. Caryopsis ovoid, with thick chartaceous pericarp.

HABITAT. *Valiha diffusa* probably originated in wet forest up to 700 m elevation. It is now becoming widespread on open hills and valleys, often growing together with *Ravenala madagascariensis*.

DISTRIBUTION. Antsiranana, Fianarantsoa, Mahajanga, Toamasina.

LOOKALIKES. In both *Valiha diffusa* and *Bambusa vulgaris*, the middle branches are dominant; *Bambusa* has large auricles and a sizeable blade on its culm sheaths while *Valiha* has no auricles and a reduced blade on its culm sheaths.

The culms of *Valiha* are usually larger and taller (6–10 m tall, diameter 6–8 cm) than those of *Perrierbambusa* (3–7 m tall, diameter 1–2 cm), and the middle branches in *Valiha* are markedly dominant and long.

LOCAL NAMES. Vologazy is the Malagasy name for *Valiha diffusa* (meaning Madagascar bamboo; 'volo' means bamboo).

NOTES. *Valiha diffusa* or "Vologazy" is easily recognised by its tall erect culm with arching tips and alternate dominant middle branches, resembling a large fan, growing singly or individually scattered on open plains, on hills or in the forest. This species has rhizomes with long necks and therefore it does not form clumps. It flowers sporadically; flowers are rarely found. It is possible that mature culms, which may produce flowers, are rarely found, because they have been harvested. *Valiha diffusa* is found over all eastern regions of Madagascar, and is Madagascar's most widely used native bamboo; in the Marojejy area, the culms were previously used for making a musical instrument, the tube zitter called "Valiha" ("Valiha" is now made from another bamboo with longer internodes: *Gigantochloa pseudoarundinacea*). The culms are also used for the construction of walls and roofs: they are split on one side and flattened, then woven into large panels. Other uses are for carrying and storing water, fences, other light construction, and baskets. *Valiha perrieri* is known only from the type specimen.

Valiha diffusa



Viguiarella

Viguiarella madagascariensis (monotypic endemic genus)

DESCRIPTION. Ascending loosely tufted annual with culms 10–40 cm long. Ligule a fringe of hairs. Leaf blades flat, narrow, apically acuminate. **Inflorescence a single terminal multilateral raceme 2–7 cm long, purple when young.** Spikelets single, sessile, 4–6 mm long, **each spikelet subtended by a small scale.** Spikelets with one basal fertile floret and 1–3 smaller apical male or sterile florets. Callus pubescent, pungent. **Glumes shorter than spikelet, pubescent, every glume with an awn 6–15 mm long.** Lemma elliptic, coriaceous, 3–5-nerved, awned.

HABITAT. Dunes, arid open grassland and roadsides; 0–500 m elevation.

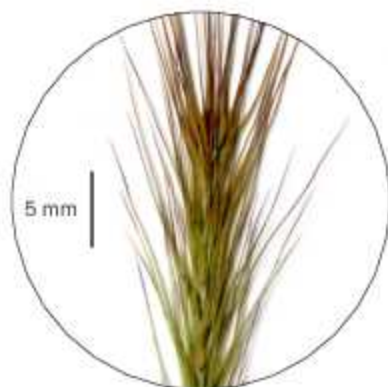
DISTRIBUTION. Antsiranana and Mahajanga.

LOOKALIKES. *Aristida* is also a densely awned grass of arid environments but it is usually perennial while *Viguiarella* is an annual; *Aristida* usually has a panicle, unlike the single racemes of *Viguiarella*. When a spikelet and floret is pulled out it is possible to see that every *Aristida* floret has a 3-branched awn; *Viguiarella* awns are simple but they arise from glumes as well as lemmas.

Perotis has a superficially similar terminal fluffy spike, but almost always wider ovate or lanceolate leaves; *Perotis* also has softer awns with only two awns per spikelet, unlike the stiff awns of *Viguiarella* with more than four awns per spikelet.

Cenchrus also has fluffy terminal spike-like inflorescences but these are thicker with bristles which arise below spikelet clusters, while awns arise from the apices of glumes and lemmas in *Viguiarella*.

NOTES. Racemes appear hairy because both glumes and every lemma give rise to a long awn.



1 cm

Viguiarella madagascariensis



Yvesia

Yvesia madagascariensis (monotypic endemic genus)

DESCRIPTION. Erect or geniculately ascending annual 15–20 cm long. Ligule a fringe of hairs. **Leaf blades lanceolate, stiff, with tubercle-based hairs. Inflorescence of several small racemes on a central axis.** Spikelets solitary, held erect, on short pedicels, white. Spikelets with 1 basal sterile floret and one apical fertile floret, lanceolate, dorsally compressed, 2–3 mm long. Lower glume absent or vestigial. Upper glume longer than the fertile lemma, **pilose with white-yellow hairs in the lower part.** Lower lemma acute, also pilose with white-yellow hairs in the lower part. Fertile lemma thick, acute. No awns.

HABITAT. Savannas and stream sides; 0–1,000 m elevation.

DISTRIBUTION. Antsiranana, Mahajanga, Fianarantsoa.

LOOKALIKES. The habit and inflorescence of *Yvesia* resembles the abundant weedy *Panicum umbellatum*, also known as *Brachiaria umbellata*; none of the *Panicum* or *Brachiaria* species have long white-yellow hairs on the lower parts of the upper glume and lower lemmas (some *Brachiaria* endemic to Madagascar have a line of hairs on the upper part of the upper glume and lower lemma).

NOTES. Can form monotypic stands on shallow soils.



1 cm

Yvesia madagascariensis

Zea

Zea mays, maize (genus of Central America)

DESCRIPTION. Erect robust annual 1–3 m tall. Ligule membranous. Leaf blades linear to lanceolate, 2–10 cm wide. **Female inflorescence a single wide woody axillary raceme wrapped in leaf-like bracts, long silky styles hanging from the tip** (this raceme is the maize cob). Male inflorescence of terminal racemes arranged on a central axis, 20–30 cm long, yellow to orange or brown, both sessile and pedicelled spikelets male. Spikelet with 2 florets. No awns.

HABITAT. In cultivation.

DISTRIBUTION. All provinces.

LOOKALIKES. *Tripsacum* is a related cultivated robust grass, but all of its racemes are cylindrical (female) in the lower half and have free sessile and pedicelled (male) spikelets in the upper half.

MALAGASY NAMES. Baby, Batribatry, Katsabato, Katsabotso, Katsaka, Sako, Tsinjaza, Tsako, Tsakotsako, Tsatsako.

NOTES. Maize is grown throughout Madagascar as food for people and animals.



Zea mays

Zoysia

2 species (genus of oceanic coasts in Asia)

DESCRIPTION. **Mat-forming perennials up to 25 cm tall, densely branched at ground level.** Ligule a line of hairs. Leaf blades distichous, stiff, flat or rolled, 1.5–3.5(–7) cm long. **Inflorescence a dense cylindrical raceme.** Pedicels flattened. **Spikelets appressed to axis**, laterally compressed, falling entire, with 1 flower. Lower glume usually absent; upper glume as long as spikelet, enclosing floret, laterally compressed, leathery, rounded on back, smooth, glossy, apex acute. **Lemma membranous.** No awns.

HABITAT. Coastal sands, low elevations.

DISTRIBUTION. Toamasina.

LOOKALIKES. *Sporobolus* can have similar panicles and spikelets; it has membranous glumes that are not hardened, and spikelets are often darker in colour.

Zoysia resembles some panicoid grasses with simple spikelets and no awns, e.g. *Brachiaria* and *Panicum*, which have a hardened upper lemma that comes out from between the upper glume and the lower lemma when the spikelet is pressed.

MALAGASY NAMES. Ahitrombilahy, Horompotsy, Tsindrondrotra.



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INDEX TO GENERIC NAMES

with notes on names not accepted or not included in this guide

Accepted names of genera known from Madagascar and main entry page number are in **bold** text.

- Acrachne* 6, 13, 15, 17, **20**, 48, 55, 68
Acroceras 7, 13, 15, 17, **21**, 34, 42, 53, 105, 112, 115, 126, 158
Adenochloa 7, 13, 15, 16, **22**, 115, 128, 132
Agrostis 5, 13, 14, 16, **23**, 26, 38, 73
Aira has not been recorded in Madagascar
Alloteropsis 8, 13, 15, 17, **24**, 66
Andropogon 9, 13, 14, 17, **25**, 28, 33, 51, 60, 61, 74, 75, 83, 88, 90, 92
Anthoxanthum 5, 13, 14, 16, **26**
Aristida 4, 13, 14, 16, **27**, 133, 160
Arthraxon 8, 9, 13, 14, 17, **28**, 33
Arundinaria = *Oldeania*
Arundinella 7, 13, 14, 16, **29**, 99, 118
Arundo has not been recorded in Madagascar 70, 121
Avena 6, 7, 13, 14, 16, **30**
Axonopus 8, 13, 15, 17, **31**, 62, 117
Bambusa 1, 10, 11, 12, 13, 14, 16, **32**, 59, 77, 159
Boivinella = *Cyphochlaena*
Bothriochloa 9, 13, 14, 17, 28, **33**, 60, 63, 74, 88, 92, 118
Brachiaria 8, 13, 15, 17, 21, **34**, 42, 45, 53, 54, 66, 73, 95, 106, 112, 115, 124, 126, 132, 142, 158, 161, 163
Brachypodium 6, 13, 14, 17, 26, **35**, 37, 67, 76, 123
Briza 2, 6, 13, 14, 16, **36**
Bromus 6, 13, 14, 16, 35, **37**, 76, 80, 123, 127
Calamagrostis 5, 13, 14, 16, 23, **38**
Camusia = *Acrachne*
Camusiella = *Setaria*
Catharostachys 10, 11, 12, 13, 14, 16, **39**, 110
Cenchrus 7, 13, 15, 16, **40**, 70, 71, 116, 119, 137, 160
Cenotheca 3, 4, 13, 14, 16, **41**, 76, 101, 144
Cephalostachyum = *Sokinochloa*
Chasechloa 8, 13, 15, 17, **42**
Chasmopodium caudatum: not recorded in Madagascar;
in Madagascar this name refers to *Rottboellia cochinchinensis*
Chloris 5, 13, 15, 17, 20, **43**, 52, 55, 56, 71, 108, 135
Chrysopogon 1, 8, 13, 14, 16, 17, **44**, 99
Coelachne 4, 13, 15, 16, **45**, 54, 95, 123
Colx 2, 4, 13, 14, 17, **46**, 84
Cortaderia 2, 6, 13, 15, 16, **47**, 109, 121
Craspedorhachis 5, 13, 15, 17, 20, **48**, 64, 65, 68
Crypsis 5, 13, 15, 16, **49**
Ctenium 5, 13, 15, 17, **50**, 71, 104, 135
Cymbopogon 9, 13, 14, 17, 25, **51**, 61, 83, 88, 92, 145
Cymbosetaria = *Setaria*
Cynodon 1, 5, 13, 15, 17, 20, 43, **52**, 55, 56, 62, 68, 117
Cyphochlaena 7, 13, 15, 17, **53**, 54, 105, 112, 126
Cyrtococcum 7, 13, 15, 16, 45, 53, **54**, 91, 105, 115, 132
Dactylis has not been recorded on Madagascar although it exists on La Réunion
Dactyloctenium 6, 13, 15, 17, 20, 42, 50, **55**, 68
Daknopholis 5, 13, 15, 16, 17, 43, **56**
Danthonia: Malagasy species now under *Merxmüllera*
Danthoniopsis = *Tristachya*
Decaryella 5, 13, 15, 17, **57**
Decaryochloa 10, 11, 12, 13, 14, 16, **58**, 110, 139
Dendrocalamus 10, 11, 12, 13, 14, 32, **59**, 77
Deschampsia has not been recorded on Madagascar although it exists on Mauritius
Dichanthium 9, 13, 14, 17, 28, 33, **60**, 63, 74, 88, 92, 108
Diectomis 9, 13, 14, 17, 25, **61**, 83, 134, 148
Digitaria 8, 13, 15, 17, 31, **62**, 63, 117
Dimeria 7, 13, 14, 17, 62, **63**, 108
Dinebra 6, 13, 15, 17, 48, **64**, 65, 153
Diplachne 2, 6, 13, 15, 17, 48, 64, **65**
Echinochloa 8, 13, 15, 17, 24, 53, **66**, 73
Echinolaena = *Chasechloa*
Ehrharta 4, 13, 14, 16, 17, **67**
Eleusine 6, 13, 15, 17, 42, 43, 52, 55, **68**, 136
Ellonurus 9, 13, 14, 16, **69**, 98, 104, 114, 129, 130, 134
Enneapogon 2, 4, 13, 15, 16, **70**, 97
Enteropogon 5, 13, 15, 17, 50, **71**, 135
Eragrostis 6, 13, 15, 16, 36, 41, 45, 64, 65, **72**, 79, 97, 101, 123, 144
Erlochloa 7, 13, 15, 16, **73**, 115, 151
Euclasta 9, 13, 14, 17, 33, 60, **74**, 74, 88, 92
Eulalia 8, 13, 14, 17, **75**, 148
Festuca 6, 7, 13, 14, 16, 23, 26, 35, 37, 38, 67, **76**, 80, 123, 126
Gigantochloa 2, 10, 11, 12, 13, 14, 32, 59, **77**, 159
Hackelochloa 9, 13, 14, 16, 17, **78**
Halopyrum 6, 13, 15, 17, **79**
Helictotrichon 7, 13, 14, 16, 30, 37, 67, **80**, 94, 99, 103, 118, 127
Hemarthra 9, 13, 14, 16, 69, **81**, 82, 98, 104, 114, 134
Heteropholis 9, 13, 14, 16, 78, **82**
Heteropogon 3, 9, 13, 14, 17, 50, 61, 71, **83**, 134, 148, 157
Hickella 10, 12, 13, 14, 16, **84**, 107
Hitchcockella 10, 12, 13, 14, **85**, 120
Holcus has not been recorded on Madagascar although it exists on La Réunion
Hordeum 2, 5, 13, 14, 17, 35, **86**, 156
Humbertochloa 4, 13, 14, 16, 17, **87**, 143, 146

Hyparrhenia 9, 13, 14, 17, 25, 51, 61, 83, **88**, 89, 92, 145
Hyperthelia 9, 13, 14, 17, 83, 88, **89**, 92, 145
Imperata 8, 13, 14, 16, 75, **90**
Isachne 13, 15, 16, 45, 54, **91**, 115, 128
Isalus = *Tristachya*
Ischaemum 9, 13, 14, 17, 60, 78, **92**
Lasiorhachis 8, 9, 13, 15, 16, 75, **93**, 141
Lecomtella 4, 13, 14, 16, **94**
Leersia 4, 13, 14, 16, **95**, 100, 113
Leptaspis 2, 4, 13, 14, 16, **96**, 100
Leptocarydon 6, 13, 15, 16, 64, 65, **97**
Leptochloa: Malagasy species now under *Dinebra* and *Diplachne*
Lepturus 5, 13, 15, 16, 69, 78, 81, **98**, 104, 114
Loudetia 7, 13, 14, 16, 44, **99**, 152, 155
Maltebrunia 4, 13, 14, 16, 95, **100**
Megastachya 4, 13, 14, 16, 41, 72, **101**
Megathyrsus = *Urochloa*
Melinis 8, 13, 15, 16, 70, **102**, 151
Merxmüllera 6, 13, 15, 16, 80, **103**, 118
Microchloa 5, 13, 15, 16, 17, **104**
Microstegium 8, 13, 15, 17, 62, **105**, 124
Miscanthidium: Malagasy species now under *Lasiorhachis*
Miscanthus: Malagasy species now under *Lasiorhachis*
Mnesithea: Malagasy species placed in *Hackelochloa* and *Heteropholis*
Moorochloa 8, 13, 15, 34, **106**, 158
Nastus 10, 12, 13, 14, 16, 84, **107**, 110, 138, 139
Neostapfiella 5, 13, 15, 17, 43, 56, 62, 63, **108**, 135
Neyraudia 6, 10, 13, 15, 16, 47, 70, 97, **109**, 121, 131, 147
Oldeania 10, 12, 13, 14, 16, **110**, 122
Olyra 4, 13, 14, 16, **111**, 128
Opismenus 8, 13, 15, 17, 53, 105, **112**, 124, 126
Oryza 1, 4, 13, 14, 15, 95, 100, **113**
Oxyrhachis 2, 7, 8, 9, 13, 15, 16, 69, 82, 98, **114**, 129, 130, 134
Panicum 4, 7, 13, 15, 16, 21, 22, 29, 34, 45, 53, 54, 66, 73, 91, 105, **115**, 128, 132, 142, 150, 151, 158, 161, 163
Paratheria 7, 13, 15, 16, 40, **116**
Paspalidium = *Setaria*
Paspalum 8, 13, 17, **117**
Pennisetum = *Cenchrus*
Pentameris 6, 13, 15, 16, 80, 103, **118**, 123
Pentaschistis = *Pentameris*
Perotis 5, 13, 15, 16, 17, **119**, 160
Perrierbambus 10, 12, 13, 14, 85, **120**, 159
Phalaris: has not been recorded on Madagascar although it exists on La Réunion
Phragmites 1, 6, 10, 13, 15, 16, 47, 70, 97, 109, **121**, 131, 147
Phyllostachys 1, 10, 12, 13, 14, **122**
Poa 6, 13, 14, 16, 45, **123**, 144
Poecilostachys 7, 13, 15, 17, 41, 42, 100, 105, 112, **124**
Pogonarthria = *Eragrostis*
Pogonatherum 1, 8, 13, 15, 17, 75, **125**

Pollinia: Malagasy species now under *Eulalia*
Polypogon: not recorded in Madagascar
Pseudechinoalaena 7, 13, 15, 17, 112, **126**, 149
Pseudobromus 6, 13, 14, 16, 35, 37, 76, **127**
Pseudolasia 4, 7, 13, 15, 16, 91, 111, 115, **128**
Pterochloris = *Chloris*
Redfieldia: Malagasy species now placed in *Styppelochloa*
Rhynchelytrum = *Melinis*
Rhytachne 9, 13, 15, 16, 69, 78, 82, 114, **129**, 130, 134
Rottboellia 9, 13, 15, 16, 69, 78, 82, 98, 114, **130**
Rytidosperma: Malagasy species now under *Merxmüllera*
Saccharum 1, 8, 10, 13, 15, 16, 75, 93, **131**, 141, 148
Sacciolepis 7, 13, 15, 16, **132**
Sartidia 4, 13, 14, 16, 27, **133**
Schizachyrium 9, 13, 15, 17, 25, 28, 61, 92, 114, 129, **134**
Schoenefeldia 5, 13, 15, 17, 43, 50, 71, **135**
Sclerodactylon 6, 13, 15, 17, 68, **136**
Setaria 3, 7, 8, 13, 15, 16, 40, 94, 102, 116, **137**
Sirochloa 3, 10, 12, 13, 14, 17, 107, 110, **138**
Sokinochloa 10, 12, 13, 14, 16, 58, 110, **139**
Sorghastrum 8, 13, 15, 16, **140**
Sorghum 8, 13, 15, 16, 93, 140, **141**
Sporobolus 4, 13, 15, 16, 45, 64, 65, **142**, 163
Stenotaphrum 8, 13, 15, 16, 17, 87, **143**, 146
Stipa: Malagasy species are now in *Aristida*, *Loudetia*, and *Sartidia*
Stipagrostis: only one historic collection known from Nosy Be most likely from cultivation for decorative purposes; re-collection attempts have not been successful; not included in this guide
Streblochaete: occurs on La Réunion but has not been recorded in Madagascar
Streptogyna: has not been confirmed as present in Madagascar
Styppelochloa 6, 13, 15, 16, **144**
Themeda 9, 13, 15, 16, 17, **145**
Thuarea 4, 13, 15, 87, 143, **146**
Thysanolaena 7, 13, 14, 16, **147**
Tollara = *Perotis*
Trachypogon 8, 13, 15, 17, 50, 61, 71, 83, 134, **148**, 157
Tragus 2, 5, 13, 15, 16, **149**
Trichanthecium 7, 13, 15, 16, 22, 115, 132, **150**
Tricholaena 8, 13, 15, 16, **151**
Trichopteryx 7, 13, 14, 16, **152**
Tripogon 6, 13, 15, 16, 17, 64, **153**
Tripsacum 2, 4, 13, 15, 17, **154**, 162
Tristachya 7, 13, 14, 16, 99, 152, **155**
Triticum 1, 2, 6, 13, 14, 16, 17, 35, 86, **156**
Urelytrum 9, 13, 15, 17, **157**
Urochloa 7, 13, 15, 16, 17, 21, 34, 42, 66, 106, 115, **158**
Valiha 10, 12, 13, 14, 39, 110, 120, **159**
Vetiveria = *Chrysopogon*
Viguerella 5, 6, 13, 17, 86, 119, **160**
Yushania: Malagasy species now under *Oldeania*
Yvesia 8, 13, 15, 17, **161**
Zea 1, 4, 13, 15, 16, 17, 154, **162**
Zoysia 5, 13, 15, 16, 63, 142, **163**

INDEX TO MALAGASY NAMES

Aakatafotsy 66
 Agnanopody 53
 Ahetse 83
 Ahibarira 115
 Ahibaritra 115
 Ahibary 66
 Ahibava 66
 Ahibe 66
 Ahibelo 115
 Ahibero 51
 Ahiborisoa 25, 134
 Ahidahy 115
 Ahidambo 83
 Ahidrano 66, 72
 Ahidrasy 66
 Ahidrindrina 68
 Ahidronono 132
 Ahifotsy 53
 Ahigisa 45
 Ahikakonga 25
 Ahikalonga 25
 Ahikatoto 43
 Ahikibobo 91, 155
 Ahikinga 43
 Ahikongona 95, 102
 Ahilava 66
 Ahimanara 115
 Ahimianara 115
 Ahimoka 72
 Ahimoso 83
 Ahipasira 60, 62
 Ahipatana 137
 Ahipilo 72
 Ahipisaka 31, 115, 117
 Ahipisakalahy 117
 Ahipisakavavy 31
 Ahipody 66, 69, 72, 98, 102, 132, 151
 Ahipody tenany 91
 Ahipolo 72
 Ahipoly 115, 137
 Ahipotsy 97
 Ahitokotoko 40, 137
 Ahitomendry 24
 Ahitoto 115
 Ahitra 83
 Ahitrakanga 24, 25
 Ahitranga 40
 Ahitrombilahy 44, 55, 163
 Ahitsa 83

Ahitsiriry 95, 102
 Ahitsoavaly 117
 Ahitsolika 102
 Ahitsorohitra 27, 114, 134
 Ahivivy 117
 Akatafotsy 72
 Akatambiv 66
 Akatavero 25, 48
 Ambody 53
 Ampemba 141
 Ampembambazaha 141
 Ampembimasombika 141
 Ampemby 141
 Anambalia 91
 Anambolo 32
 Andrafo 131
 Andrantsiky 88
 Andrasika 109
 Andrasiko 109
 Angeka 113
 Angeky 113
 Angika 113
 Angofo 60, 62
 Antoro 90
 Arampandrotra 52
 Arapandrotra 52

 Baby 162
 Bakaky 141
 Bararata 121
 Batribatry 162
 Behatoka 113
 Bekaka 141
 Benaka 141
 Berambo 99
 Betombo 55
 Betrihaka 55
 Betsa 131
 Betsabetsa 131
 Boka 83
 Boritika 113
 Botrivaventy 113
 Bozaka 27, 90

 Danga 83, 88, 148
 Dravala 72

 Fakaka 88
 Fakatenina 90
 Famaky 60, 62
 Famoa 115

Fampitanana 113
 Fandrahana 52
 Fandridahy 115
 Fandrokalana 117
 Fandropalana 52
 Fandrotrarana 52
 Fandrotsana 52
 Fangomoka 72
 Fantaka 29, 109, 115
 Fantakabe 109
 Fantakavazaha 72
 Farimainty 131
 Farimainty 131
 Farimanga 131
 Fary 131
 Fataka 94, 115
 Fatakamanga 94
 Fatakamanitra 51
 Fatakambe 109
 Fatakana 88, 109
 Fatakandahy 109
 Fehana 44, 51, 90
 Femba 141
 Fembamboloky 141
 Fiahana 51
 Fiapary 131
 Fiehana 51
 Fingomoka 72
 Firifiry 52
 Fisika 131
 Fisiky 131
 Forona 129
 Fotobalo 32
 Goana 132
 Hara 99
 Harabo 99
 Harambo 99
 Haravola 25
 Haravolo 99
 Haravolovavy 99
 Honkona 141
 Horo 148
 Horombavy 27
 Horompotsy 163
 Horona 24, 27, 72, 90, 99
 Horondahy 148
 Horondary 129
 Horondrano 129
 Hosihosy 95

- Intsihombilona 53
 Isimbalalia 49

 Jama 113

 Kalafa 88
 Kalay 130
 Kallia 113
 Kapany 20
 Karanga 66, 73
 Karaokana 113
 Katsabato 162
 Katsabotso 162
 Katsaka 121, 162
 Katsaoka 121
 Kelimidina 113
 Ketsa 113
 Kiafotsa 115
 Kiahipody 115, 137
 Kidesy 52
 Kifafa 27, 44, 72
 Kifafadrano 129
 Kifafalahy 27
 Kifafandrano 129
 Kifafarano 129
 Kifafavavy 27
 Kifafavola 155
 Kifofofano 129
 Kilailay 99
 Kilefo 115
 Kindrese 52
 Kindresy 52
 Kiriminy 113
 Kiritika 113
 Kisizavazaha 25
 Kitrambero 88
 Kitrofoka 83, 88
 Kitrofony 83, 88
 Kitsangy 29
 Kitsanjy 88
 Kiverovato 88
 Kofafa 69
 Kolafa 88
 Korona 27
 Korovola 99
 Kotomena 25
 Kotrofony 83, 88

 Lailay 131
 Laim-pary 131
 Lambambary 113
 Lantsidaky 113
 Lefondambo 83
 Lefondambo 83
 Lefonomby 83
 Lengompary 131
 Liritoto 72
 Lohambitro 113

 Mafaibaratra 75
 Mafiloah 33
 Maheritola 111
 Maintisomotra 113
 Manevika 90
 Maneviky 90
 Manimbafoana 53
 Maroforofo 51
 Masiry 25
 Masonkibobo 113
 Mavotohana 131
 Mavotohona 131
 Menakapaha 102
 Menapaka 102
 Menarirana 99
 Menavavy 117
 Merakapaha 95
 Morama 141
 Morateraka 24
 Morona 141
 Motidambo 40

 Orombavy 27
 Osaosa 66

 Paipaika 44
 Pembamboloky 141
 Pepeka 27
 Pepeky 27
 Piko-piko 46

 Raboka 99
 Rampandrotra 52
 Rampandrotsa 52
 Rojo 113

 Saingona 25
 Sako 162
 Sandrahiriky 102
 Sarivary 60, 62, 66
 Sekotovalo 27
 Sekotovalohorombavy 27
 Sihy 88
 Siky 88
 Simena 143
 Sindambo 143
 Songolo 66
 Soratana 77
 Sy 88

 Taimborky 60, 92
 Taindalka 137
 Taindalitra 137
 Taindambo 72, 137
 Tamatama 55
 Tamatamaka 55
 Tambrota 55
 Tanandalitra 40
 Tarifina 72

 Tefy 72
 Tenina 90
 Tenindalitra 137
 Tenona 90
 Tongolonakanga 24
 Tranondahitra 55
 Trongatse 40
 Tsako 162
 Tsakotsako 162
 Tsangambary 24
 Tsatsako 162
 Tsevoka 90
 Tsevondambo 83
 Tsibora 43, 55
 Tsibotsiboka 136
 Tsigegolovolo 111
 Tsikalabana 78, 92
 Tsikasakasa 137
 Tsilaimbery 46
 Tsilainday 40
 Tsilavonomby 98
 Tsimangetahilia 141
 Tsimanimpanariva 33
 Tsimaromana 46
 Tsimatiloah 81
 Tsimatimpanarivo 81
 Tsimbolo 58, 66
 Tsimbony 72
 Tsimparefare 115
 Tsimparifarifotsy 66
 Tsimparifarimanja 66
 Tsimparifary 66, 115, 132
 Tsimpipina 55, 68
 Tsimpipina 20
 Tsimpipiny 20
 Tsindrondrotra 163
 Tsingarivary 132
 Tsingolovolo 96
 Tsinjaza 162
 Tsipala 113
 Tsiparifary 132
 Tsipihipihina 20
 Tsipipina 20, 68, 117
 Tsipipitra 111
 Tsiiry 95
 Tsiiryvary 66
 Tsiroadroatra 72
 Tsiivongo 43
 Tsiivongonombly 117

 Vahitsitafitahady 52
 Vakamanitry 46
 Vakamanivo 46
 Valoriotrabe 111
 Vandrahana 52
 Variampemba 141
 Variampemby 141

- Varifemba 141
 Varijao 113
 Varimbazaha 156
 Varimbivihy 66
 Varinakanga 140
 Varinandriananahary 113
 Vary 113
 Vary andrianahary 113
 Velatrahitra 54
 Velatrahitrahny 54
 Vero 46, 88, 141
 Verobe 88
 Veroboboka 25
 Verofehana 51, 88
 Verofotsy 88
 Verokely 143
 Veromafaika 51
 Veromanga 88
 Veromanitra 25, 51
 Verombato 51, 88
 Veromena 88
 Verotsanga 88, 115
 Verotsangana 88, 115
 Verotsanjy 88
 Viko 111
 Vilonahosihosy 95
 Vilonaomby 95
 Voatondro 55
 Voavalotra 111
 Vodikongo 75
 Vohitara 88
 Voio 32, 39
 Voioandoitra 107
 Voloandro 66
 Volobe 39, 77
 Volobe mavo 32
 Vologazy 159
 Voloko 111
 Volonaondry 52
 Volonondry 115
 Volopoko 111
 Volotrabé 111
 Volosarona 39, 107
 Volosy 39
 Volotara 121
 Voloto 39
 Volotsangana 39, 122
 Volotsiriry 97
 Volovavy 111
 Volovezona 122
 Volozatsy 32, 39
 Volozaty 32
 Vondoha 55

