

Keys to the genera of grasses of Costa Rica*

by

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Because our recent field work has added many genera to the known grass flora of Costa Rica and because older publications useful for the identification of Central American grasses are no longer available, these keys are offered for use and trial. They represent a first step toward the publication of a grass flora of Costa Rica. The author will appreciate suggestions which might aid in the improvement of these keys.

Detailed keys to the bamboos are not included, since the present state of our knowledge of this group of grasses does not permit construction of such keys. The author urges students of Central American plants to watch for the flowering of bamboos, and to make comprehensive specimens of the plants, including inflorescences, foliage from flowering and vegetative culms, leaf sheaths from young culms, and notes of culm size, growth habit, branching, rhizome growth, and any other plant features which cannot be preserved in the usual herbarium specimens.

Several herbaceous grasses are nearly always sterile in Costa Rica and may present problems in identification. Vetiver (*Vetiveria zizanioides*) with stiff, erect, folded leaves, forms dense clumps and is frequently planted to hold road embankments, particularly in the Meseta Central. Lemon oil grass, Zacate Limón, (*Cymbopogon citratus*) is often grown around houses, probably for its lemon odor and for its use in folk medicine. It has apparently never been seen blooming in Central America. Ribbon grass (*Phalaris arundinacea* var. *picta*), a low perennial with leaves longitudinally striped with green and white, is cultivated

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around San Pedro. A giant grass, with culms up to 2 cm thick at the base and 5-7 m tall, dominates a large marsh on the south slopes of Volcán Turrialba. Local people say that it never blooms, and we have not been successful in bringing it to bloom in the greenhouse at Ames. Anatomically, it belongs to the Subfamily Arundinoideae, and we have tentatively named it as a strain of *Phragmites australis*.

In genera of which only one species is found in Costa Rica, that species is listed in the keys.

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MASTER KEY

- 1a. Culms at least 2 m tall, woody and perennial; foliage leaves usually borne on secondary branches; rarely blooming KEY I
- 1b. Culms herbaceous, usually less than 2 m tall; foliage leaves on main culms as well as branches; blooming annually 2
 - 2a. All or some of the spikelets borne partially or completely concealed, in spiny burs, or bony rachis joints, or bead-like or horn-like structures, or detachable fascicles of hard bracts, or completely hidden in leaf sheaths with only the stamens and stigmas visible KEY II
 - 2b. Spikelets borne in the open, in panicles, racemes, or spike-like inflorescences 3
- 3a. Leaf blades separated from the sheaths by a slender pseudopetiole, 1-several cm long KEY III
- 3b. Leaf blades attached directly to the sheaths, or with short pseudopetioles not more than 1-3 mm long 4
 - 4a. Spikelets disarticulating above the glumes which remain attached to the pedicels as visible bracts KEY IV
 - 4b. Spikelets disarticulating completely from the pedicels, no glumes remaining on the plant, or at the most a minute nerveless cupule 5
- 5a. Spikelets all falling as single units, without attached accessory structures KEY V
- 5b. Spikelets, or some of them, falling in clusters or with attached rachis joints, pedicels, or sterile, bristle-like branches KEY VI

KEY I

GIANT GRASSES, CULMS 2-20 M TALL, OFTEN WOODY OR SOLID

- 1a. Culm internodes solid 2
- 1b. Culm internodes hollow 4

- 2a. Leaf blades 1-several m long, borne on the main culm; culms pithy, not extremely woody 3
- 2b. Leaf blades usually less than 20 cm long, mostly borne on branches, the main culms naked or bearing bladeless sheaths *Chusquea*

- 3a. Leaf blades distributed along the culms; spikelets single-flowered, disarticulating below the glumes; cultivated plants of fields; pith sweet. *Saccharum officinarum*
- 3b. Leaf blades in a large, fan-shaped group at the apex of the culms; spikelets 2-flowered, disarticulating above the glumes; wild plants, usually of river banks; pith not sweet *Gynerium sagittatum*

- 4a. Leaf blades 1-2 m long, cordate-clasping at the base, borne on the main culm, frequently yellow-striped; culms thin-walled; plants cultivated for ornament, rarely wild *Arundo donax*
- 4b. Leaf blades usually 20 cm long or shorter, not cordate-clasping 5

- 5a. Culms thorny at the nodes *Guadua*
- 5b. Culms not thorny 6

- 6a. Culms thin-walled, easily crushed between the fingers; annual-blooming plants, the canes slender, less than 1 cm thick; leaning, arching, or scrambling in brush 7
- 6b. Culms hard, thick-walled; plants usually non-flowering; culms slender to very thick (up to 20 cm); plants erect, arching, or drooping Various genera of bamboos, including *Aulonemia*, *Arthrostylidium*, *Bambusa*, *Oatea*, *Elytostachys*, *Phyllostachys*, *Merostachys*, *Melocanna*, *Gigantochloa*, and others

- 7a. Spikelets all alike, with a short first glume and elongated second glume and sterile lemma, placed at an angle to the pedicel; leaf blades sessile, without pseudopetioles; disarticulation below the glumes *Lasiacis*
- 7b. Spikelets unisexual, of two kinds; pistillate spikelets with both glumes longer than the solitary fertile floret and often caudate; disarticulation above the glumes; leaf blades contracted into short pseudopetioles *Olyra*

KEY II

GRASSES WITH VARIOUSLY CONCEALED OR HIGHLY MODIFIED SPIKELETS

- 1a. Low, stoloniferous grass of mountain pastures; spikelets concealed within the sheaths, only the stigmas and stamens protruding *Pennisetum clandestinum*
- 1b. Grasses of various statures; spikelets not all concealed in leaf sheaths 2

- 2a. Inflorescence a spike of densely spiny, readily detached burs, each concealing 1-several spikelets *Cenchrus*
- 2b. Inflorescence not bearing spiny burs 3

- 3a. Inflorescence an unbranched spike bearing fascicles of coriaceous flat bracts which conceal the spikelets, the fascicles readily detached from the zigzag rachis *Anthephora hermaphrodita*
- 3b. Inflorescence rachis without detachable fascicles 4

- 4a. Low stoloniferous or rhizomatous widely spreading plants 5
- 4b. Plants not stoloniferous or rhizomatous; culms erect 6

- 5a. Sheaths strongly flattened and keeled; plants stoloniferous on moist soil; spikelets sunken into one side of a flattened, corky, club-shaped erect rachis; spikelets perfect-flowered *Stenotaphrum secundatum*
- 5b. Sheaths not keeled; plants stoloniferous or rhizomatous, forming mats or mounds on coastal sand dunes or mud flats; plants dioecious; pistillate plants bearing rigid, pointed horns containing the caryopses, in clusters at the tips of the culms *Jouvea*
- 6a. Pistillate spikelets borne in single spheroidal beads on the tips of axillary peduncles; staminate inflorescence a short cluster of spikelets protruding from the opening of the bead *Coix lacryma-jobi*
- 6b. Pistillate spikelets borne in exposed spikes or on axillary cobs concealed in leaf sheaths, never in beadlike structures 7
- 7a. Staminate spikelets borne on a terminal panicle; pistillate spikelets borne on a thick axillary spike (cob), completely covered with leaf sheaths, the styles protruding as "silks" *Zea mays*
- 7b. Staminate and pistillate spikelets borne on a single terminal spike, the basal portion composed of a series of hard, bony internodes, each containing a single pistillate spikelet, the internodes separating when mature; terminal portion of the spike with a flattened rachis, each node bearing a pair of staminate spikelets *Tripsacum*

KEY III

LEAF BLADES WITH PSEUDOPETIOLES AT LEAST 1 CM LONG

- 1a. Spikelets with 2-many florets, laterally compressed; leaf blades linear or lanceolate 2
- 1b. Spikelets with a single floret; not compressed; leaf blades ovate to elliptical 3
- 2a. Spikelets 2-flowered; flowers perfect *Orthoclada laxa*
- 2b. Spikelets several-many flowered; the lowermost flower pistillate, the others staminate *Zeugites*
- 3a. Veins of leaf blades diverging from the midrib, running straight to the lateral leaf margins; lemmas awnless; inflorescence a panicle *Pharus*
- 3b. Veins of leaf blades running from base to tip of the blades, parallel to the midrib; spikelets with a long, coiled awn; inflorescence a spike *Streptochaeta*

KEY IV

SPIKELETS WITH 1-MANY FLORETS; GLUMES EVIDENT, WITH A MIDRIB; DISARTICULATION ABOVE THE GLUMES, WHICH REMAIN ON THE PEDICELS

- 1a. Spikelets 1-flowered 2
- 1b. Spikelets with 2-many flowers, some of which may be staminate or sterile 21
- 2a. Spikelets unisexual, the two kinds different in appearance 3
- 2b. Spikelets with perfect flowers, all alike 7
- 3a. Leaf blades with veins running from base to tip 4
- 3b. Leaf blades broad, with veins running from midrib to lateral margins; fruit bearing hooked hairs *Pharus*

- 4a. Fertile floret broad and flat at the apex, obpyramidal, hard and bony *Lithachne pauciflora*
- 4b. Fertile floret acute-tipped, elliptical 5
- 5a. Inflorescence with usually less than 5 spikelets; low grasses of rain forests, less than 30 cm tall; leaf blades short, crowded, the leafy culms resembling the pinnately compound leaves of some legumes 6
- 5b. Inflorescence with many spikelets; plants small or up to 3-4 m tall; leaves not crowded, lanceolate to linear *Olyra*
- 6a. Leaf blades hirsute *Raddia costaricensis*
- 6b. Leaf blades glabrous *Cryptochloa concinna*
- 7a. Floret hard, smooth, usually awned 8
- 7b. Floret soft-textured, awned or awnless 14
- 8a. Floret awnless, laterally compressed, with 2 minute rudimentary florets attached below it and closely appressed to it, the three falling as a unit from the glumes *Phalaris*
- 8b. Floret awned, without rudimentary florets below, terete or nearly so 9
- 9a. Lemma bearing 3 awns, the lateral 2 often smaller *Aristida*
- 9b. Lemma bearing a single awn 10
- 10a. Awn attached to the back of the lemma below the tip *Triniochloa stipoides*
- 10b. Awn attached at the tip of the lemma 11
- 11a. Palea exposed between the edges of the lemma *Lorenzochloa*
- 11b. Palea concealed by the overlapping margins of the cylindrical lemma 12
- 12a. Floret plump, swollen near the apex, the readily deciduous awn attached eccentrically *Nasella*
- 12b. Floret slender-cylindrical, the firmly attached awn attached at the center 13
- 13a. Awn glabrous, curved, not strongly twisted above the base; in savannas at low elevations *Aristida*
- 13b. Awn hairy below, straight but geniculate, strongly twisted above the base; upper elevations in the mountains *Stipa ichu*
- 14a. Fertile spikelets surrounded by a cluster of bristles (abortive spikelets) *Pereilema*
- 14b. Spikelets not surrounded by bristles 15
- 15a. Inflorescence a panicle 17
- 15b. Inflorescence of several-many one-sided spikes or racemes 16
- 16a. Stoloniferous or rhizomatous plants; spikes digitate; lemmas awnless; common weed *Cynodon*
- 16b. Tufted plants; spikes racemose; lemmas awned; rare, Boruca *Gymnopogon fastigiatus*
- 17a. Both glumes longer than the floret 18
- 17b. One or both glumes shorter than the floret 19

- 18a. Rachilla prolonged behind the palea of the floret as a bristle; callus hairs usually long and abundant; lemmas awned *Calamagrostis*
- 18b. Rachilla not prolonged behind the palea; callus hairs usually minute; lemmas awned or awnless *Agrostis*
- 19a. Awn arising from the back of the lemma below the tip *Trinichloa stipoides*
- 19b. Awn absent or arising from the tip of the lemma 20
- 20a. Lemmas 1-nerved, awnless; ovary wall gelatinous and swollen when wet, the seed extruding from the burst ovary *Sporobolus*
- 20b. Lemmas 3-nerved, usually awned; ovary wall not becoming gelatinous, the seed not extruding *Muhlenbergia*
- 21a. Inflorescence a single balanced or one-sided spike or raceme 22
- 21b. Inflorescence a panicle, or a group of spikes or racemes borne on a common peduncle 27
- 22a. Florets becoming entangled into a single group by the elongated, stiff, spirally-coiled styles; stigmas 3 *Streptogyna americana*
- 22b. Florets not becoming entangled by the styles; stigmas 2 23
- 23a. Spikelets on short, erect, hairy pedicels *Brachypodium mexicanum*
- 23b. Spikelets sessile 24
- 24a. Spikelets 2-flowered; keels of lemmas with a row of short, stiff, spreading hairs; cultivated, upper elevations, rare *Secale cereale*
- 24b. Spikelets with more than 2 flowers; keels of lemmas without spreading hairs 25
- 25a. Spikelets placed edgewise to the rachis, only the exterior glume present; flowers perfect; upper elevation pastures *Lolium perenne*
- 25b. Spikelets placed flatwise to the rachis; both glumes present 26
- 26a. Flowers staminate; wiry stoloniferous seashore plants *Jouvea*
- 26b. Flowers perfect; caespitose alpine plants; Cerro Chirripó Grande *Agropyron*
- 27a. Tall, stout, reedlike grasses, the culms usually 2-12 m tall; panicles large, plumelike, the spikelets silky because of the abundant long hairs attached to the lemmas or rachillas (glabrous in staminate *Gyneris:m*) 28
- 27b. Grasses of various statures, but usually less than 2 m tall; inflorescences not silky-hairy 31
- 28a. Culms solid; leaves all in a cluster at the top of the culms; spikelets with 2 florets, the staminate ones glabrous; panicles more than 1 m long on larger plants *Gynerium sagittatum*
- 28b. Culms hollow; leaves basal or along the culms; spikelets with more than 2 florets 29
- 29a. Lemmas hairy 30
- 29b. Lemmas glabrous; rachilla internodes long-hairy *Phragmites australis*

- 30a. Leaf blade bases very broad, conspicuously clasping; leaves spaced evenly along the culms; blades often yellow striped; flowers perfect; cultivated for ornament, or escaped *Arundo donax*
- 30b. Leaf blades narrow; leaves aggregated into basal cluster, the culms few-leaved; flowers functionally unisexual; usually paramo plants, one species rarely cultivated *Cortaderia*
- 31a. One or both glumes much shorter than the spikelet 40
- 31b. Both glumes at least $\frac{3}{4}$ as long as the spikelet 32
- 32a. Lower 1 or 2 florets much longer than the terminal one and either staminate or sterile 33
- 32b. Lower florets about as long as the upper ones, all perfect-flowered and similar to the lowermost 35
- 33a. Spikelets 3-flowered, one or both of the lower florets with awns and either staminate or sterile; plants with the sweet odor of coumarin 34
- 33b. Spikelets 2-flowered, the lower floret staminate, awnless; upper floret perfect, with a conspicuous geniculate awn; plants not sweet-scented *Arundinella*
- 34a. Glumes very unequal; both of the two lower florets sterile *Anthoxanthum odoratum*
- 34b. Glumes equal; at least one of the lower florets staminate *Hierochloa*
- 35a. Spikelets 2 cm or more long, the glumes many-nerved; annual crop, persisting after cultivation in mountain fields *Avena sativa*
- 35b. Spikelets less than 2 cm long; glumes 1-5 nerved 36
- 36a. Lemmas with 3 conspicuous nerves; spikelets nearly sessile, arranged in 2 rows along the lower sides of the simple, elongated panicle branches; lemmas awnless or short-awned *Leptochloa*
- 36b. Lemmas with 5 or more nerves; spikelets variously arranged, mostly in open panicles, not along the lower sides of simple panicle branches 37
- 37a. Florets 4-5; lemmas nearly awnless, bidentate at the tip; rare introduction in high elevation pastures *Sieglingia decumbens*
- 37b. Florets 2-3; lemmas awned, the awn from the back or between teeth; native plants of upper elevations 38
- 38a. Awn attached above the middle of the lemma *Trisetum*
- 38b. Awn attached near the base of the lemma 39
- 39a. Rachilla extending above the base of the upper floret as a minute hairy bristle; perennial *Deschampsia*
- 39b. Rachilla not extending beyond the second floret; diminutive annual *Aira caryophyllea*
- 40a. Lemmas with 3 conspicuous nerves 41
- 40b. Lemmas with 5 or more inconspicuous nerves, or rarely only the midrib visible 48
- 41a. Spikelets with a single fertile floret, a differently shaped rudimentary one above it 42
- 41b. Spikelets of several-many similar florets 43

- 42a. Inflorescence of 1-several whorls of spikes; second floret with an evident lemma *Chloris*
- 42b. Inflorescence a raceme of spikes; second floret much reduced, the lemma scarcely wider than the awn; rare, Boruca *Gymnopogon fastigiatus*
- 43a. Spikelets sessile, pectinately arranged in short, thick, one-sided spikes borne in one or two whorls 44
- 43b. Spikelets borne on pedicels, either in panicles, or racemosely along slender branches attached to a central rachis 45
- 44a. Rachis of each spike extended beyond the spikelets as a naked tip; second glume bearing a short, divergent awn *Dactyloctenium aegyptium*
- 44b. Rachis covered with spikelets to its tip; glumes not bearing awns *Eleusine indica*
- 45a. Palea long-hairy on its upper half; tip of lemma split, the short awn arising between the teeth; sandy beach at Limón Airport *Triplasis*
- 45b. Palea not long-hairy; tip of lemma various; plants not confined to sandy beaches 46
- 46a. Primary panicle branches elongated and simple, the spikelets arranged in 2 rows along the lower side, on very short pedicels; lemmas awned or awnless 47
- 46b. Primary panicle branches at least in part with secondary branches; spikelets not arranged in rows along the lower sides; some of the pedicels at least half as long as the spikelets; lemmas awnless *Eragrostis*
- 47a. Glumes several-nerved; lemmas long-awned, spikelets 1-2 cm long *Gouinia virgata*
- 47b. Glumes 1-nerved; lemmas short-awned or awnless; spikelets less than 5 mm long *Leptochloa*
- 48a. Spikelets all alike 49
- 48b. Spikelets paired, one of each pair sterile, containing only empty lemmas, its rachilla not disarticulating; the other fertile, its lemmas 1-nerved, the rachilla disarticulating; panicle dense, spikelike; introduced in upper elevation pastures *Cynosurus cristatus*
- 49a. Leaf sheaths with united edges, at least for the basal third of their length 50
- 49b. Leaf sheaths with overlapping edges 52
- 50a. Lemmas blunt-tipped, the nerves running parallel to the midrib *Glyceria plicata*
- 50b. Lemmas acute or awned, the nerves converging toward the midrib 51
- 51a. Spikelets 2 cm or more long, all on evident pedicels *Bromus*
- 51b. Spikelets less than 1 cm long, subsessile, crowded in dense fascicles at the tips of the few, rigid panicle branches *Dactylis glomerata*
- 52a. Plants tall, stout, extensively stoloniferous; on coastal sand dunes; spikelets strongly compressed and keeled *Uniola pittieri*
- 52b. Plants not stoloniferous; growing at middle and upper elevations; spikelets not strongly compressed and keeled 53
- 53a. Lemmas nearly circular in outline, spreading at right angles to the rachilla, awnless and without evident nerves *Briza minor*
- 53b. Lemmas longer than wide, acute or awned at the tip, placed at acute angles to the rachilla 54

- 54a. Lemmas awned or acuminate; leaf blades acuminate *Festuca*
 54b. Lemmas awnless, blunt or acute, pubescent on the nerves or with a tuft
 of cottony hairs on the callus; leaf blades with blunt, boat-shaped tips *Poa*

KEY V

SPIKELETS DISARTICULATING FROM THE PEDICELS INDIVIDUALLY, WITHOUT ATTACHED
 RACHIS OR BRISTLES

- 1a. Spikelets all alike in appearance 3
 1b. Spikelets of 2 unlike kinds 2
- 2a. Inflorescence a single erect "rame" bearing pairs of spikelets, one of each pair
 long-awned, detachable and perfect-flowered, the other awnless, persistent, and
 staminate; savanna plants *Trachypogon*
 2b. Inflorescences panicles or racemes; spikelets all awnless, unisexual, lacking glumes,
 having 2 bracts only; flowers unisexual, the two sexes borne in separate in-
 florescences; marsh or aquatic plants *Luziola*
- 3a. Spikelets when mature covered with hooked spines *Pseudoechinolaena polystachya*
 3b. Spikelets not covered with hooked spines 4
- 4a. Spikelets laterally compressed 5
 4b. Spikelets dorsally compressed or terete 17
- 5a. Spikelets borne in a single raceme or spike 6
 5b. Spikelets borne in a panicle or a cluster of spikes 8
- 6a. First glume missing, the second glume leathery, its lower margins united;
 floret 1 *Zoysia*
 6b. First glume present; margins of glumes not united; sterile lemma present below
 the fertile floret 7
- 7a. Spike erect, slender; first glume about as long as the spikelet *Mesosetum pittieri*
 7b. Spike strongly reflexed, short and thick; first glume twice as long as the rest of
 the spikelet, tuberculate-hispid *Echinolaena gracilis*
- 8a. Spikelets sessile, in slender or dense spikes 9
 8b. Spikelets pedicellate, in open or dense panicles 10
- 9a. Spikelets awned, in very slender spikes; delicate annual weed; Meseta Central
 *Arthraxon quartinianus*
 9b. Spikelets awnless, densely imbricated in stiff, short spikes; wiry perennial; coral
 beaches north of Limón *Spartina spartinae*
- 10a. Spikelets concealed by long pinkish or silvery hairs *Rhynchelytrum repens*
 10b. Spikelets not concealed by hairs 11
- 11a. Spikelets with 2 bracts only (lemma and palea), the glumes missing; lemma
 awnless *Leersia*
 11b. Spikelets with 4 or more bracts; lemmas awned or awnless 12

12a.	Leaf blades borne on pseudopetioles	<i>Zeugites</i>
12b.	Leaf blades lacking pseudopetioles	13
13a.	Spikelets with numerous florets; tall, stout, stoloniferous grasses of sea beaches	<i>Uniola pittieri</i>
13b.	Spikelets with 1-2 florets; not sea beach grasses	14
14a.	Glumes longer than the florets	15
14b.	"Glumes" (actually sterile lemmas) much shorter than the floret	<i>Oryza</i>
15a.	Foliage densely velvety hairy; florets 2	<i>Holcus lanatus</i>
15b.	Foliage not velvety; floret 1	16
16a.	Glumes and lemma awned	<i>Polypogon elongatus</i>
16b.	Glumes and lemma awnless; rachilla prolonged behind the palea	<i>Cinna poaeformis</i>
17a.	Spikelets covered with long, dense, silky hairs	18
17b.	Spikelets glabrous or pubescent, but not silky-hairy	19
18a.	Inflorescence golden-brown	<i>Eriochrysis cayennensis</i>
18b.	Inflorescence white or grayish	42
19a.	Leaf blades broad, longitudinally pleated	<i>Setaria paniculifera</i>
19b.	Leaf blades never pleated	20
20a.	Each spikelet subtended by one or more stiff bristles (sterile branchlets); inflorescence a panicle	21
20b.	Spikelets not subtended by sterile bristles, every branchlet ending in a spikelet; inflorescence a panicle or group of racemes	22
21a.	Each spikelet subtended by a single bristle; spikelets with a broad papery wing when mature	<i>Ixophorous unisetus</i>
21b.	Each spikelet subtended by several-many bristles; spikelets never winged	<i>Setaria</i>
22a.	Inflorescence a single one-sided raceme on each peduncle	23
22b.	Inflorescence of several-many racemes, or a panicle	24
23a.	Spikelets in 2 or 4 longitudinal rows, their sterile lemmas facing outwards; first glume present or absent	<i>Paspalum</i>
23b.	Spikelets in a single longitudinal row, paired so that the sterile lemmas of each 2 successive spikelets are facing each other; first glume present	<i>Thrasya</i>
24a.	Spikelets awnless, with a hardened knob-like protrusion at the base, formed of the first glume and rachilla joint	<i>Eriochloa</i>
24b.	Spikelets without a basal knob-like protrusion; first glume evident or missing	25
25a.	Spikelets awned or awn-tipped	26
25b.	Spikelets blunt or acute, never awned	29
26a.	Foliage densely covered with sticky hairs; plants aromatic	<i>Melinis minutiflora</i>
26b.	Foliage not sticky hairy; plants not aromatic	27

- 27a. Plants decumbent or stoloniferous; leaf blades short, lanceolate or elliptical *Oplismenus*
 27b. Plants not stoloniferous; leaf blades linear 28
- 28a. Spikelets narrow, with a pointed basal callus; both glumes long-awned
 *Chaetium bromoides*
 28b. Spikelets ovoid, blunt at the base; glumes not long-awned *Echinochloa*
- 29a. Spikelets with 2 fertile florets, nearly spherical *Isachne*
 29b. Spikelets with a perfect terminal floret, the lower floret staminate or sterile 30
- 30a. Spikelets borne in panicles 35
 30b. Spikelets borne in one-sided spikelike racemes, all on the lower sides of the
 usually flattened rachises 31
- 31a. Backs of the fertile lemma and second glume turned toward the rachis 32
 31b. Backs of the fertile lemma and second glume turned away from the rachis 34
- 32a. Fertile floret soft and flexible, the edges of the lemma thin, exposed *Digitaria*
 32b. Fertile floret rigid, the edges of the lemma inrolled and concealed 33
- 33a. Fertile lemma smooth; spikelets plano-convex; first glume small or absent *Paspalum*
 33b. Fertile lemma transversely corrugated; spikelets with rounded edges; first glume
 well developed *Panicum*
- 34a. First glume well developed; spikelet with 3 bracts below the fertile floret
 *Brachiaria*
 34b. First glume absent; spikelet with 2 bracts below the fertile floret *Axonopus*
- 35a. Spikelets with 2 bracts below the fertile floret, the first glume missing
 *Leptocoryphium lanatum*
 35b. Spikelets with 3 bracts below the fertile floret, the first glume present 36
- 36a. Spikelets placed very obliquely on the tip of the pedicel, rotund, usually
 turning black when mature; the second glume and florets with minute tufts
 of hairs at the tip; some species with woody culms *Lasiacis*
 36b. Spikelets not obliquely placed on the pedicel; florets lacking tufts of hairs
 at the tip; culms not woody 37
- 37a. Fertile lemma with small, fleshy blisters, which leave scar-like depressions in drying,
 along its edges at the base *Ichnanthus*
 37b. Fertile lemma lacking blisters or scars along its edges 38
- 38a. Panicles dense, cylindrical and spikelike 39
 38b. Panicles more or less open, not spikelike 40
- 39a. Spikelets strongly inflated or bulging on the second glume side; blades narrow; culms
 less than 1 m tall *Sacciolepis*
 39b. Spikelets not inflated; blades very wide, with prominent cordate bases; culms usually
 2-3 m tall *Hymenachne*
- 40a. Both glumes as long as the pointed spikelet *Homolepis aturensis*
 40b. First glume shorter than the spikelet 41

- 41a. Fertile lemma with a laterally flattened, beaklike tip *Acroceras oryzoides*
 41b. Fertile lemma rounded to the tip, without a beak *Panicum*
- 42a. Both glumes longer than the thin, delicate floret *Imperata*
 42b. Glumes shorter than the stiff, dark-colored floret *Trichachne*

KEY VI

SPIKELETS, OR SOME OF THEM, EITHER FALLING IN CLUSTERS OF 2 OR MORE, OR WITH ATTACHED RACHIS JOINTS, PEDICELS, OR BRISTLES (REDUCED BRANCHLETS OR ABORTIVE SPIKELETS)

- 1a. Inflorescences usually arising directly from the ground on short, leafless peduncles, club shaped, bearing 3 flattened bracts in a whorl at each node, these bearing the minute staminate spikelets and concealing a single pistillate spikelet within *Pariana*
- 1b. Inflorescences all on leafy culms; not as in 1a 2
- 2a. Spikelets laterally compressed 3
 2b. Spikelets dorsally compressed or spherical 7
- 3a. Rachis of inflorescence disarticulating into single internodes, each bearing one or two spikelets 4
 3b. Rachis of inflorescences not disarticulating, the spikelets groups dropping from it 5
- 4a. Inflorescence a single rame on each peduncle; spikelets awned, dimorphic, the pedicellate ones enlarged and flattened *Diectomis fastigiata*
 4b. Inflorescence of several-many spikes or rames 25
- 5a. Spikelets borne in short, one-sided spikes of more than 3 spikelets, the spikes disarticulating as units from the axis *Bouteloua*
 5b. Spikelets borne in fascicles of 1-3, often with attached bristles 6
- 6a. Spikelets 1-2 in a cluster, accompanied by bristles (reduced spikelets)
 *Pantarrhaphis annua*
 6b. Spikelets 3 in a cluster, all pedicellate; sterile bristles absent
 *Aegopogon cenobroides*
- 7a. Spikelets all unisexual, the lower part of each inflorescence made up of a series of bony cylindrical joints, each containing a single pistillate spikelet; upper portion flattened, bearing paired staminate spikelets *Tripsacum*
 7b. Spikelets, or some of them, with perfect flowers, inflorescence not as in 7a 8
- 8a. Inflorescence a dense cylindrical bristly panicle; each spikelet or group of spikelets surrounded by a ring of bristles, with which it falls from the rachis *Pennisetum*
 8b. Inflorescence a panicle or group of rames; spikelets not falling with an attached ring of bristles 9
- 9a. Inflorescence much branched, terminal on a single peduncle, lacking bracts interspersed among the spikelets 10
 9b. Inflorescence a solitary rame or spike, or of clustered rames or spikes borne on bracted peduncles 14

- 10a. Panicle dense, cylindrical; the spikelets concealed by dense, golden-brown silky hairs covering the glumes and rachis joints *Eriochrysis cayennensis*
- 10b. Panicles open; the spikelets not covered with brown pubescence 11
- 11a. Individual rames of many pairs of spikelets 12
- 11b. Individual rames of 1-7 pairs of spikelets 13
- 12a. Culms 3 cm or more thick, solid, 3-6 m tall; leaf blades 1-2 m long; crop plant *Saccharum officinarum*
- 12b. Culms 1 cm or less thick, usually hollow, less than 2 m tall; leaf blades less than 1 m long; wild plants *Andropogon*
- 13a. Pedicellate spikelets present, staminate *Sorghum*
- 13b. Pedicellate spikelets missing, only the hairy pedicels present *Sorghastrum*
- 14a. Low, creeping plants; rames or spikes 1 on each culm 15
- 14b. Plants not low and creeping; rames 1-many on each culm 17
- 15a. Sheaths strongly compressed and keeled; spikelets sunken into one side of an erect, corky, club-shaped rachis *Stenotaphrum secundatum*
- 15b. Sheaths not compressed and keeled; spikelets not sunken into the thin rachis 16
- 16a. Spikelets acute-pointed, awned, equal, 2-3 per node; rachis readily disarticulating *Polytrias amaura*
- 16b. Spikelets truncate, awnless, the first glume notched; the sessile spikelet perfect-flowered, the pedicellate very reduced, on an inflated pedicel; rachis tough, not readily disarticulating *Eremochloa ophiuroides*
- 17a. Each peduncle bearing a single rame 18
- 17b. Each peduncle bearing 2 or more rames 21
- 18a. Sessile spikelets spherical, hard, black, rough and ridged, 1-2 mm in diameter, awnless *Hackelochloa granularis*
- 18b. Spikelets never spherical, either awned or awnless 19
- 19a. Rachis of rames thin, not enclosing the spikelets; sessile spikelets usually awned *Schizachyrium*
- 19b. Rachis joints strongly thickened, the rames cylindrical; spikelets awnless 20
- 20a. Rachis joint adnate to the pedicel; pedicellate spikelets sterile; foliage bristly-hispid *Rottboellia exaltata*
- 20b. Rachis joint not adnate to the pedicel, the pedicellate spikelet sometimes with a flower; foliage not hispid *Manisuris aurita*
- 21a. One spikelet of each pair sessile 22
- 21b. Both spikelets of each pair pedicellate and usually alike; pedicels of unequal length *Ischaemum*
- 22a. First glume strongly cross-wrinkled; lower floret staminate *Ischaemum*
- 22b. First glume not cross-wrinkled; lower floret sterile 23
- 23a. All pairs of spikelets in each rame alike; first glume of sessile spikelets sharply keeled, with inflexed margins; spikelet pairs many in each rame 24
- 23b. Lowermost 1-several pairs of spikelets awnless; margins of first glumes curved inward but not sharply keeled; spikelet pairs several-many in each rame *Hyparrhenta*

- 24a. Inflorescence a leafless pedunculate panicle of rames; upper pedicels and rachis joints with thick margins and a thin central groove *Bothriochloa*
- 24b. Inflorescence of several digitately arranged rames, often covered with leaf sheaths; pedicels and rachis joints without a central groove *Andropogon*
- 25a. Spikelets awned, solitary at each node of the few digitate spikes; low annual plants *Arthraxon quariniianus*
- 25b. Spikelets awnless, paired at each node of the rames, which are verticillate, in a large panicle; tall perennial plants, 2 m tall, in dense, hard clumps. *Vetiveria zizanioides*

GLOSSARY

ADNATE. Attached to.

AWN. A bristle-like prolongation of the midrib or of one of the lateral nerves of a bract.

BRISTLE. A stiff, threadlike branch, which contains a vascular bundle.

CAESPITOSE. Growing in clumps, without obvious stolons or rhizomes.

CORIACEOUS. Of stiff leathery texture.

CULM. The flowering stem of a grass.

CUPULE. A minute cup, as at the tip of the pedicel in *Oryza* and *Leersia*.

DIGITATE. Arising from a common center, like the ribs of an umbrella.

DIOECIOUS. Having the staminate and pistillate flowers borne on different plants.

DORSALLY COMPRESSED. Said of spikelets so flattened that the bracts lack a prominent keel; opposite of laterally compressed.

FASCICLE. A small cluster of spikelets, usually falling from the inflorescence as a unit.

FLORET. In a grass spikelet, a unit consisting of a lemma, a palea, and the flower contained between them; the floret often disarticulates from the spikelet and serves for dissemination.

GENICULATE. Sharply bent.

GLABROUS. Without hairs.

GLUME. One of the (usually) two empty bracts at the base of a spikelet.

INFLORESCENCE. The cluster of flowers or spikelets (in grasses).

KEEL. A sharply folded structure, like the keel of a boat.

- LATERALLY COMPRESSED.** Said of spikelets so flattened that the bracts are strongly folded along the midrib.
- LEMMA.** The outer of the two bracts that enclose a grass flower.
- LIGULE.** A membranous or hairy collar arising between the sheath and the blade of a grass leaf.
- MURICATE.** Bearing short, spine-like hairs.
- NERVE.** A vascular bundle.
- PALEA.** The inner of the two bracts that enclose a grass flower; characteristically with only two nerves.
- PANICLE.** A much-branched flower cluster, bearing spikelets on pedicels attached to lateral branches.
- PEDICEL.** In grasses, the stalk of a single spikelet.
- PEDUNCLE.** The stalk of an inflorescence.
- PERFECT.** Said of a flower that has both stamens and pistil.
- PSEUDOPETIOLE.** A petiole-like structure located between the sheath and the blade.
- RACHILLA.** The minute central axis of a spikelet, which bears the florets.
- RACHIS.** The main axis of an inflorescence.
- RACEME.** An unbranched flower cluster, the spikelets all attached to pedicels that arise directly from the central axis.
- RAME.** An unbranched inflorescence having both sessile and stalked spikelets, as in *Andropogon* and related genera.
- RHIZOME.** A creeping underground stem, bearing roots and scale leaves.
- SESSILE.** Lacking stalks or pedicels, attached directly to a main axis.
- SHEATH.** The tubular basal portion of a grass leaf that surrounds the stem.
- SPIKE.** An unbranched inflorescence in which the spikelets all lack pedicels and are directly attached to the central axis.
- SPIKELET.** The ultimate branchlet of an inflorescence, consisting of one or more flowers enclosed between scaly bracts, a rachilla, and glumes.
- STOLON.** A creeping stem lying above the soil surface and bearing green foliage leaves.
- TERETE.** Round in cross section.
- VEIN.** A vascular bundle.
- WHORL.** A circle of structures arising from one point like the ribs of an umbrella.