EDINBURGH JOURNAL OF BOTANY 74 (1): 33–75 (2017)

doi: 10.1017/S0960428616000275

AN ILLUSTRATED GENERIC KEY AND UPDATED LIST OF THE GRASSES (POACEAE) OF BELIZE

S. P. Sylvester[1,2]

A generic key to 81 genera representing 255 naturally occurring species known from Belize is presented using easily distinguished characters and including illustrations of many of the genera. An up-to-date list of the grasses of Belize is also given.

Keywords. Belize, checklist, diagnostic key, Gramineae, identification, Mesoamerica, savannah.

Introduction

Belize is the second smallest country in Central America, occupying 22,963 km^2 (Meerman & Sabido, 2001). Grass-dominated Neotropical savannah, which covers 12.3% of the country, is the second largest natural biome in Belize after lowland broadleaved forest (Meerman & Sabido, 2001). These savannahs host high grass diversity (Bridgewater *et al*., 2002; Laughlin, 2002; Bridgewater *et al*., 2006; Farruggia *et al*., 2008; Goodwin *et al*., 2013), but grasses are also found in all the varied terrestrial, and some aquatic, habitats across the country, occupying numerous ecological niches (Iremonger & Brokaw, 1999; Meerman & Sabido, 2001; Penn *et al*., 2004; Urban *et al*., 2006).

Taxonomic work focusing specifically on Belizean grasses began with Standley & Record (1936), who were the first to produce a checklist to the grasses of Belize, although their work was very brief and lacked an identification key. Swallen (1955) used the work of Hitchcock (1930) as a baseline for his *Grasses of Guatemala*; this also covered British Honduras (now Belize), which formed part of Guatemala at that time. As part of a long-term commitment to Central America, Missouri Botanical Garden began exploration in Belize in the late 1960s, with Spellman *et al*. (1975) producing an updated checklist to the monocots of Belize with 241 grass species. Building on this and many other studies, the highly comprehensive *Flora Mesoamericana* (Davidse *et al*., 1994; Flora Mesoamericana Online, 1997–) was produced, which is the most recent taxonomic treatment covering Belize that includes detailed species descriptions and a dichotomous key.

The most recent large-scale taxonomic work in the country has been through the Ethnobotany and Floristics of Belize Project (Ethnobotany and Floristics of Belize

[1] Royal Botanic Garden Edinburgh, 20A Inverleith Row, Edinburgh EH3 5LR, Scotland, UK. E-mail: steven_sylvester@hotmail.com
[2] Department of Geography, Philipps-Universität Marburg, Deutschhausstraße 10, D-35032 Marburg, Germany.

Project Collaborators, continuously updated), which was designed to catalogue the Belizean flora, and to explore the historical and present-day relationships between the people and plants of Belize. A highlight of the project has been the publication of a checklist to the vascular plants of Belize (Balick *et al.*, 2000), a work that has long been needed in the country and has formed the basis of this study. In this work, 248 species of grass belonging to 74 genera were recorded, excluding cultivated species, with the Poaceae found to be the third most speciose family of vascular plants in Belize. Subsequently, four additional species were found during a survey done by Bridgewater *et al.* (2006), a further five species were found by Goodwin *et al.* (2013), and most recently *Schizachyrium glaziovii* Peichoto, previously known only from South America, was also discovered (Welker & Peichoto, 2015). With continuing taxonomic work (Soreng *et al.*, 2000–), three species previously considered distinct by Balick *et al.* (2000), namely *Eragrostis excelsa* Griseb., *Oryza alta* Swallen and *Urochloa fasciculata* (Sw.) R.D.Webster, have also been placed as synonyms of species already recognised in the checklist (Balick *et al.*, 2000), thus bringing the total number of wild-growing species known from Belize to 255 (see the list at the end of this paper).

Taxonomic study has also led to certain genera being sunk within others. *Hypogynium* Nees has been sunk into *Andropogon* L. (Soreng *et al.*, 2015), *Paspalidium* Stapf into *Setaria* P.Beauv. (Morrone *et al.*, 2014), *Pennisetum* Rich. into *Cenchrus* L. (Chemisquy *et al.*, 2010), *Pentarrhaphis* Kunth into *Bouteloua* Lag. (Soreng *et al.*, 2015), *Rhynchelytrum* Nees into *Melinis* P.Beauv. (Soreng *et al.*, 2015) and *Spartina* Schreb. into *Sporobolus* R.Br. (Soreng *et al.*, 2000–; Peterson *et al.*, 2014; Soreng *et al.*, 2015). Other genera have been split, *Chloris ciliata* Sw. being placed in *Stapfochloa* H.Scholz (Peterson *et al.*, 2015), *Aristida megapotamica* Spreng. in *Jarava* Ruiz & Pav. (Peñailillo, 2002), and taxa of *Leptochloa* P.Beauv. in *Dinebra* Jacq. and *Diplachne* P.Beauv. (Peterson *et al.*, 2012). *Panicum* L., which was once considered the most speciose genus of grasses in Belize (Balick *et al.*, 2000), has been split into numerous genera. Of the 34 species of *Panicum* recorded in Belize (Balick *et al.*, 2000; Goodwin *et al.*, 2013), 15 have been placed in nine other genera: *Aakia* J.R.Grande (1 sp.; Lizarazu *et al.*, 2014), *Coleataenia* Griseb. (3 spp.; Soreng, 2010; Zuloaga *et al.*, 2010), *Cyphonanthus* Zuloaga & Morrone (1 sp.; Morrone *et al.*, 2007), *Louisiella* C.E.Hubb. & J.Léonard (1 sp.; Scataglini *et al.*, 2014), *Megathyrsus* (Pilg.) B.K.Simon & S.W.L.Jacobs (1 sp.; Simon & Jacobs, 2003), *Morronea* Zuloaga & Scataglini (2 spp.; Scataglini & Zuloaga, 2013), *Ocellochloa* Zuloaga & Morrone (2 spp.; Sede *et al.*, 2009), *Rugoloa* Zuloaga (3 spp.; Acosta *et al.*, 2014) and *Steinchisma* Raf. (1 sp.; Aliscioni *et al.*, 2003). With these new discoveries and changes in nomenclature, the number of genera known from Belize is currently 81 (see the list).

The taxonomic treatments currently used to identify Belizean grasses cover a much greater number of taxa than are known from Belize (874 spp. in 176 genera in Davidse *et al.*, 1994, and Flora Mesoamericana Online, 1997–; 455 spp. in 120 genera in Swallen, 1955), and as such have often used inconspicuous floral characters not easily seen in the field to key out taxa to genus level. Because 44 of the 81 genera found in Belize are represented by only 1 wild-growing species, and 17 genera represented by only 2

wild-growing species, it is possible to use more species-specific, easily distinguishable characters to differentiate genera. I present an illustrated identification key specific to the grass genera and species currently known from Belize, using, where possible, easily distinguishable characters. An up-to-date list of the grasses known from Belize, following current nomenclature (Soreng *et al*., 2000–), is also given. It is hoped that this work will benefit conservation assessments and floristic surveys within Belize, enabling surveyors to identify this key plant family with greater ease.

Taxonomic Key

This key has been created for the 81 genera and 255 species of wild-growing grasses known from Belize (see the list at the end of this paper and Balick *et al.*, 2000; Bridgewater *et al.*, 2006; Goodwin *et al.*, 2013; and Welker & Peichoto, 2015), following current nomenclature (Soreng *et al*., 2000–). No cultivated species have been included (see the list for the five species under cultivation). The number in square brackets, for example '[1]', in each couplet refers to the couplet that led to it, so that readers may retrace their progress through the key. The number of species found in Belize appears in parentheses alongside the genus name. Where a number of species of a genus have been keyed out separately, this is noted with an asterisk after the genus name, and the relevant species epithets are found in the footnotes. The list that follows the keys gives the names of all species, including authorities, as well as recent synonyms since the publication of Balick *et al.* (2000), Bridgewater *et al.* (2006) and Goodwin *et al.* (2013). For genus and species descriptions, and keys to the larger genera, see *Flora Mesoamericana Online* (Flora Mesoamericana Online, 1997–), *GrassBase* (Clayton *et al.*, 2006–), Davidse *et al*. (1994) and Swallen (1955). Illustrations are taken and modified from Görts-van-Rijn & Judziewicz (1990), courtesy of Koeltz Scientific Books, and depict the general characteristics of taxa present in Belize.

Master key

1a. Culms hard and woody; plants usually tall, (1–)2–15 m high; leaf blades frequently pseudopetiolate and emerging from clustered branches along the culm ____ **Subkey 1**

1b. Culms herbaceous and can be crushed between the fingers; plants often short, usually < 2 m tall; leaf blades with or without pseudopetioles, rarely emerging from clustered branches along the main culm (see *Isachne*) ____ 2

2a. [1] Spikelets inserted in a panicle (at least in the uppermost inflorescence), panicle open, contracted, or condensed and spike-like (*NB: spikelets in racemes inserted in* secondary *branches of the main inflorescence axis, i.e. false panicles, are included here)* ____ **Subkey 2** (Fig. 1A)

2b. Spikelets inserted in a spike or raceme, or spikelets congested in 1-sided raceme-like primary branches (in *Steinchisma laxum* lower primary branches sometimes with secondary branching), spikes/racemes solitary, digitate/subdigitate or

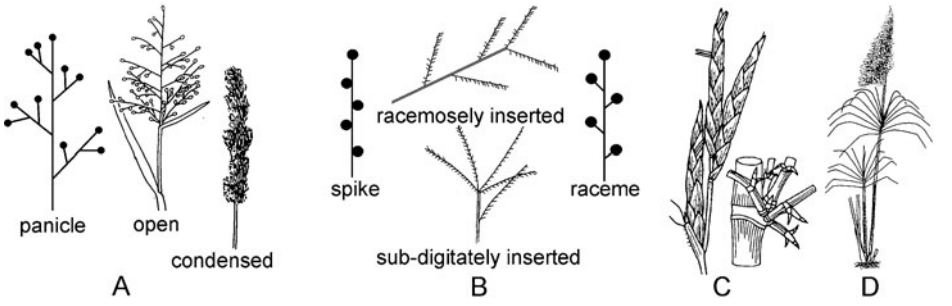

FIG. 1. Characters used in the master key and characters of taxa in subkey 1. **A**, **Spikelets held in a panicle**, either open or condensed and spike-like; **B**, **spikelets held in spikes or racemes**, these inserted racemosely or subdigitately on the central inflorescence axis; **C**, ***Guadua***, generalised spikelet and culm branch spines; **D**, ***Gynerium sagittatum***, habit.

inserted racemosely on the main inflorescence axis (*NB: false spikes of single-spikelet follicles sessile on the main inflorescence axis are included here, i.e.* Cenchrus*)* ____ **Subkey 3** (Fig. 1B)

Subkey 1

Culms hard and woody; plants usually tall, (1–)2–15 m high; leaf blades frequently pseudopetiolate and emerging from clustered branches along the culm.

1a. Spines present on the lower culm branches; spikelets 50–130 mm long ____ *Guadua longifolia* (Fig. 1C)

1b. Stems lacking spines; spikelets < 25 mm long ____ 2

2a. [1] Culms solid, 30–50 mm diam. at the base; base of leaf blade narrow and merging with the sheath, blades linear; inflorescence a large terminal panicle *Gynerium sagittatum* (Fig. 1D)

2b. Culms hollow, 2–35 mm diam. at the base; base of leaf blade abruptly narrowed into a pseudopetiole before joining the sheath, blades elliptic; inflorescence composed of solitary spikes ____ 3

3a. [2] Stem diam. 20–35 mm, nodes with a skirt of white hairs; spikelets 10–15 mm long ____ *Merostachys pauciflora*

3b. Stem diam. 2–8 mm, nodes without a skirt of white hairs; spikelets 16–25 mm long ____ *Rhipidocladum bartlettii*

Subkey 2

Spikelets inserted in a panicle (at least in the uppermost inflorescence), panicle open, contracted, or condensed and spike-like. *(NB: spikelets in racemes inserted in secondary branches of the main inflorescence axis, i.e. false panicles, are included here.)*

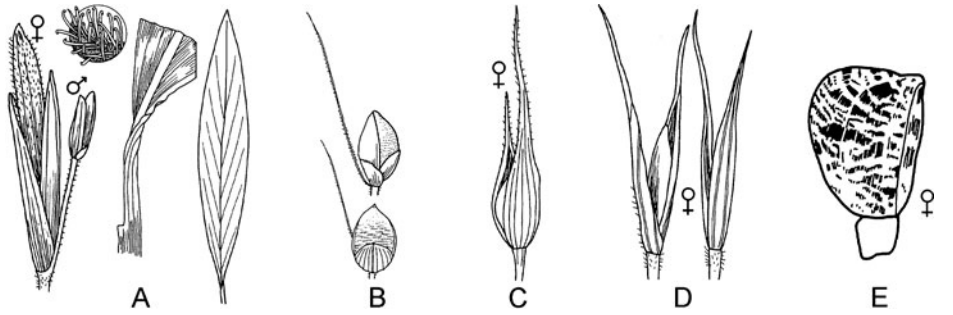

FIG. 2. Characters of taxa in subkey 2. **A**, ***Pharus***, generalised pistillate and staminate spikelet pair, close-up of hooked hairs of the sessile pistillate spikelet, pseudopetiole, and leaf blade with pinnate venation; **B**, ***Setaria***,[1] spikelet (lateral and dorsal views); **C**, ***Olyra***, generalised pistillate spikelet; **D**, ***Cryptochloa***, two views of pistillate spikelet; **E**, ***Lithachne pauciflora***, pistillate spikelet.

1a. Leaf blades with pseudopetioles > 5 mm long ____ 2
1b. Leaf blades without pseudopetioles or pseudopetioles < 5 mm long ____ 3

2a. [1] Leaf blade venation pinnate, cross-veins between the obliquely diverging main veins; spikelets paired, of two distinct types differing morphologically, sessile pistillate spikelets larger than pedicellate staminate ones, 12–19 mm long; spikelets never subtended by bristles; floret of sessile pistillate spikelets partly or wholly covered in hooked hairs ____ *Pharus* (3 spp.; Fig. 2A)
2b. Leaf blade venation parallel to the midvein, no conspicuous cross-veins between the main veins; spikelets of one type, not differing morphologically, 3–4 mm long; spikelets sometimes subtended by a single bristle; florets not covered in hooked hairs ____ *Setaria*[1] (Fig. 2B)

3a. [1] Large pistillate spikelets 8.5–34 mm long; spikelets of two distinct types on the same plant, staminate spikelets smaller and slenderer, reduced to a lemma and palea; leaf blades asymmetrical ____ 4
3b. Spikelets usually < 8.5 mm long, if longer then all of one type; leaf blades rarely markedly asymmetrical ____ 6

4a. [3] Inflorescence solely terminal; large pistillate spikelets with the glumes unequal, the lower glume much longer than the upper glume
Olyra (2 spp.; Fig. 2C)
4b. Inflorescences emerging both terminally and axillary, axillary inflorescences racemose or paniculate; large pistillate spikelets with the glumes equal or subequal ____ 5

[1] *Setaria palmifolia* and *S. sulcata*.

5a. [4] Ligule usually conspicuous, 1–5.5 mm long, asymmetrical; pedicels not enlarged towards apex; pistillate floret gradually narrowed to a blunt tip; fruit never triangular or bony white ____ *Cryptochloa strictiflora* (Fig. 2D)

5b. Ligule short, 0.5–0.7 mm long, symmetrical; pedicels of pistillate spikelets enlarged towards apex; pistillate floret obtriangular or helmet-shaped; fruit triangular, initially bony white turning mottled brown when mature ____ *Lithachne pauciflora* (Fig. 2E)

6a. [3] Inflorescence congested into a solitary terminal dense false spike 3–40 cm long, 5–30 mm wide (–60 mm wide in *Setaria vulpiseta*); spikelets sometimes subtended by long stiff bristles or tufted hairs *(NB:* Imperata *panicles are sometimes diffuse but recognisable by spikelets subtended by tufted hairs that reach past the apex of the spikelet and spikelets falling singly, not in pairs, at maturity)* ____ 7

6b. Inflorescence open to congested but never a solitary terminal false spike; spikelets never subtended by bristles, if spikelets subtended by tufted hairs then panicle more open and often spathulate ____ 14

7a. [6] Spikelets subtended by tufted hairs or long stiff bristles and/or glumes covered by long hairs; pedicels sometimes with stiff bristles ____ 8

7b. Spikelets not subtended by tufted hairs or bristles; glumes not covered by long hairs; pedicels lacking bristles ____ 11

8a. [7] Spikelets subtended by, and pedicels sometimes with, long stiff bristles; spikelets lacking long hairs ____ 9

8b. Spikelets and pedicels without long stiff bristles; spikelets subtended by tufted hairs and/or glumes covered with long hairs ____ 10

9a. [8] Culms 0.2–2 m tall, rarely thicker than 10 mm; spikelets planoconvex, 1–3(–3.7) mm long; pedicels with long stiff bristles ____ *Setaria*[2] (Fig. 3A)

9b. Culms 2–8 m tall, 10–25 mm thick; spikelets lanceolate, 4.5–7 mm long; pedicels pilose, without long stiff bristles ____ *Pennisetum purpureum* (Fig. 3B)

10a. [8] Inflorescence hairs golden brown; culm nodes with tufted hairs *Eriochrysis cayennensis* (Fig. 3C)

10b. Inflorescence hairs white; culm nodes hairless ____ *Imperata* (2 spp.; Fig. 3D)

11a. [7] Plants 0.75–3.5 m tall; blades 12–38 mm wide, flat; leaf blade base cordate, amplexicaul and usually more than twice as wide as the sheath; inflorescence spike 10–40 cm long × 1–2 cm wide; plant growing in and around rivers and lakes ____ *Hymenachne amplexicaulis* (Fig. 3E)

11b. Plants 0.05–1.1 m tall; blades 1–5(–8) mm wide, flat or involute; leaf blade base narrow and merging with the sheath; inflorescence spike 4–25 cm long × 0.4–0.8 cm wide (–3 cm wide in *Eragrostis ciliaris*); plants of generally dry areas ____ 12

[2] *Setaria grisebachii*, *S. parviflora*, *S. scandens*, *S. tenacissima*, *S. tenax* and *S. vulpiseta*.

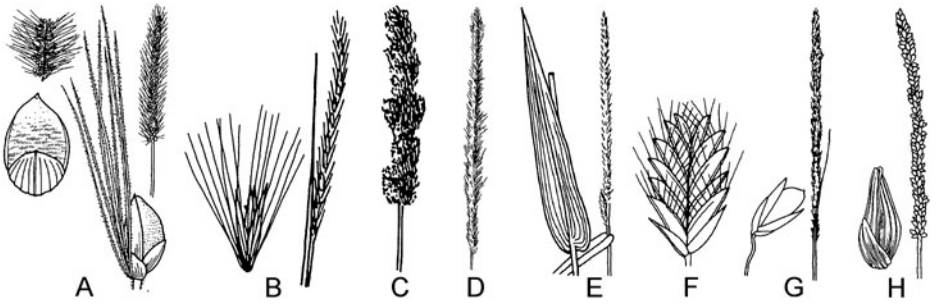

FIG. 3. Characters of taxa in subkey 2. **A**, ***Setaria***,[2] generalised spikelet (dorsal and lateral views) and inflorescence; **B**, ***Pennisetum***, generalised spikelet and inflorescence; **C**, ***Eriochrysis cayennensis***, inflorescence; **D**, ***Imperata***, generalised inflorescence; **E**, ***Hymenachne amplexicaulis***, leaf blade and inflorescence; **F**, ***Eragrostis ciliaris***, spikelet; **G**, ***Sporobolus***,[3] generalised spikelet and inflorescence; **H**, ***Sacciolepis myuros***, spikelet and inflorescence.

12a. [11] Spikelets 6- to 11-flowered, laterally compressed; palea keels conspicuously ciliate _____ *Eragrostis ciliaris* (Fig. 3F)

12b. Spikelets 1- or 2-flowered, dorsally compressed or terete; palea keels not ciliate _____ 13

13a. [12] Ligule an inconspicuous membrane, 0.2–0.4 mm long; spikelets 1-flowered; glumes and lemmas membranous, 1-nerved _____ *Sporobolus*[3] (Fig. 3G)

13b. Ligule a conspicuous membrane, 1–2.5 mm long; spikelets 2-flowered; glumes and lemmas herbaceous, 3- to 7-nerved _____ *Sacciolepis myuros* (Fig. 3H)

14a. [6] Inflorescence a pseudopanicle of short racemes of paired spikelets, one sessile on the rachis, the other pedicellate with the pedicel emerging from the base of the sessile spikelet (spikelets can occur in threes at branch apex, i.e. 1 sessile and 2 pedicellate); pedicellate spikelets usually staminate or sterile, sometimes reduced or lost, leaving only the pedicel; spikelet pair with joining pedicel falling as a unit at maturity; pseudopanicles sometimes interrupted by reddish spathes _____ 15 (Fig. 4A)

14b. Inflorescence a panicle (pseudopanicle in *Urochloa fusca* and *Acroceras zizanioides*) with spikelets solitary or in groups, but if paired or in threes, all spikelets pedicellate; spikelets that are inserted in groups rarely reduced or staminate; spikelets falling in groups, solitarily, or breaking up above the glumes at maturity (i.e. with the glumes remaining on the plant after fruiting); panicles never spathulate _____ 22

15a. [14] Inflorescence interrupted by reddish (rarely green) spathes that subtend the short racemes of paired sessile and pedicellate spikelets _____ 16

15b. Inflorescence lacking spathes _____ 20

[3] *Sporobolus indicus*, *S. jacquemontii* and *S. virginicus*.

FIG. 4. Characters of taxa in subkey 2. **A**, **Generalised andropogonoid spikelet pairing** (p, pedicellate spikelet; s, sessile spikelet on rachis); **B**, ***Andropogon virgatus***, raceme; **C**, ***Hyparrhenia***, generalised spikelet pair; **D**, ***Andropogon***, generalised spikelet pair and inflorescence; **E**, ***Schizachyrium***, generalised portion of raceme; **F**, ***Sorghastrum setosum***, portion of raceme; **G**, ***Bothriochloa bladhii***, portion of raceme; **H**, ***Sorghum halepense***, spikelet pair.

16a. [15] Spikelets not subtended by hairs; pedicels minutely hairy or glabrous ____ 17

16b. Spikelets subtended by tufted hairs and/or pedicels covered with long hairs ____ 18

17a. [16] Short annuals 4–60 cm tall; leaf blades 1–3.5 cm long; inflorescence a simple false panicle ____ *Schizachyrium brevifolium*

17b. Tall perennials 95–165 cm tall; leaf blades 10–50 cm long; inflorescence a large false panicle ____ *Andropogon virgatus* (Fig. 4B)

18a. [16] Sessile spikelets with robust awns exserted 15–30 mm, lower part of awns covered in short hairs ____ *Hyparrhenia* (2 spp.; Fig. 4C)

18b. Sessile spikelets with filamentous awns or awnless; if awned, awns glabrous or scabrid, exserted 5–17 mm ____ 19

19a. [18] Lower glume of sessile spikelet inwardly concave (or rarely flat), without nerves between the keels; stem internodes cylindrical, usually hollow, rarely solid; sessile spikelets awned or awnless; lower glume apex acute ____ *Andropogon*[4] (Fig. 4D)

19b. Lower glume of sessile spikelet outwardly convex or flat between the keels, never inwardly concave, with 1–9 nerves between the keels (sometimes nerves only apparent towards glume apex); stem internodes markedly to slightly flattened, solid; sessile spikelets always awned; lower glume apex bifid ____ *Schizachyrium*[5] (Fig. 4E)

20a. [15] Pedicellate spikelets absent, with only the pedicels remaining or reduced to sterile rudiments; stem internodes hollow ____ *Sorghastrum setosum* (Fig. 4F)

[4] *Andropogon bicornis*, *A. glomeratus* and *A. virginicus*.
[5] *Schizachyrium glaziovii* and *S. microstachyum*.

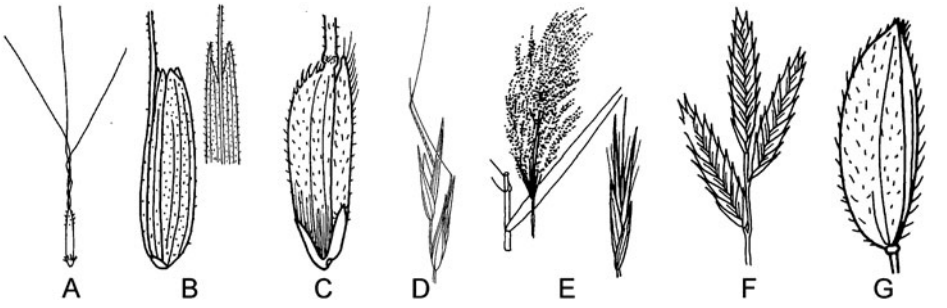

FIG. 5. Characters of taxa in subkey 2. **A**, ***Aristida***, generalised spikelet; **B**, ***Melinis minutiflora***, spikelet (only showing part of the awn) and apex of lower lemma; **C**, ***Oryza latifolia***, spikelet (only showing base of the awn); **D**, ***Arundinella***, generalised spikelet pair; **E**, ***Phragmites australis***, inflorescence, part of culm and spikelet; **F**, ***Eragrostis***, generalised spikelets; **G**, ***Leersia***, generalised spikelet.

20b. Pedicellate spikelets well developed, similar to the sessile spikelets but awnless, staminate or sterile; stem internodes solid ____ 21

21a. [20] Ligule c.1 mm long; blades 2–12 mm wide; sessile spikelets 3–4.5 mm long; pedicellate spikelets 2–3.5 mm long; lower glume sometimes with a glandular pit in its centre, apex rounded to acute; pedicels, and usually upper branch internodes, on upper part of inflorescence with a central groove or membranous area ____ *Bothriochloa bladhii* (Fig. 4G)

21b. Ligule 3–6 mm long; blades 12–40 mm wide; sessile spikelets 4–6.5 mm long; pedicellate spikelets 4–5.7 mm long; lower glume lacking a glandular pit in its centre, apex 3-dentate; pedicels and upper branch internodes on upper part of inflorescence lacking a central groove or membranous area ____ *Sorghum halepense* (Fig. 4H)

22a. [14] Spikelets prominently awned; awns > 1 mm long ____ 23

22b. Spikelets awnless, or mucronate; mucro < 1 mm long ____ 29

23a. [22] Lemmas 3-awned ____ 24

23b. Lemmas 1-awned ____ 25

24a. [23] Glumes acuminate to short awned, awns < 5 mm long *Aristida* (9 spp.)[6] (Fig. 5A)

24b. Glumes long-awned, lower glume with awns > 10 mm long, upper glume with awns c.5 mm long ____ *Jarava megapotamica*

25a. [23] Annuals; spikelets (not including awns) < 2.5 mm long ____ 26

25b. Perennials; spikelets (not including awns) > 3.5 mm long *(NB: some spikelets can appear < 3.5 mm long because the long acuminate tips are misinterpreted as awns)* ____ 27

[6] Not including *Aristida ternipes*.

26a. [25] Plants > 60 cm tall; spikelets 2-flowered, with 3 bracts below the fertile floret; glumes unequal, lower glume much shorter than upper glume; plants sticky, with a characteristic strong sweet smell — *Melinis minutiflora* (Fig. 5B)

26b. Plants < 30 cm tall; spikelets 1-flowered, with 2 bracts below the fertile floret; glumes equal in length; plants not sticky or strong-smelling — *Muhlenbergia tenella*

27a. [25] Spikelets conspicuously laterally compressed; glumes less than half the length of the spikelet; lemmas distinctly ridged, with keel on the midrib — *Oryza latifolia* (Fig. 5C)

27b. Spikelets dorsally compressed or terete; glumes more than half the length to exceeding the spikelet; lemma surface smooth and without a keel on the midrib — 28

28a. [27] Spikelets 3.5–6 mm long; sheaths usually papillose-hispid and/or ciliate; glumes unequal in length, upper glume much longer than lower glume, exceeding the spikelet — *Arundinella* (2 spp.; Fig. 5D)

28b. Spikelets 15–23 mm long; sheaths glabrous; glumes equal or subequal in length, shorter than the spikelet — *Aristida ternipes*

29a. [22] Spikelets 11–20 mm long, lanceolate; the rachilla between the fertile florets densely covered in long fine silky hairs giving a plumose appearance when flowering; plants of aquatic or wet habitat — *Phragmites australis* (Fig. 5E)

29b. Spikelets usually < 10 mm long, globose to lanceolate, if > 10 mm long the rachilla between the florets never covered in long silky hairs; plants of varying habitat — 30

30a. [29] Spikelets with 3 or more florets, laterally compressed (often conspicuously) with midrib of glumes and lemmas usually keeled — 31

30b. Spikelets with 1 or 2 florets, laterally or dorsally compressed, if glumes or lemmas with prominent keels then 1- or 2-flowered — 32

31a. [30] Glumes 3- to 7-nerved; lemmas 5- to 11-nerved; plants dioecious — *Distichlis spicata*

31b. Glumes generally 1-nerved, rarely 3-nerved; lemmas 3-nerved; plants monoecious — *Eragrostis* (13 spp.; Fig. 5F)

32a. [30] Spikelets inserted in 2 rows on one side of the rachis; spikelets 1-flowered; glumes missing, with only a conspicuously laterally compressed and hardened lemma and palea present — *Leersia* (2 spp.; Fig. 5G)

32b. Spikelets inserted on both sides or all around the rachis; spikelets 1- or 2-flowered; glumes or glume-like sterile bracts present, all spikelets having 3 or more bracts, not conspicuously laterally compressed and hardened — 33

33a. [32] Spikelets globose, 1–2 mm long; glumes equal and slightly shorter than spikelet, enclosing 2 hardened fertile florets both similar in shape; glumes lightly pubescent towards their tips or glabrous — *Isachne* (3 spp.; Fig. 6A)

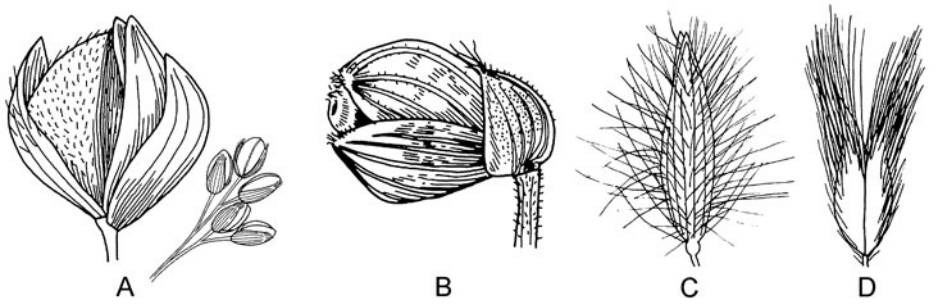

FIG. 6. Characters of taxa in subkey 2. **A**, ***Isachne***, generalised spikelet and portion of inflorescence; **B**, ***Lasiacis***, generalised spikelet; **C**, ***Anthaenantia lanata***, spikelet; **D**, ***Melinis repens***, spikelet.

33b. Combination of characters not as above; spikelets ovoid, ellipsoid, elliptic lanceolate or subglobose, 1–6 mm long (if subglobose, i.e. *Lasiacis*, > 2.6 mm long with glumes unequal, hardened fertile floret 1, and woolly hairs emerging from the tips of the glumes, lemmas and/or paleas); glumes equal or unequal, as long as the spikelet to much shorter; fertile florets 1 or 2, either hardened or herbaceous, if hardened then only 1 hardened floret present; glumes glabrous to densely pubescent ____ 34

34a. [33] Glumes, lemmas and/or paleas with woolly hairs arising from the tips, turning shiny black at maturity; spikelets subglobose and generally large, > 3.5 mm long, rarely as short as 2.6 mm, placed obliquely on the pedicels; lower glumes 5- to 11-nerved; upper glume and lower lemma 7- to 13-nerved; leaf blade base often pseudopetiolate; leaf blades elliptical or obovate; growing in rain forest *(NB: the woolly hairs in* Lasiacis *can sometimes be short and indistinct, so many spikelets should be checked.)* ____ *Lasiacis* (10 spp.; Fig. 6B)

34b. Combination of characters not as above; glumes, lemmas and/or paleas glabrous to pilose but not with woolly hairs arising solely from the tips, green to purple when mature; spikelets globose to lanceolate and generally small, < 3 mm long, rarely longer, erect on the pedicels; lower glumes 0- to 9-nerved or absent; upper glume and lower lemma 1- to 15-nerved; leaf blade base rarely pseudopetiolate, usually rounded abruptly before joining the sheath, or narrow and merging with the sheath; leaf blades elliptical or obovate to linear; growing in a variety of habitats including rain forest ____ 35

35a. [34] Lowermost sterile/staminate bracts of spikelet, i.e. glumes and lower lemma, lightly to densely pubescent, at least at the tips (lower glume, if present, often glabrous), enclosing the perfect floret ____ 36

35b. Lowermost sterile/staminate bracts of spikelet, i.e. glumes (and often lower lemma), scabrous or glabrous, enclosing the perfect floret or much shorter ____ 41

36a. [35] Lowermost sterile/staminate bracts of spikelet, i.e. glumes and lower lemma, densely covered with long hairs; perfect floret herbaceous; spikelets 3–5 mm long ____ 37

36b. Lowermost sterile/staminate bracts of spikelet, i.e. glumes and lower lemma, sparsely to densely pilose with usually short hairs; perfect floret hardened and often shiny; spikelets 1–3.7 mm long ____ 38

37a. [36] Spikelets elliptic-lanceolate, dorsally compressed, hairs covering spikelets as long as 2 mm, light or dark, never reddish, purple or silver; ligule a minute ciliate membrane c.0.2 mm long ____ *Anthaenantia lanata* (Fig. 6C)

37b. Spikelets ovoid, laterally compressed; hairs covering spikelets as long as 8.5 mm, reddish, purple or silver; ligule a ring of hairs c.1 mm long ____ *Melinis repens* (Fig. 6D)

38a. [36] Hardened perfect floret distinctly transversely rugose; spikelets 2.8–3.7 mm long; culms 50–300 cm tall; panicles 13–60 cm long; leaf blades linear, 20–85 cm long, 8–35 mm wide ____ *Megathyrsus maximus* (see Fig. 8B)

38b. Hardened perfect floret smooth to rugulose; spikelets 0.9–3.6 mm long; culms 5–200 cm tall; panicles 1.5–57 cm long; leaf blades linear lanceolate to ovate, or if linear then 0.6–5 mm wide, 2–54 cm long, 0.6–28 mm wide ____ 39

39a. [38] Hardened perfect floret with simple papillae all over its surface and long unicellular macrohairs towards the apex; spikelets lanceolate, 2.5–3.6 mm long, acuminate to shortly awned, in pairs on the rachis; lower glume a nerveless rudiment, 1/30–1/5 length of the spikelet, 0.1–1 mm long; upper glume and lower lemma 3- to 5-nerved; leaf blades 16–54(–70) cm long, 10–33 mm wide ____ *Aakia tuerckheimii*

39b. Hardened perfect floret smooth or papillose, lacking macrohairs or sparsely puberulent with minute globular trichomes in *Panicum hirtum*; spikelets ovoid to oblanceolate, sometimes (ob)planoconvex, 1–3.6 mm long, acute to obtuse, solitary or paired on the rachis; lower glume 1- to 3(–5)-nerved, rarely enerved in *Dichanthelium*, 1/4–2/3(–1/1, i.e. as long as the spikelet, in *P. hirtum*) the length of the spikelet, 0.4–2.9 mm long; upper glume and lower lemma 3- to 9(–15)-nerved; leaf blades 2–43 cm long, 0.6–28 mm wide *(NB:* Panicum tricanthum *spikelets sometimes sparsely pilose with lower glume enerved but spikelets ellipsoid, 1.2–1.6 mm long)* ____ 40

40a. [39] Upper glume and lower lemma 7- to 9(–15)-nerved (5-nerved in *Dichanthelium strigosum*); plants frequently forming a basal rosette of short wide leaves different from the longer thinner cauline leaves; only terminal inflorescences flower, spikelets of axillary inflorescences cleistogamous; lower palea present; pseudoligule of hairs 1.5–5.5 mm long sometimes present and conspicuous behind the ligule at the base of the leaf blade ____ *Dichanthelium*[7]

[7] *Dichanthelium aciculare*, *D. acuminatum*, *D. dichotomum*, *D. portoricense*, *D. sciurotoides*, *D. sphaerocarpon*, *D. strigosum* and *D. viscidellum*.

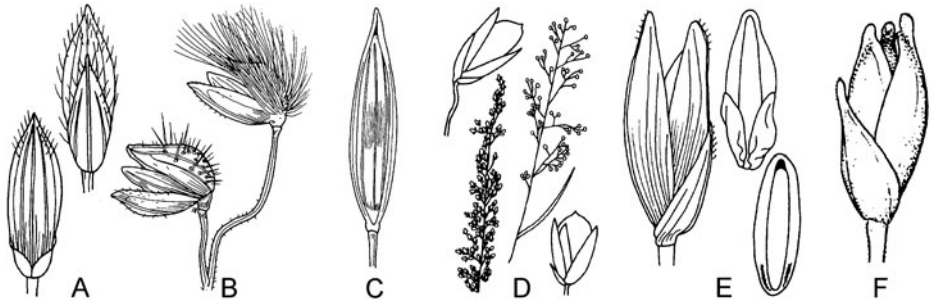

FIG. 7. Characters of taxa in subkey 2. **A**, ***Panicum rudgei***, spikelet (dorsal and ventral views); **B**, ***Panicum hirtum***, spikelets at different stages of maturity; **C**, ***Homolepis aturensis***, spikelet (ventral view); **D**, ***Sporobolus***,[9] generalised spikelets and open to semicontracted panicles; **E**, ***Ichnanthus***, generalised spikelet and perfect florets with membranous appendages or scars at the base of the lemma; **F**, ***Acroceras zizanioides***, spikelet.

40b. Upper glume and lower lemma usually 3- to 5-nerved (7- to 9-nerved in *Panicum rudgei* but recognisable by shortly stipitate hardened fertile floret); plants not forming a basal rosette of short wide leaves, leaves at the base similar to cauline leaves; all spikelets of inflorescence flower at once; lower palea present or absent; pseudoligules absent _____ *Panicum*[8] (Fig. 7A, B)

41a. [35] Lower and upper glume equal in length and as long as the spikelet, enclosing 2 herbaceous florets; spikelets elliptic-lanceolate and dorsally compressed, 6–8 mm long _____ *Homolepis aturensis* (Fig. 7C)

41b. Glumes unequal in length (subequal in *Eragrostis polytricha* and some *Sporobolus* spp., but then much shorter than the spikelet), lower glume shorter than the spikelet (upper glume also shorter than the spikelet in *E. polytricha* and some *Sporobolus*); florets 1 or 2, herbaceous, rigid or hardened; spikelets rarely elliptic lanceolate, and if so, combination of characters not as above, dorsally or laterally compressed, 1–6(–7) mm long _____ 42

42a. [41] Both glumes shorter than the spikelet; spikelets disarticulating above the glumes, with glumes remaining in the inflorescence with their pedicel after the grains have fallen; leaf blade base narrow and merging with the sheath; leaves linear _____ 43

42b. At least 1 of the 2 lowermost sterile bracts (i.e. glumes, or upper glume and glume-like lower lemma if lower glume lost) as long as the spikelet; spikelets disarticulating below the glumes, with the glumes and grain falling together at maturity; leaf blade base narrow and merging with the sheath, or cordate, pseudopetiolate or rounded abruptly before joining the sheath; leaves linear to elliptical or obovate _____ 44

[8] *Panicum haenkeanum*, *P. hirtum*, *P. rudgei*, *P. sellowii*, *P. trichanthum* and *P. trichoides*.

43a. [42] Spikelets 2-flowered; glumes subequal, herbaceous; lemmas herbaceous, 3-nerved, scabrous on the keel _____ *Eragrostis polytricha*

43b. Spikelets 1-flowered; glumes subequal or unequal with the lower glume shorter than the upper, membranous; lemmas membranous, 1-nerved, glabrous

Sporobolus[9] (Fig. 7D)

44a. [42] Spikelet midribs keeled either for their entirety or just towards the tips; spikelets laterally compressed (*Acroceras* spikelets sometimes appear dorsally compressed but have a prominent keel at the tips); perfect floret rigid or hardened, if floret hardened then with a short stipe at base bearing membranous appendages/wings adnate to the base of the lemma (i.e. *Ichnanthus*); leaf blade base cordate, pseudopetiolate, or rounded abruptly before joining the sheath; leaves lanceolate to ovate _____ 45

44b. Spikelet midribs lacking keels (rarely slightly apically keeled in some species of *Panicum*); spikelets dorsally compressed; perfect floret usually hardened, less often rigid, never with a short stipe or membranous appendages at its base; leaf blade base variable, narrow and merging with the sheath, cordate, pseudopetiolate, or rounded abruptly before joining the sheath; leaves variable, linear to ovate _____ 46

45a. [44] Glume apices acuminate to awned; midrib of both glumes with a prominent keel running for the entirety of the glume; perfect floret hardened, with a short stipe at base bearing 2 membranous appendages adnate to the base of the lemma (these appendages can be reduced or indicated only by scars); blade bases usually asymmetrical, cordate, rounded, or often abruptly narrowed into a pseudopetiole _____ *Ichnanthus* (8 spp.; Fig. 7E)

45b. Glume apices blunt to acute, never acuminate or awned; upper glume, lower lemma and upper lemma with a keel towards the tip, the lower part rounded; perfect floret rigid, never with a short stipe or membranous appendages; blade bases symmetrical, cordate, never pseudopetiolate

Acroceras zizanioides (Fig. 7F)

46a. [44] Hardened perfect floret surface rugose/rugulose wrinkled _____ 47

46b. Hardened perfect floret surface never rugulose, smooth and shiny, finely striate, or with simple or compound papillae covering the surface _____ 49

47a. [46] Inflorescence a false panicle of short open racemes; spikelets in pairs, triplets or up to 5 with pedicels emerging from the same point on the rachis, rarely solitary; spikelets obovoid with a short acute apex; upper glume and lower lemma often with reticulate cross-veins on their surface

Urochloa fusca (Fig. 8A)

[9] *Sporobolus buckleyi*, *S. cubensis*, *S. diandrus*, *S. jacquemontii* and *S. tenuissimus*.

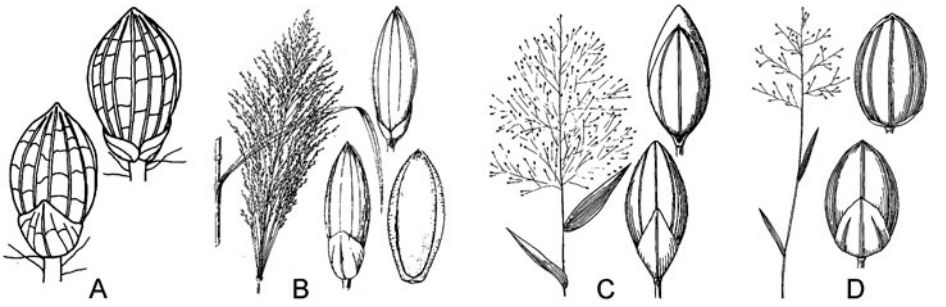

FIG. 8. Characters of taxa in subkey 2. **A**, ***Urochloa fusca***, spikelet (dorsal and ventral views); **B**, ***Megathyrsus maximus***, inflorescence, culm and leaf, spikelet (dorsal and ventral views) and hardened floret (ventral view); **C**, ***Panicum trichoides***, portion of plant and spikelet (dorsal and ventral views); **D**, ***Panicum parvifolium***, portion of plant and spikelet (dorsal and ventral views).

47b. Inflorescence a true panicle; spikelets solitary, oblong-ellipsoid or obplanoconvex, with an obtuse or subacute apex; upper glume and lower lemma lacking reticulate cross-veins ____ 48

48a. [47] Spikelets 2.8–3.7 mm long; hardened upper floret distinctly transversely rugose; herbaceous lower floret staminate; culms 0.5–3 m tall; panicles 13–60 cm long; leaf blades linear, symmetrical, 20–85 cm long, 8–35 mm wide ____ *Megathyrsus maximus* (Fig. 8B)

48b. Spikelets 1–2.3 mm long; hardened upper floret minutely to clearly rugulose; herbaceous lower floret sterile; culms 0.1–1.5 m tall; panicles 4–28 cm long; leaf blades lanceolate to ovate, asymmetrical, 2–17 cm long, 7–28 mm wide ____ *Panicum*[10] (Fig. 8C)

49a. [46] Hardened perfect floret pilose at the base and tip or all over ____ 50

49b. Hardened perfect floret glabrous or scabrous (sometimes puberulent towards the tip in *Coleataenia rigidula* but never at the base) ____ 51

50a. [49] Hardened perfect floret pilose at the base and tip; spikelets gibbous; upper glume and lower lemma 3-nerved; growing in wet areas *Cyphonanthus discrepans*

50b. Hardened perfect floret with conspicuous macrohairs all over its surface (sparsely pilose in *Morronea parviglumis*); spikelets not gibbous; upper glume and lower lemma 5- to 7-nerved; usually growing in drier areas, forest edges, etc. ____ *Morronea* (2 spp.)

51a. [49] Aquatic perennial, 1–6 m tall; blades 20–50 cm long; panicles 25–50 cm long; spikelets (3.3–)4.5–5.6 mm long, lanceolate; lower palea reduced or absent; lower glume reduced, nerveless and hyaline ____ *Louisiella elephantipes*

[10] *Panicum trichoides* and *P. sellowii*.

51b. Combination of characters not as above; annuals or perennials, usually not aquatic, usually < 2 m tall (rarely taller, e.g. *Panicum altum* and *P. amarum*); blades 2–50 cm long; panicles 1–25(–51) cm long; spikelets 1.2–3.5(–7.7) mm long, usually ovoid; lower palea present or absent; lower glume reduced and hyaline or developed and herbaceous with nerves ____ 52

52a. [51] Upper glume and lower lemma (3–)7- to 9(–15)-nerved, if 3- or 5-nerved then hardened perfect floret with compound papillae present only at the apex of the palea (and apex of lemma in some species), i.e. *Panicum*, or plants with a basal rosette of short wide leaves different from the longer thinner cauline leaves, i.e. *Dichanthelium strigosum*; lower palea present or absent ____ 53

52b. Upper glume and lower lemma 5-nerved (sometimes 7-nerved in *Coleataenia stenodes* and *Morronea parviglumis*); hardened perfect floret either smooth, shiny, without papillae and usually with prickle hairs towards the apex of the lemma (*Coleataenia*) or covered with simple papillae (*Morronea*) regularly distributed over the lemma and palea; lower palea present (*Coleataenia*) or absent (*Morronea*) ____ 54

53a. [52] Spikelets 0.9–2.2 mm long; upper glume and lower lemma 7- to 9(–15)-nerved (5-nerved in *Dichanthelium strigosum*); plants frequently forming a basal rosette of short wide leaves different from the longer thinner cauline leaves; only terminal inflorescences flower, spikelets of axillary inflorescences cleistogamous; lower palea present; hardened perfect floret usually with simple papillae covering the surface of the lemma and palea ____ *Dichanthelium*[11]

53b. Spikelets 1.2–7.7 mm long; spikelets < 2 mm long usually with upper glume and lower lemma (3–)5-nerved (upper glume rarely 7-nerved in *Panicum trichidiachne*), spikelets > 2 mm usually with upper glume and lower lemma (5–)7- to 9(–13)-nerved *(NB:* P. hirsutum *spikelets 7- to 9-nerved, 1.8–2.2 mm long)*; plants not forming a basal rosette of short wide leaves, leaves at the base similar to cauline leaves; all spikelets of inflorescence flower at once; lower palea present or absent; hardened perfect floret with compound papillae present only at the apex of the palea (and apex of lemma in some species) ____ *Panicum*[12] (Fig. 8D)

54a. [52] Hardened perfect floret smooth, shiny, without papillae and often with prickle hairs (sometimes puberulent towards the tip in *Coleataenia rigidula*); sheaths generally glabrous or with a few auricular hairs; lower palea present, 1/3–3/4 length of lower lemma ____ *Coleataenia* (3 spp.)

54b. Hardened perfect floret covered with simple papillae regularly distributed over the lemma and palea, prickle hairs and pubescence absent; sheaths papillose-hispid; lower palea absent ____ *Morronea parviglumis*

[11] *Dichanthelium dichotomum*, *D. ensifolium*, *D. sphaerocarpon*, *D. strigosum* and *D. viscidellum*.

[12] *Panicum altum*, *P. amarum*, *P. aquaticum*, *P. bartlettii*, *P. caricoides*, *P. cayennense*, *P. cyanescens*, *P. ghiesbreghtii*, *P. hirsutum*, *P. parvifolium*, *P. repens*, *P. trichanthum* and *P. trichidiachne*.

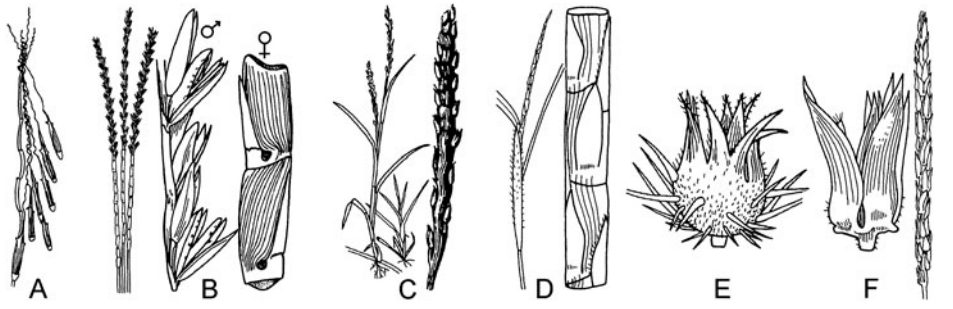

FIG. 9. Characters of taxa in subkey 3. **A**, ***Streptochaeta sodiroana***, mature disarticulating spikelets; **B**, ***Tripsacum***, generalised inflorescence and close-up of portions of pistillate and staminate sections of the inflorescence; **C**, ***Stenotaphrum secundatum***, habit and inflorescence (dorsal view); **D**, ***Rottboellia cochinchinensis***, inflorescence and close-up of portion of the spike; **E**, ***Cenchrus***,[13] generalised spikelet; **F**, ***Anthephora hermaphrodita***, spikelet and inflorescence.

Subkey 3

Spikelets inserted in a spike or raceme, or spikelets congested in 1-sided raceme-like primary branches (in *Steinchisma laxum* lower primary branches sometimes with secondary branching), spikes/racemes solitary, digitate/subdigitate or inserted racemosely on the main inflorescence axis. (*NB: false spikes of single-spikelet follicles sessile on the main inflorescence axis are included here, i.e.* Cenchrus.*)*

1a. Leaf blade base abruptly narrowed into a pseudopetiole, blades asymmetrical, 5–9.5 cm wide; inflorescence a single spike 15–32 cm long composed of 40–100 pseudospikelets, each pseudospikelet 13–17 mm long with c.11 rigid bracts subtending a single hermaphroditic floret; awns spirally twisted, 30–40 mm long ____ *Streptochaeta sodiroana* (Fig. 9A)

1b. Leaf blades not pseudopetiolate, symmetrical (sometimes pseudopetiolate and/or asymmetrical in *Ichnanthus* and *Echinolaena*), blades < 5 cm wide; floral characters not as above ____ 2

2a. [1] Spikelets (at least the lower) sunk into the swollen rachis of the raceme/spike ____ 3

2b. Spikelets all free on the rachis ____ 5

3a. [2] Inflorescence composed of two distinct parts, the lower portion of the raceme with pistillate spikelets sunk into the whitened thickened rachis, whereas the upper portion of the raceme has staminate spikelets free and arranged on one side of the flattened rachis; plants usually 3–6 m tall

Tripsacum (3 spp.; Fig. 9B)

3b. Inflorescence not composed of distinct parts, with spikelets sunk into the rachis throughout (*Rottboellia* has spikelet pairs of one sessile spikelet sunken into the rachis and one pedicellate spikelet); plants < 2 m tall ____ 4

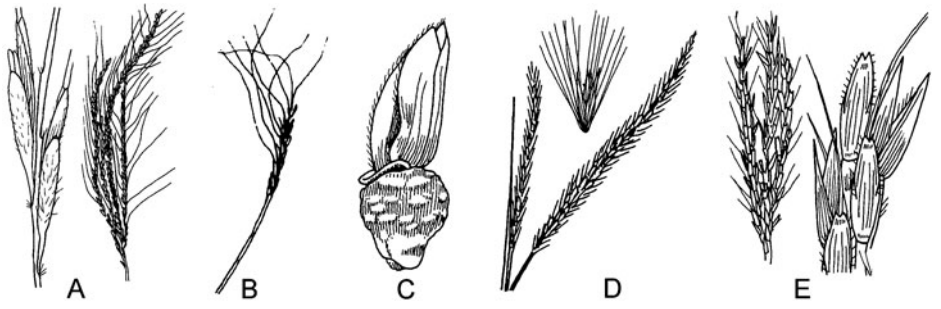

FIG. 10. Characters of taxa in subkey 3. **A**, ***Trachypogon spicatus***, portion of raceme and inflorescence; **B**, ***Heteropogon contortus***, inflorescence; **C**, ***Mnesithea granularis***, spikelet pair; **D**, ***Cenchrus***,[14] generalised spikelet and inflorescence; **E**, ***Ischaemum latifolium***, inflorescence and portion of raceme.

4a. [3] Leaf sheaths glabrous, strongly keeled; leaf blades glabrous with a rounded apex; plants stoloniferous; swollen rachis flattened, with spikelets sunken in 2 rows on one or both sides of the swollen rachis
Stenotaphrum secundatum (Fig. 9C)

4b. Leaf sheaths strongly papillose-hirsute (hairs irritating to touch), rounded; leaf blades with hairs present and an acute apex; plants tufted; swollen rachis cylindrical, with spikelets sunken all around the swollen rachis
Rottboellia cochinchinensis (Fig. 9D)

5a. [2] Spikelets hidden inside a subtending spiny or spineless involucre ____ 6

5b. Spikelets free on the rachis and not subtended by an involucre ____ 7

6a. [5] Involucre spiny ____ *Cenchrus*[13] (Fig. 9E)

6b. Involucre not spiny ____ *Anthephora hermaphrodita* (Fig. 9F)

7a. [5] Awns 2.5–12 cm long, prominent, thickened, geniculate and hairy; inflorescence a solitary raceme (rarely 2 racemes) ____ 8

7b. Awns absent or < 2.5 cm long, filamentous, either scabrid or glabrous (*Hyparrhenia* [Fig. 4C] has hairy awns to 3 cm long but inflorescence in paired racemes subtended by coloured bracts); inflorescence composed of 1 to many racemes or spikes ____ 9

8a. [7] Culms and sheaths rounded; ligule a glabrous membrane; spikelet pairs all similar along a slender continuous rachis, short pedicelled spikelet staminate and awnless, long pedicelled spikelet perfect and long-awned
Trachypogon spicatus (Fig. 10A)

8b. Culms flattened, sheaths conspicuously keeled; ligule a ciliate membrane; lower few spikelet pairs staminate and awnless, above this the sessile spikelets are

[13] *Cenchrus brownie*, *C. echinatus* and *C. incertus*.

perfect and long-awned whereas the pedicellate spikelets are staminate and awnless ____ *Heteropogon contortus* (Fig. 10B)

9a. [7] Spikes/racemes solitary or digitate/subdigitate, mostly arising from a central point on the peduncle *(NB:* Bouteloua scabra*, with fascicles comprising a single spikelet and subtending bristles inserted along a central inflorescence axis, included here)* ____ 10 (Fig. 1B)

9b. Spikes, racemes or raceme-like primary inflorescence branches arranged racemosely on the central inflorescence axis *(NB: sometimes racemes congested on the central axis, so check closely)* ____ 36 (Fig. 1B)

10a. [9] Spikelets inserted on both sides or all around the rachis of the spike or raceme ____ 11

10b. Spikelets inserted on one side of the rachis of the spike or raceme ____ 20

11a. [10] Spikelets awnless, or if awned, awns < 1 mm long ____ 12

11b. Spikelets (at least some) prominently awned, awns > 1 mm long ____ 14

12a. [11] Spikelets of two distinct types in pairs on the raceme, one a rugose ball, the other dorsally compressed, neither subtended by long hairs; sheaths hairy; pedicels glabrous ____ *Mnesithea granularis* (Fig. 10C)

12b. Spikelets all similar, subtended by long hairs; sheaths glabrous; pedicels, if present, covered in long hairs ____ 13

13a. [12] Inflorescence a single congested terminal spike/raceme per peduncle; spikelets solitary or in groups of 2–5, if paired then both pedicellate *Cenchrus*[14] (Fig. 10D)

13b. Inflorescence (1–)2–5 digitate racemes per peduncle; spikelets paired, one sessile on the rachis, the other pedicellate, the pedicel emerging from the base of the sessile spikelet (sometimes the pedicellate spikelet is reduced leaving only the pedicel) ____ *Andropogon*[15] (Fig. 4A)

14a. [11] Leaf blades broad, ≥ 10 mm wide, base cordate or rounded abruptly before joining the sheath ____ *Ischaemum latifolium* (Fig. 10E)

14b. Leaf blades narrow, 1–5(–7) mm wide, base merging with the sheath, not rounded ____ 15

15a. [14] Spikelet subtended by 5 dark bristles, solitary, laterally compressed; spikelet and subtending bristles falling as a unit at maturity; glumes shorter than the spikelet, awned ____ *Bouteloua scabra*

15b. Spikelets not subtended by bristles, paired, 1 sessile and 1 pedicellate (sometimes the pedicellate spikelet rudimentary with only the pedicel apparent, i.e. *Andropogon virginicus*), dorsally compressed; spikelet pair with joining pedicel

[14] *Cenchrus nervosus*, *C. polystachios* and *C. purpureus*.
[15] *Andropogon bourgeaie*, *A. lateralis*, *A. leucostachyus* and *A. selloanus*.

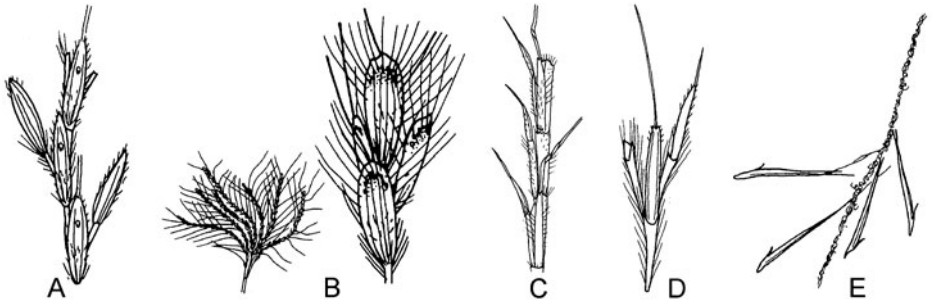

FIG. 11. Characters of taxa in subkey 3. **A**, ***Bothriochloa***, generalised portion of raceme; **B**, ***Dichanthium annulatum***, inflorescence and portion of raceme; **C**, ***Schizachyrium***, generalised portion of raceme; **D**, ***Andropogon***, generalised spikelet pair; **E**, ***Streptogyna americana***, spikelets.

falling as a unit at maturity; lower glume as long as or longer than the spikelet; glumes awnless ____ 16 (Fig. 4A)

16a. [15] Awns 14–30 mm long; stem nodes often with tufted white hairs ____ 17

16b. Awns < 14 mm long (11–17 mm in *Andropogon virginicus*); stem nodes hairless ____ 19

17a. [16] Racemes paired and subtended by a coloured bract; sessile spikelets with awns exserted 15–30 mm; lower part of awns covered in short hairs *Hyparrhenia* (2 spp.; Fig. 4C)

17b. Racemes (1–)2–7, not subtended by bracts; sessile spikelets with awns 14–20 mm long; awns glabrous or scabrid ____ 18

18a. [17] Sheaths keeled, usually hairy; lower glume usually with a pitted hole in its centre ____ *Bothriochloa pertusa* (Fig. 11A)

18b. Sheaths rounded, glabrous; glumes never with pitted holes *Dichanthium annulatum* (Fig. 11B)

19a. [16] Stem internodes markedly to slightly flattened, solid; ligule a short membrane 0.5–1 mm long; racemes 1 per peduncle; lower glume outwardly convex or flat between the keels, but never inwardly concave, with 1–9 nerves between the keels (sometimes nerves only apparent towards apex of glume); lower glume apex bifid; upper lemma of sessile spikelet with ciliate margins *Schizachyrium*[16] (Fig. 11C)

19b. Stem internodes cylindrical, usually hollow, rarely solid; ligule a ciliate membrane (0.7–)1–2.5(–8) mm long; racemes 1–6 per peduncle; lower glume inwardly concave or flat and without nerves between the keels; lower glume apex acute; upper lemma of sessile spikelet with entire margins *Andropogon*[17] (Fig. 11D)

[16] *Schizachyrium sanguineum* and *S. tenerum*.
[17] *Andropogon bourgeaie*, *A. gerardi*, *A. gyrans*, *A. lateralis* and *A. virginicus*.

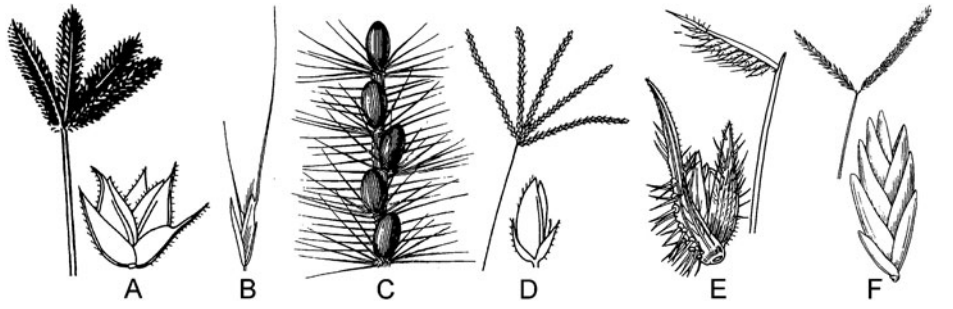

FIG. 12. Characters of taxa in subkey 3. **A**, ***Dactyloctenium aegyptium***, inflorescence and spikelet; **B**, ***Chloris***, generalised spikelet; **C**, ***Axonopus aureus***, portion of raceme; **D**, ***Cynodon***, generalised inflorescence and spikelet; **E**, ***Echinolaena***, generalised spikelet and raceme; **F**, ***Eleusine indica***, inflorescence and spikelet.

20a. [10] Spikelets (at least some) with awns ____ 21
20b. Spikelets awnless ____ 25

21a. [20] Awns 2–2.5 cm long; stigmas long, persistent, hardened, coiled and tangled at maturity ____ *Streptogyna americana* (Fig. 11E)
21b. Awns short, < 0.6 cm long; stigmas short, deciduous, not hardened or coiled ____ 22

22a. [21] Spikes 1–3 cm long, exceptionally longer; spike rachis terminating in a distinct naked green point; upper glume (and sometimes lower lemma) with a stout short flexuose (often crooked) awn emerging from the apex *Dactyloctenium aegyptium* (Fig. 12A)
22b. Spikes usually > 3 cm long; spike rachis not terminating in a naked point; upper glume with a short awn arising from between 2 lobes in the glume apex (*Eustachys*), or awnless or with a short filamentous awn arising from the glume apex; lemmas awned (*Chloris* and *Stapfochloa*), or unawned or mucronate (*Eustachys*) ____ 23

23a. [22] Awns 0.3–0.5 mm long, arising from between 2 lobes in the glume apex; lemmas unawned or mucronate; glumes not membranaceous, green throughout; leaf blade apex obtuse ____ *Eustachys petraea*
23b. Awns 0.9–13 mm long, arising from the lemma tips and sometimes the glume tips; glumes with membranaceous margins; leaf blade apex acute to acuminate, rarely appearing obtuse ____ 24

24a. [23] Plants annual; fertile floret lemma awn 4–13 mm long, sterile floret lemma awn 2–7.5 mm long ____ *Chloris* (2 spp.; Fig. 12B)
24b. Plants perennial; fertile floret lemma awn 1–2 mm long, sterile floret lemma awn absent or 0.9–1.4 mm long ____ *Stapfochloa ciliata*

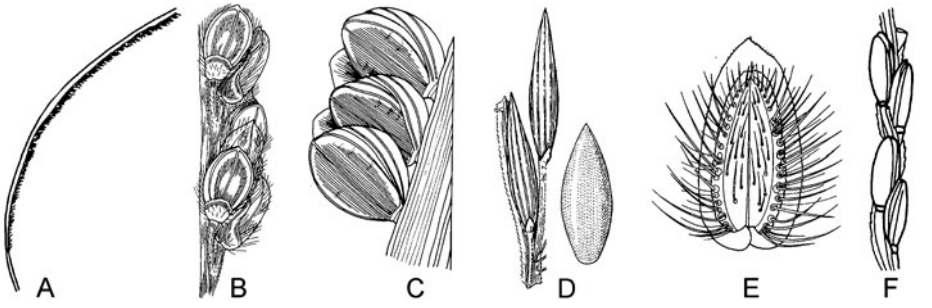

FIG. 13. Characters of taxa in subkey 3. **A**, ***Thrasya***, generalised raceme; **B**, ***Paspalum pilosum***, portion of raceme; **C**, ***Paspalum***, generalised portion of raceme; **D**, ***Digitaria***,[19] generalised spikelets and perfect floret lemma with gristly surface; **E**, ***Paspalum pectinatum***, spikelet; **F**, ***Axonopus***, generalised portion of raceme.

25a. [20] Spikelets with long tufted white or yellow-brown hairs at their base, these hairs sometimes extending up the back and sides of the glumes ——— 26
25b. Spikelets without long tufted hairs at their base, glumes rarely ciliate, and if so, lacking tufted hairs at their base ——— 27

26a. [25] Racemes 2–15; rachis covered with and spikelets subtended by stiff golden yellow-brown hairs; sheaths keeled ——— *Axonopus aureus* (Fig. 12C)
26b. Raceme solitary; spikelets with long white hairs covering the base and emerging ciliately from the sides of the glumes (sometimes also covering the back of the glumes); sheaths rounded ——— *Mesosetum* (2 spp.)

27a. [25] Spikelets laterally compressed, midrib of glumes and lemmas prominently keeled ——— 28
27b. Spikelets dorsally compressed, lacking a prominent keel on the midrib ——— 30

28a. [27] Spikelets 1–3 mm long, 1-flowered ——— *Cynodon* (2 spp.; Fig. 12D)
28b. Spikelets 4–11 mm long, 2– to many-flowered ——— 29

29a. [28] Spikes solitary, 2–2.5 cm long; spikelets pustulose hispid; glumes longer than the spikelet, lower glume much longer than the upper; sheaths and adaxial leaf surface papillose hispid; leaf blades 1–4 cm × 3–6 mm, cordate at the base ——— *Echinolaena gracilis* (Fig. 12E)
29b. Spikes usually 2–6, rarely solitary, usually 3.5–10 cm long, rarely < 2.5 cm; spikelets glabrous; glumes shorter than the spikelet, lower glume shorter than the upper; sheaths glabrous apart from long soft hairs along the margin of upper sheaths and collars, adaxial leaf surface with sparse long soft hairs; leaf blades 5–35 cm × 2–6 mm, base merging with sheath ——— *Eleusine indica* (Fig. 12F)

30a. [27] Inflorescence a solitary terminal raceme with spikelets in a single row; rachis of the raceme with well-developed herbaceous wings partly enfolding the spikelets ——— *Thrasya* (2 spp.; Fig. 13A)

30b. Inflorescence composed of 1 to many racemes with spikelets in > 1 row; rachis of spike rarely with herbaceous wings (see *Paspalum*) ____ 31

31a. [30] Spikelets paired or in triplets, the pedicels all emerging from the same place on the rachis ____ 32

31b. Spikelets solitary on the rachis ____ 33

32a. [31] Spikelets circular to elliptic, usually distinctly planoconvex, sometimes biconvex or concave–convex; lowermost bracts (i.e. upper glume and glume-like lower lemma, lower glume absent or a nerveless rudiment, 1-nerved in *Paspalum pilosum*, Fig. 13B) with an obtuse apex that is either with a short acute tip or apex blunt; perfect floret lemma surface smooth, margins thick or herbaceous, not thinner than the main body of the lemma, inrolled around the palea ____ *Paspalum*[18] (Fig. 13B, C)

32b. Spikelets elliptic-lanceolate, not distinctly planoconvex; lowermost bracts (i.e. upper glume and glume-like lower lemma, lower glume absent or a small nerveless rudiment) narrowed to an acute tip; perfect floret lemma surface gristly, finely wrinkled, margins thin/hyaline, thinner than the main body of the lemma, not inrolled ____ *Digitaria*[19] (Fig. 13D)

33a. [31] Inflorescence a single raceme, 2–2.5 cm long; spikelets 5.5–11 mm long, lanceolate; lower glume usually exceeding the spikelet and longer than the upper glume; glume apices acuminate; lemma of upper perfect floret with a thickened scar at its base ____ *Echinolaena gracilis* (Fig. 12E)

33b. Inflorescence with 1 to many racemes, of variable length; spikelets usually < 5 mm long (to 6.7 mm in *Paspalum pectinatum*), ovoid to lanceolate; lower glume (or lowermost sterile bract) never longer than upper glume (or upper sterile bract); glume apices blunt or acute; lemma of upper perfect floret without scarring at its base ____ 34

34a. [33] Spikelets 4.5–6.7 mm long; the lowermost bract (upper glume) winged with a cordate base, glabrous; the glume-like lower lemma strongly pustulose ciliate with cilia to 2 mm long ____ *Paspalum pectinatum* (Fig. 13E)

34b. Spikelets rarely as long as 4.5 mm, and if so, glumes never winged or with cordate bases; lowermost sterile bracts (i.e. glumes or glume-like lower lemmas) never strongly pustulose ciliate ____ 35

35a. [34] Spikelets usually distinctly planoconvex, one side flattened, the other distinctly rounded, sometimes biconvex or concave–convex, ovoid to elliptic, less than twice as long as wide; rounded lemma of perfect floret (i.e. rounded side of the spikelet) facing towards the rachis, flattened

[18] *Paspalum blodgettii*, *P. clavuliferum*, *P. corcovadense*, *P. decumbens*, *P. fimbriatum*, *P. humboldtianum*, *P. langei*, *P. laxum*, *P. ligulare*, *P. nutans*, *P. peckii*, *P. pictum*, *P. pilosum*, *P. plicatulum* and *P. setaceum*.

[19] *Digitaria cayoensis*, *D. ciliaris*, *D. fuscescens*, *D. horizontalis* and *D. setigera*.

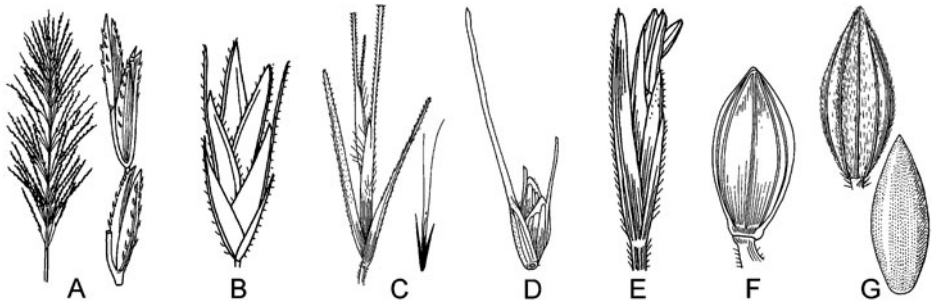

FIG. 14. Characters of taxa in subkey 3. **A**, ***Chrysopogon zizanioides***, inflorescence and portion of raceme; **B**, ***Leptochloa virgata***, spikelet; **C**, ***Gymnopogon spicatus***, spikelet (showing only base of the awn) and silhouette of full spikelet; **D**, ***Oplismenus***, generalised spikelet; **E**, ***Sporobolus spartinus***, spikelet; **F**, ***Paspalum***,[25] generalised spikelet; **G**, ***Digitaria***,[26] generalised spikelet and perfect floret lemma with gristly surface.

side of the spikelet facing away from the rachis; sheaths sometimes keeled _____ *Paspalum*[20] (Fig. 13C)

35b. Spikelets not distinctly planoconvex, both sides flattened to some degree; spikelets oblong-elliptic to elliptic-lanceolate, more than twice as long as wide; lemma of perfect floret facing away from the rachis; sheaths always keeled _____ *Axonopus*[21] (Fig. 13F)

36a. [9] Spikelets inserted on both sides or all around the rachis of the primary inflorescence branch; spikelets in pairs or triplets with one spikelet sessile and the other(s) pedicellate; sessile spikelet perfect whereas pedicellate spikelet(s) sterile or staminate _____ 37 (Fig. 4A)

36b. Spikelets inserted on one side of the rachis of the primary inflorescence branch (*Ichnanthus nemoralis* spikelets inserted all around but all spikelets pedicellate; *NB: herbarium specimens of certain genera, e.g.* Leptochloa *and* Urochloa, *have spikelets that sometimes appear distichously inserted as a result of being pressed*); if spikelets in groups on the rachis, then all spikelets pedicellate and fertile _____ 39

37a. [36] All spikelets laterally compressed with the glume midrib keeled, never subtended by tufted hairs; inflorescence composed of verticillate racemes along the central inflorescence axis; glumes covered in short scabrid spines _____ *Chrysopogon zizanioides* (Fig. 14A)

[20] *Paspalum conjugatum*, *P. corcovadense*, *P. humboldtianum*, *P. lineare*, *P. minus*, *P. multicaule*, *P. notatum*, *P. nutans*, *P. orbiculatum*, *P. pulchellum*, *P. serpentinum* and *P. vaginatum*.

[21] *Axonopus compressus*, *A. purpusii*, *A. poiophyllus* and *A. fissifolius*.

37b. Sessile/subsessile spikelets of the spikelet pairs dorsally compressed, lacking prominent keels on the midrib, usually subtended by tufted hairs (rarely glabrous in *Bothriochloa pertusa*); inflorescence composed of alternate racemes along the central inflorescence axis; glumes lacking spines ____ 38

38a. [37] Pedicellate spikelets awned and laterally compressed; leaf blade base rounded abruptly before joining the sheath; glumes never with pitted holes ____ *Ischaemum latifolium* (Fig. 10E)

38b. Pedicellate spikelets awnless and dorsally compressed; leaf blade base either merging with the sheath or rounded abruptly; glumes usually with a pitted hole in their centre ____ *Bothriochloa* (2 spp.; Fig. 11A)

39a. [36] Spikelets laterally compressed; glumes and lemmas prominently keeled on the midrib (*Ichnanthus* spikelets sometimes appear dorsally compressed because of the dorsally compressed perfect floret, but glumes and lower lemma are keeled) ____ 40

39b. Spikelets dorsally compressed; glumes and lemmas lacking a prominent keel on the midrib ____ 48

40a. [39] Spikelets awned ____ 41

40b. Spikelets awnless ____ 44

41a. [40] Spikes/racemes long and narrow, 5–25 cm long ____ 42

41b. Spikes/racemes short and broad, < 4 cm long ____ 43

42a. [41] Leaf blade base merging with the sheath; glumes shorter than the spikelet, acute; lemma awns absent or up to 2.2 mm long ____ *Leptochloa virgata* (Fig. 14B)

42b. Leaf blade base subcordate; glumes as long as the spikelet, acuminate; lemma awns 7–25 mm long ____ *Gymnopogon spicatus* (Fig. 14C)

43a. [41] Spikelets 5–9 mm long excluding awns; leaf blades linear, narrow, 1–4 mm wide; awns arising from the tips of the lemmas, lemmas 3-awned ____ *Bouteloua repens*

43b. Spikelets 2–4.5 mm long excluding awns; leaf blades elliptic, broad, 4–20 mm wide; awns arising from the tips of the glumes; glumes 1-awned ____ *Oplismenus* (2 spp.; Fig. 14D)

44a. [40] Leaf blades elliptic with a subcordate base, usually pseudopetiolate; leaf blades broad, elliptic-ovate lanceolate; blade bases subcordate or rounded, usually abruptly narrowed into a pseudopetiole or less often subpetiolate, often asymmetrical (*Ichnanthus*) ____ 45

44b. Leaf blades linear; blade bases merging with the sheath, never pseudopetiolate, symmetrical ____ 46

45a. [44] Leaf blade venation with distinct cross-veins; blade bases usually asymmetrical; lower glume shorter than the spikelet; spikelets glabrous or scabrid but never papillose hispid; perfect floret with a short stipe at base

bearing 2 membranous appendages 0.5–1.5 mm long adnate to the base of the lemma ____ *Ichnanthus*[22] (Fig. 7E)

45b. Leaf blade venation lacking distinct cross-veins; blade bases symmetrical; both glumes at least as long as the spikelet, with lower glume usually exceeding the spikelet; spikelets usually papillose hispid, rarely glabrous
Echinolaena standleyi (Fig. 12E)

46a. [44] Spikelets 1-flowered; upper glume surpassing the apex of the floret; the floret never reduced, entire spikelet falling at maturity
Sporobolus spartinus (Fig. 14E)

46b. Spikelets 2- to 9-flowered; upper glume rarely reaches apex of the lowermost floret; the uppermost floret reduced to a small rudiment, spikelets breaking up above the glumes at maturity ____ 47

47a. [46] Spikelets 1.8–3 mm long; 2–4 florets per spikelet
Dinebra panicea subsp. *mucronata*

47b. Spikelets 5–9 mm long; 7–10 florets per spikelet
Diplachne fusca subsp. *uninervia*

48a. [39] Perfect floret subtended by 2 sterile bracts (i.e. upper glume and glume-like lower lemma, lower glume lost) or rarely 1 sterile bract (i.e. lower lemma, glumes lost, as in *Paspalum pulchellum*); bracts equal in length and enclosing the perfect floret ____ 49

48b. Perfect floret subtended by 3 sterile/staminate bracts (i.e. lower and upper glume and lower lemma), lower glume shorter than upper glume, upper glume and lower lemma usually equal in length and enclosing the perfect floret (some taxa with upper glume slightly shorter than spikelet; *Setaria geminata* with upper glume 1/2 to as long as spikelet) ____ 53

49a. [48] Perfect floret much shorter than the bracts (i.e. upper glume and glume-like lower lemma), awned; awn stiff, 1 mm long, arising from the lemma apex (often difficult to see because enclosed by the bracts) ____ *Eriochloa punctata*

49b. Perfect floret as long as the bracts (i.e. upper glume and glume-like lower lemma), never awned ____ 50

50a. [49] Spikelets solitary on the rachis ____ 51

50b. Spikelets paired or in groups of 3–5, the pedicels all emerging from the same place on the rachis ____ 52

51a. [50] Spikelets usually distinctly planoconvex, one side flattened, the other distinctly rounded, rarely concave–convex or biconvex, ovoid to elliptic, less than twice as long as wide, rarely lanceolate *(NB:* Paspalum pectinatum *spikelets lanceolate and not distinctly planoconvex; Fig. 13E)*; lowermost bract

[22] *Ichnanthus lanceolatus* and *I. nemoralis*.

(i.e. upper glume) and rounded lemma of the perfect floret facing towards the rachis; sheaths sometimes keeled _____ *Paspalum*[23] (Fig. 13C)

51b. Spikelets not distinctly planoconvex, both sides flattened to some degree; spikelets oblong-elliptic to elliptic-lanceolate, more than twice as long as wide; lowermost bract (i.e. upper glume) and lemma of the perfect floret facing away from the rachis; sheaths always keeled _____ *Axonopus*[24] (Fig. 13F)

52a. [50] Spikelets ovoid to elliptic, usually distinctly planoconvex, one side flattened, the other distinctly rounded, sometimes concave–convex or biconvex; sterile bracts (i.e. upper glume and glume-like lower lemma) either with a short acute tip or apex blunt; perfect floret lemma surface usually smooth; perfect floret lemma margins thick or herbaceous, not thinner than the main body of the lemma, inrolled around the palea _____ *Paspalum*[25] (Figs 13C, 14F)

52b. Spikelets elliptic-lanceolate, not distinctly planoconvex; sterile bracts (i.e. upper glume and glume-like lower lemma) narrowed to an acute tip; perfect floret lemma surface gristly, finely wrinkled; perfect floret lemma margins thin/hyaline, thinner than the main body of the lemma, not inrolled *Digitaria*[26] (Fig. 14G)

53a. [48] Lower glume reduced to a nerveless rudiment _____ 54

53b. Lower glume developed, 1- to 5-nerved _____ 56

54a. [53] Leaf base cordate; perfect floret lemma surface finely wrinkled; lemma of perfect floret and upper glume facing away from the rachis, the lower glume facing the rachis _____ *Urochloa reptans* (Fig. 15A)

54b. Leaf base merging smoothly with sheath or rounded, never cordate; perfect floret lemma surface never finely wrinkled; lemma of perfect floret and upper glume facing the rachis, the lower glume facing away from the rachis _____ 55

55a. [54] Spikelets elliptic-obovate or elliptic-lanceolate, usually distinctly planoconvex; upper glume and lower lemma with subacute to acuminate apices; perfect floret lemma surface minutely striate or papillose-striate, margins thick, never thin/hyaline, inrolled around the palea _____ *Paspalum*[27] (Fig. 15B)

55b. Spikelets lanceolate, rarely distinctly planoconvex; upper glume and lower lemma with acuminate apices; perfect floret lemma surface gristly with wrinkles, margins thin/hyaline, not inrolled _____ *Digitaria*[28] (Fig. 13D)

[23] *Paspalum corcovadense*, *P. fasciculatum*, *P. humboldtianum*, *P. orbiculatum*, *P. pectinatum*, *P. pulchellum*, *P. repens* and *P. vaginatum*.

[24] *Axonopus aureus, A. ciliatifolius*, *A. poiophyllus*, *A. purpusii* and *A. compressus*.

[25] *Paspalum arundinaceum*, *P. blodgettii*, *P. botterii*, *P. caespitosum*, *P. corcovadense*, *P. coryphaeum*, *P. humboldtianum*, *P. langei*, *P. laxum*, *P. ligulare*, *P. microstachyum*, *P. millegrana*, *P. paniculatum*, *P. peckii*, *P. pictum*, *P. plicatulum*, *P. urvillei* and *P. virgatum*.

[26] *Digitaria multiflora* and *D. setigera*.

[27] *Paspalum fasciculatum*, *P. langei* and *P. peckii*.

[28] *Digitaria ciliaris*, *D. horizontalis*, *D. insularis* and *D. setigera*.

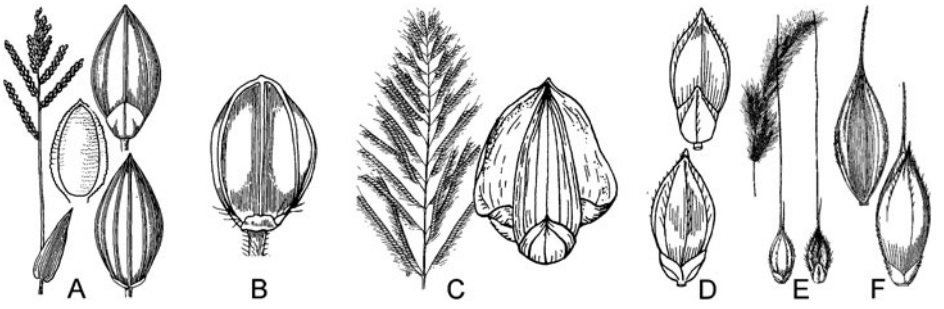

FIG. 15. Characters of taxa in subkey 3. **A**, ***Urochloa reptans***, inflorescence and leaf blade, spikelet (dorsal and ventral views) and floret (ventral view) showing wrinkled surface of lemma; **B**, ***Paspalum***,[27] spikelet (ventral view); **C**, ***Ixophorus unisetus***, inflorescence and mature spikelet; **D**, ***Echinochloa colona***, spikelet (dorsal and ventral views); **E**, ***Echinochloa crus-pavonis***, inflorescence and spikelet (dorsal and ventral views); **F**, ***Echinochloa polystachya***, spikelet (dorsal and ventral views).

56a. [53] Both glumes at least as long as the spikelet, with the lower glume longer than the upper glume and exceeding the spikelet in an acuminate tip; leaf blades pseudopetiolate, pseudopetioles 0.1–15 mm long

Echinolaena standleyi (Fig. 12E)

56b. Only the upper glume almost as long to as long as the spikelet (*Setaria geminata* with upper glume 1/2 to as long as the spikelet), with the lower glume shorter than the upper glume, rounded to acute; leaf blades never pseudopetiolate

57

57a. [56] Sheaths prominently keeled; spikelets awned or apiculate (*Echinochloa colona* spikelets sometimes acute; Fig. 15D) or rachis with long dark bristles ____ 58

57b. Sheaths usually rounded, rarely keeled; spikelets never awned, rarely appearing apiculate; rachis without bristles, or if bristles present, then white and filamentous ____ 59

58a. [57] Rachis of spike with long dark bristles attached; spikelets never awned; lemmas herbaceous, never hardened and shiny; mature spikelets with a papyraceous wing ____ *Ixophorus unisetus* (Fig. 15C)

58b. Rachis of spike without bristles; spikelets often awned; lemma of perfect floret hardened and shiny; mature spikelets never with a papyraceous wing

Echinochloa (3 spp.; Fig. 15D–F)

59a. [57] Rachis of racemes terminating in a short flattened naked point/bristle (or rarely a reduced sterile spikelet); racemes erect or adpressed to the central inflorescence axis; upper glume 1/2 to almost as long as the spikelet, nerves often anastomosing; hardened perfect floret surface usually rugulose, less often smooth; leaf blades linear; plants of wet areas ___ *Setaria geminata* (Fig. 16A)

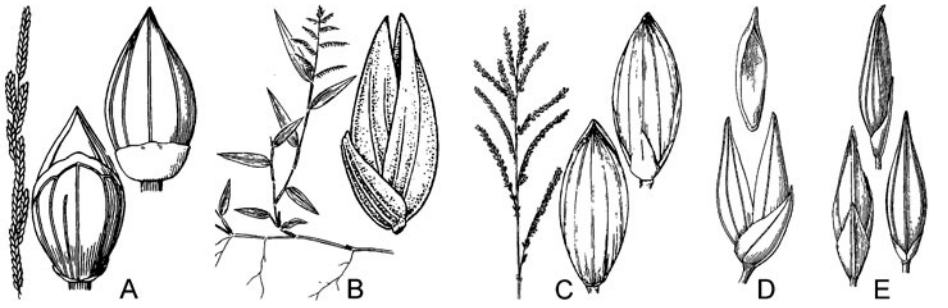

FIG. 16. Characters of taxa in subkey 3. **A**, ***Setaria geminata***, portion of inflorescence and spikelet (dorsal and ventral views); **B**, ***Ocellochloa stolonifera***, habit and spikelet (lateral view); **C**, ***Urochloa mutica***, inflorescence and spikelet (dorsal and ventral views); **D**, ***Steinchisma laxum***, spikelet (lateral view) and perfect floret (ventral view) showing palea almost as long as the lemma; **E**, ***Rugoloa polygonata***, spikelet (lateral, dorsal and ventral views).

59b. Rachis of racemes terminating in a fertile spikelet; racemes generally divergent from the central inflorescence axis; upper glume slightly shorter to as long as the spikelet, nerves rarely anastomosing, spikelets sometimes with prominent cross-veins (*Urochloa*); hardened perfect floret surface rugulose (*Urochloa*), smooth, papillose, papillose-striate or scaberulous; leaf blades usually linear-lanceolate to lanceolate-ovate, rarely linear; plants of wet or dry areas ____ 60

60a. [59] Hardened perfect floret surface smooth; hardened perfect floret shortly stipitate at the base ____ *Ocellochloa* (2 spp.; Fig. 16B)

60b. Hardened perfect floret papillose and sometimes scaberulous at apex, or surface gristly/rugulose with fine transverse wrinkles; hardened perfect floret not stipitate ____ 61

61a. [60] Hardened perfect floret surface gristly/rugulose with fine transverse wrinkles, not scaberulous, papillose or papillose-striate; upper glume and lower lemma sometimes with prominent cross-veins; lower glume 1- to 5-nerved, upper glume and lower lemma 5- to 9-nerved ____ *Urochloa*[29] (Figs 8A, 16C)

61b. Hardened perfect floret papillose or papillose-striate, sometimes minutely to clearly scaberulous at the apex, surface not rugulose; upper glume and lower lemma never with cross-veins; lower glume 1- to 3-nerved, upper glume and lower lemma 3- to 5-nerved ____ 62

62a. [61] Spikelets usually distinctly planoconvex, almost circular to elliptic-obovate; hardened perfect floret surface minutely papillose or papillose striate, apex not scaberulous ____ *Paspalum*[30]

[29] *Urochloa fusca* and *U. mutica*.
[30] *Paspalum botterii* and *P. fimbriatum*.

62b. Spikelets not distinctly planoconvex, lanceolate to ovoid-lanceolate; hardened perfect floret surface papillose, usually minutely to clearly scaberulous at the apex ——— 63

63a. [62] Hardened perfect floret covered with compound papillae, prickle hairs sometimes present towards apex of lemma; lower palea slightly shorter to slightly longer than the lower lemma; stamens 2; spikelet apex obtuse; glumes and lower lemma usually glabrous, rarely hairy; lower primary branches of inflorescence sometimes with secondary branching
Steinchisma laxum (see Fig. 16D)

63b. Hardened perfect floret covered with simple papillae, with prickle hairs towards the apex; lower palea absent or usually to 4/5 length of lower lemma (equalling the lower lemma in *Rugoloa hylaeica*); stamens 3; spikelet apex obtuse to acute; glumes and lower lemma glabrous, hairy, or scabrous in the middle nerve of the bracts (*Panicum stagnatile*); lower primary branches of inflorescence lacking secondary branching ——— 64

64a. [63] Ligule membrane (not including cilia) 0.6–1.1 mm long; leaf blades (17–)20–37 cm long; glumes and lower lemma glabrous with the middle nerve scabrous; lower lemma 3-nerved; anthers 0.6–1.1 mm long
Panicum stagnatile

64b. Ligule membrane (not including cilia) absent or to 0.4 mm long; leaf blades 4–16(–25) cm long; glumes and lower lemma glabrous or pubescent, never scabrous; lower lemma 3- to 5-nerved; anthers 0.3–0.8 mm long
Rugoloa (3 spp.; Fig. 16E)

List of the Grasses Currently Known from Belize (Including Cultivated Species)

The information is taken mostly from Balick *et al*. (2000). Genus names, and species epithet if the genus is represented by only a single species, are in **bold**. New species records found by Bridgewater *et al.* (2006) are marked '†', new records found by Goodwin *et al.* (2013) are marked '‡', and the new record found by Welker & Peichoto (2015) is marked '§'. Cultivated species are marked with an asterisk. Names from the above publications that have since been placed in synonymy (Soreng *et al*., 2000–) have been noted as '**Syn:**'.

Aakia tuerckheimii (Hack.) J.R.Grande **Syn:** *Panicum tuerckheimii* Hack.

Andropogon L. (10 spp.) **Syn:** *Hypogynium* Nees

Andropogon bicornis L.

Andropogon bourgeaei Hack.

Andropogon gerardi Vitman

Andropogon glomeratus (Walter) Britton, Sterns & Poggenb.

Andropogon gyrans Ashe

Andropogon lateralis Nees

Andropogon leucostachyus Kunth

Andropogon selloanus (Hack.) Hack.

Andropogon virgatus Desv. ex Ham. **Syn:** *Hypogynium virgatum* (Desv. ex Ham.) Dandy

Andropogon virginicus L.

Anthaenantia lanata (Kunth) Benth. **Syn:** *Leptocoryphium lanatum* (Kunth) Nees

Anthephora hermaphrodita (L.) Kuntze

Aristida L. (10 spp.)

Aristida appressa Vasey

Aristida capillacea Lam.

Aristida gibbosa (Nees) Kunth‡

Aristida hamulosa Henrard

Aristida longifolia Trin.

Aristida purpurascens Poir.

Aristida recurvata Kunth

Aristida setifolia Kunth

Aristida ternipes Cav.

Aristida torta (Nees) Kunth **Syn:** *Aristida tincta* Trin. & Rupr.

Arundinella Raddi (2 spp.)

Arundinella berteroniana (Schult.) Hitchc. & Chase

Arundinella deppeana Nees ex Steud.

Axonopus P.Beauv. (6 spp.)

Axonopus aureus P.Beauv.

Axonopus ciliatifolius Swallen

Axonopus compressus (Sw.) P.Beauv.

Axonopus fissifolius (Raddi) Kuhlm.

Axonopus poiophyllus Chase

Axonopus purpusii (Mez) Chase

Bothriochloa Kuntze (2 spp.)

Bothriochloa bladhii (Retz.) S.T.Blake

Bothriochloa pertusa (L.) A.Camus

Bouteloua Lag. (2 spp.) **Syn:** *Pentarrhaphis* Kunth
Bouteloua repens (Kunth) Scribner & Merr.
Bouteloua scabra (Kunth) Columbus **Syn:** *Pentarrhaphis scabra* Kunth

Cenchrus L. (6 spp.) **Syn:** *Pennisetum* Rich.
Cenchrus brownii Roem. & Schult.
Cenchrus echinatus L.
Cenchrus incertus M.A.Curtis
Cenchrus nervosus (Nees) Kuntze **Syn:** *Pennisetum nervosum* (Nees) Trin.
Cenchrus polystachios (L.) Morrone **Syn:** *Pennisetum setosum* (Sw.) Rich.
Cenchrus purpureus (Schumach.) Morrone **Syn:** *Pennisetum purpureum* Schumach.

Chloris Sw. (2 spp.)
Chloris barbata Sw. **Syn:** *Chloris inflata* Link
Chloris radiata (L.) Sw.

Chrysopogon zizanioides (L.) Roberty **Syn:** *Vetiveria zizanioides* (L.) Nash

Coleataenia Griseb. (3 spp.)
Coleataenia rigidula (Bosc ex Nees) LeBlond **Syn:** *Panicum rigidulum* Bosc ex Nees
Coleataenia stenodes (Griseb.) Soreng **Syn:** *Panicum stenodes* Griseb.‡
Coleataenia tenera (Beyr. ex Trin.) Soreng **Syn:** *Panicum tenerum* Beyr. ex Trin.

Cryptochloa strictiflora (E.Fourn.) Swallen

****Cymbopogon citratus*** (DC.) Stapf

Cynodon Rich. (2 spp.)
Cynodon dactylon (L.) Pers.
Cynodon nlemfuensis Vanderyst

Cyphonanthus discrepans (Döll) Zuloaga & Morrone **Syn:** *Panicum discrepans* Döll

Dactyloctenium aegyptium (L.) Willd.

Dichanthelium (Hitchc. & Chase) Gould (9 spp.)
Dichanthelium aciculare (Desv. ex Poir.) Gould & C.A.Clarke
Dichanthelium acuminatum (Sw.) Gould & C.A.Clarke
Dichanthelium dichotomum (L.) Gould

Dichanthelium ensifolium (Baldwin ex Elliott) Gould
Dichanthelium portoricense (Desv. ex Ham.) B.F.Hansen & Wunderlin
Dichanthelium sciurotoides (Zuloaga & Morrone) Davidse
Dichanthelium sphaerocarpon (Elliott) Gould
Dichanthelium strigosum (Muhl. ex Elliott) Freckmann
Dichanthelium viscidellum (Scribn.) Gould

Dichanthium annulatum (Forssk.) Stapf

Digitaria Haller (7 spp.)
Digitaria cayoensis Swallen
Digitaria ciliaris (Retz.) Koeler
Digitaria fuscescens (J. Presl) Henrard
Digitaria horizontalis Willd.
Digitaria insularis (L.) Fedde
Digitaria multiflora Swallen
Digitaria setigera Roth

Dinebra panicea subsp. ***mucronata*** (Michx.) P.M.Peterson & N.Snow **Syn:** *Leptochloa mucronata* (Michx.) Kunth

Diplachne fusca subsp. ***uninervia*** (J.Presl) P.M.Peterson & N.Snow **Syn:** *Leptochloa uninervia* (J.Presl) Hitchc. & Chase

Distichlis spicata (L.) Greene

Echinochloa P.Beauv. (3 spp.)
Echinochloa colona (L.) Link
Echinochloa crus-pavonis (Kunth) Schult.
Echinochloa polystachya (Kunth) Hitchc.

Echinolaena Desv. (2 spp.)
Echinolaena gracilis Swallen
Echinolaena standleyi (Hitchc.) Stieber

Eleusine indica (L.) Gaertn.

Eragrostis Wolf (14 spp.)
Eragrostis acutiflora (Kunth) Nees
Eragrostis atrovirens (Desf.) Trin. ex Steud.

Eragrostis bahiensis Schrad. ex Schult.‡
Eragrostis ciliaris (L.) R.Br.
Eragrostis contrerasii R.W.Pohl
Eragrostis elliottii S.Watson
Eragrostis gangetica (Roxb.) Steud.
Eragrostis hirta E.Fourn.
Eragrostis hypnoides (Lam.) Britton, Sterns & Poggenb.
Eragrostis maypurensis (Kunth) Steud.
Eragrostis polytricha Nees
Eragrostis prolifera (Sw.) Steud. **Syn:** *Eragrostis excelsa* Griseb.
Eragrostis rufescens Schrad. ex Schult.
Eragrostis unioloides (Retz.) Nees ex Steud. **Syn:** *Eragrostis amabilis* (L.) Wight & Arn.

Eriochloa punctata (L.) Desv. ex Ham.

Eriochrysis cayennensis P.Beauv.

Eustachys petraea (Sw.) Desv.

Guadua longifolia (E.Fourn.) R.W.Pohl

Gymnopogon spicatus (Spreng.) Kuntze

Gynerium sagittatum (Aubl.) P.Beauv.

Heteropogon contortus (L.) P.Beauv. ex Roem. & Schult.

Homolepis aturensis (Kunth) Chase

Hymenachne amplexicaulis (Rudge) Nees

Hyparrhenia Andersson ex E.Fourn. (2 spp.)
Hyparrhenia bracteata (Humb. & Bonpl. ex Willd.) Stapf
Hyparrhenia rufa (Nees) Stapf

Ichnanthus P.Beauv. (8 spp.)
Ichnanthus calvescens (Nees ex Trin.) Döll
Ichnanthus dasycoleus Tutin
Ichnanthus inconstans (Trin. ex Nees) Döll **Syn:** *Ichnanthus mexicanus* E.Fourn.
Ichnanthus lanceolatus Scribn. & J.G.Sm.

Ichnanthus nemoralis (Schrad.) Hitchc. & Chase
Ichnanthus nemorosus (Sw.) Döll
Ichnanthus pallens (Sw.) Munro ex Benth.
Ichnanthus tenuis (J.Presl & C.Presl) Hitchc. & Chase

Imperata Cirillo (2 spp.)
Imperata brasiliensis Trin.
Imperata contracta (Kunth) Hitchc.

Isachne R.Br. (3 spp.)
Isachne arundinacea (Sw.) Griseb.
Isachne polygonoides (Lam.) Döll
Isachne pubescens Swallen

Ischaemum latifolium (Spreng.) Kunth

Ixophorus unisetus (J.Presl) Schltdl.

Jarava megapotamica (Spreng.) Peñail. **Syn:** *Aristida megapotamica* Spreng.

Lasiacis (Griseb.) Hitchc. (10 spp.)
Lasiacis divaricata (L.) Hitchc.
Lasiacis grisebachii (Nash) Hitchc.
Lasiacis nigra Davidse
Lasiacis oaxacensis (Steud.) Hitchc.
Lasiacis procerrima (Hack.) Hitchc.
Lasiacis rugelii (Griseb.) Hitchc.
Lasiacis ruscifolia (Kunth) Hitchc.
Lasiacis scabrior Hitchc.
Lasiacis sloanei (Griseb.) Hitchc.
Lasiacis sorghoidea (Desv. ex Ham.) Hitchc. & Chase

Leersia Sw. (2 spp.)
Leersia hexandra Sw.
Leersia ligularis Trin.

Leptochloa virgata (L.) P.Beauv.

Lithachne pauciflora (Sw.) P.Beauv.

Louisiella elephantipes (Nees ex Trin.) Zuloaga **Syn:** *Panicum elephantipes* Nees ex Trin.

Megathyrsus maximus (Jacq.) B.K.Simon & S.W.L.Jacobs **Syn:** *Panicum maximum* Jacq.

Melinis P.Beauv. (2 spp.) **Syn**: *Rhynchelytrum* Nees
Melinis minutiflora P.Beauv.
Melinis repens (Willd.) Zizka **Syn:** *Rhynchelytrum repens* (Willd.) C.E.Hubb.

Merostachys pauciflora Swallen

Mesosetum Steud. (2 spp.)
Mesosetum blakei Swallen
Mesosetum filifolium F.T.Hubb.

Mnesithea granularis (L.) de Koning & Sosef **Syn:** *Hackelochloa granularis* (L.) Kuntze

Morronea Zuloaga & Scataglini (2 spp.)
Morronea cayoensis (Swallen) Zuloaga & Scataglini **Syn:** *Panicum cayoense* Swallen
Morronea parviglumis (Hack.) Zuloaga & Scataglini **Syn:** *Panicum parviglume* Hack.

Muhlenbergia tenella (Kunth) Trin.†

Ocellochloa Zuloaga & Morrone (2 spp.)
Ocellochloa pulchella (Raddi) Zuloaga & Morrone **Syn:** *Panicum pulchellum* Raddi
Ocellochloa stolonifera (Poir.) Zuloaga & Morrone **Syn:** *Panicum stoloniferum* Poir.

Olyra L. (2 spp.)
Olyra glaberrima Raddi
Olyra latifolia L.

Oplismenus P.Beauv. (2 spp.)
Oplismenus burmannii (Retz.) P.Beauv.
Oplismenus hirtellus (L.) P.Beauv.

Oryza L. (2 spp.)
Oryza latifolia Desv. **Syn:** *Oryza alta* Swallen
**Oryza sativa* L.

Panicum L. (19 spp.)
Panicum altum Hitchc. & Chase
Panicum amarum Elliott
Panicum aquaticum Poir.
Panicum bartlettii Swallen
Panicum caricoides Nees ex Trin.
Panicum cayennense Lam.
Panicum cyanescens Nees ex Trin.
Panicum ghiesbreghtii E.Fourn.
Panicum haenkeanum J.Presl
Panicum hirsutum Sw.
Panicum hirtum Lam.
Panicum parvifolium Lam.
Panicum repens L.
Panicum rudgei Roem. & Schult.
Panicum sellowii Nees
Panicum stagnatile Hitchc. & Chase
Panicum trichanthum Nees
Panicum trichidiachne Döll
Panicum trichoides Sw.

Paspalum L. (36 spp.)
Paspalum arundinaceum Poir.
Paspalum blodgettii Chapm.
Paspalum botterii (E.Fourn.) Chase
Paspalum caespitosum Flüggé
Paspalum clavuliferum C.Wright
Paspalum conjugatum P.J.Bergius
Paspalum corcovadense Raddi
Paspalum coryphaeum Trin.
Paspalum decumbens Sw.
Paspalum fasciculatum Willd. Ex Flüggé
Paspalum fimbriatum Kunth
Paspalum humboldtianum Flüggé
Paspalum langei (E.Fourn.) Nash

Paspalum laxum Lam.
Paspalum ligulare Nees
Paspalum lineare Trin.
Paspalum microstachyum J.Presl
Paspalum millegrana Schrad.
Paspalum minus E.Fourn.
Paspalum multicaule Poir.
Paspalum notatum Flüggé
Paspalum nutans Lam.
Paspalum orbiculatum Poir.
Paspalum paniculatum L.
Paspalum peckii F.T.Hubb.
Paspalum pectinatum Nees ex Trin.
Paspalum pictum Ekman‡
Paspalum pilosum Lam.
Paspalum plicatulum Michx.
Paspalum pulchellum Kunth
Paspalum repens P.J.Bergius
Paspalum serpentinum Hochst. ex Steud.
Paspalum setaceum Michx.‡
Paspalum urvillei Steud.
Paspalum vaginatum Sw.
Paspalum virgatum L.

Pharus *P.Browne* (3 spp.)
Pharus latifolius L.
Pharus parvifolius Nash
Pharus vittatus Lem.

Phragmites australis (Cav.) Trin. ex Steud.

Rhipidocladum bartlettii (McClure) McClure

Rottboellia cochinchinensis (Lour.) Clayton

Rugoloa Zuloaga (3 spp.)
Rugoloa hylaeica (Mez) Zuloaga **Syn:** *Panicum hylaeicum* Mez

Rugoloa pilosa (Sw.) Zuloaga **Syn:** *Panicum pilosum* Sw.
Rugoloa polygonata (Schrad.) Zuloaga **Syn:** *Panicum polygonatum* Schrad.

****Saccharum officinarum*** L.

Sacciolepis myuros (Lam.) Chase

Schizachyrium Nees (5 spp.)
Schizachyrium brevifolium (Sw.) Nees ex Buse
Schizachyrium glaziovii Peichoto§
Schizachyrium microstachyum (Desv. ex Ham.) Roseng., B.R.Arrill. & Izag.
Schizachyrium sanguineum (Retz.) Alston
Schizachyrium tenerum Nees

Setaria P.Beauv. (9 spp.) **Syn:** *Paspalidium* Stapf
Setaria geminata (Forssk.) Veldkamp **Syn:** *Paspalidium geminatum* (Forssk.) Stapf
Setaria grisebachii E.Fourn.
Setaria palmifolia (J.Koenig) Stapf **Syn:** *Setaria paniculifera* (Steud.) E.Fourn. ex Hemsl.
Setaria parviflora (Poir.) Kerguélen
Setaria scandens Schrad.
Setaria sulcata Raddi **Syn:** *Setaria poiretiana* (Schult.) Kunth†
Setaria tenacissima Schrad. ex Schult.
Setaria tenax (Rich.) Desv.
Setaria vulpiseta (Lam.) Roem. & Schult.

Sorghastrum setosum (Griseb.) Hitchc.

Sorghum Moench (2 spp.)
**Sorghum bicolor* (L.) Moench
Sorghum halepense (L.) Pers.

Sporobolus R.Br. (8 spp.) **Syn:** *Spartina* Schreb.
Sporobolus buckleyi Vasey
Sporobolus cubensis Hitchc.
Sporobolus diandrus (Retz.) P.Beauv.
Sporobolus indicus (L.) R.Br.
Sporobolus jacquemontii Kunth

Sporobolus spartinus (Trin.) P.M. Peterson & Saarela **Syn:** *Spartina spartinae* (Trin.) Merr. ex Hitchc.

Sporobolus tenuissimus (Mart. ex Schrank) Kuntze

Sporobolus virginicus (L.) Kunth

Stapfochloa ciliata (Sw.) P.M.Peterson **Syn:** *Chloris ciliata* Sw.

Steinchisma laxum (Sw.) Zuloaga **Syn:** *Panicum laxum* Sw.

Stenotaphrum secundatum (Walter) Kuntze

Streptochaeta sodiroana Hack.

Streptogyna americana C.E.Hubb.

Thrasya Kunth (2 spp.)

Thrasya campylostachya (Hack.) Chase

Thrasya trinitensis Mez

Trachypogon spicatus (L.f.) Kuntze

Tripsacum L. (3 spp.)

Tripsacum andersonii J.R.Gray†

Tripsacum dactyloides (L.) L.

Tripsacum latifolium Hitchc.

Urochloa P.Beauv. (3 spp.)

Urochloa fusca (Sw.) B.F.Hansen & Wunderlin† **Syn:** *Urochloa fasciculata* (Sw.) R.D.Webster

Urochloa mutica (Forssk.) T.Q.Nguyen

Urochloa reptans (L.) Stapf

****Zea mays*** L.

Acknowledgements

Thanks to David Harris (E), Tom Cope (K), Gerritt Davidse (MO), Daniel Atha (NY), Jimmy Ratter (E) and Henry Noltie (E), who provided helpful comments on the key, and to the herbarium staff at E, K, MO and NY. Paul Peterson and an anonymous reviewer are thanked for corrections and helpful comments on the manuscript. Koeltz Scientific Books are thanked for providing the illustrations. This research was funded

by a NERC MSc scholarship, the Davis Expedition Fund and the SNSF Postdoc mobility grant number P2ZHP3_161988.

References

Acosta, J. M., Scataglini, M. A., Reinheimer, R. & Zuloaga, F. O. (2014). A phylogenetic study of subtribe *Otachyriinae* (Poaceae, Panicoideae, Paspaleae). *Pl. Syst. Evol.* 300(10): 2155–2166.

Aliscioni, S. S., Giussani, L. M., Zuloaga, F. O. & Kellogg, E. A. (2003). A molecular phylogeny of *Panicum* (Poaceae: Paniceae): tests of monophyly and phylogenetic placement within the Panicoideae. *Amer. J. Bot.* 90(5): 796–821. DOI: https://doi.org/10.3732/ajb.90.5.796

Balick, M. J., Nee, M. H. & Atha, D. E. (2000). Checklist of the vascular plants of Belize, with common names and uses. *Mem. New York Bot. Gard.* 85: 1–246.

Bridgewater, S. G. M., Ibáñez, A., Ratter, J. & Furley, P. A. (2002). Vegetation classification and floristics of the savannas and associated wetlands of the Rio Bravo Conservation and Management Area, Belize. *Edinburgh J. Bot.* 59(3): 421–442. DOI: https://doi.org/10.1017/S0960428602000252

Bridgewater, S. G. M., Harris, D. J., Whitefoord, C., Monro, A. K., Penn, M. G., Sutton, D. A., Sayer, B., Adams, B., Balick, M. J., Atha, D. E., Solomon, J. & Holst, B. K. (2006). A preliminary checklist of the vascular plants of the Chiquibul Forest, Belize. *Edinburgh J. Bot.* 63(2–3): 269–321. DOI: https://doi.org/10.1017/S0960428606000618

Chemisquy, M. A., Giussani, L. M., Scataglini, M. A., Kellogg, E. A. & Morrone, O. (2010). Phylogenetic studies favour the unification of *Pennisetum*, *Cenchrus* and *Odontelytrum* (Poaceae): a combined nuclear, plastid and morphological analysis, and nomenclatural combinations in *Cenchrus*. *Ann. Bot. (Oxford)* 106(1): 107–130.

Clayton, W. D., Vorontsova, M. S., Harman, K. T. & Williamson, H. (2006–). *GrassBase – the Online World Grass Flora Descriptions*. Online. Available: http://www.kew.org/data/grasses-db.html (accessed 12 June 2016).

Davidse, G., Mario Sousa, S. & Chater, A. O. (eds) (1994). *Flora Mesoamericana Volumen 6: Alismataceae a Cyperaceae*. Universidad Nacional Autónoma de México, Missouri Botanical Garden Press and the Natural History Museum (London).

Ethnobotany and Floristics of Belize Project Collaborators (continuously updated). *The New York Botanical Garden Ethnobotany and Floristics of Belize*. Online. Available: http://www.nybg.org/bsci/belize/index.html (accessed 8 May 2016).

Farruggia, F. T., Stevens, M. H. H. & Vincent, M. A. (2008). A floristic description of a Neotropical coastal savanna in Belize. *Caribbean J. Sci.* 44(1): 53–69.

Flora Mesoamericana Online (1997–). *W3FM – Flora Mesoamericana Online. Online*. Available: http://www.tropicos.org/Project/FM (accessed 2 June 2016).

Goodwin, Z. A, López, G. N., Stuart, N., Bridgewater, S. G. M., Haston, E. M., Cameron, I. D., Michelakis, D., Ratter, J. A., Furley, P. A., Kay, E., Whitefoord, C., Solomon, J., Lloyd, A. J. & Harris, D. J. (2013). A checklist of the vascular plants of the lowland savannas of Belize, Central America. *Phytotaxa* 101: 1–119. DOI: https://doi.org/10.11646/phytotaxa.101.1.1

Görts-Van-Rijn, A. R. A. & Judziewicz, E. J. (1990) *Flora of the Guianas. Serie A: Phanerogams, Fascicle 5. 187. Poaceae (Gramineae)*. Koenigstein: Koeltz Scientific Books.

Hitchcock, A. S. (1930). The grasses of Central America. *Contr. U.S. Natl. Herb.* 24(9): 557–762.

Iremonger, S. & Brokaw, N. V. L. (1995). Vegetation classification for Belize. In: Wilson, R. (ed.) *Towards a National Protected Area Systems Plan for Belize, Synthesis Report*. Belize City: Programme for Belize.

Laughlin, D. C. (2002). Flora of the pine savanna at Monkey Bay Wildlife Sanctuary, Belize. *Caribbean J. Sci.* 38(1–2): 151–155.

Lizarazu, M. A., Nicola, M. V. & Salariato, D. L. (2014). Taxonomic re-evaluation of *Panicum* sections *Tuerckheimiana*and *Valida* (Poaceae: Panicoideae) using morphological and molecular data. *Taxon* 63(2): 265–274. DOI: https://doi.org/10.12705/632.34

Meerman, J. C. & Sabido, W. (2001). *Central American Ecosystems: Belize*, volumes 1 and 2. Belize City: Programme for Belize.

Morrone, O., Scataglini, M. A. & Zuloaga, F. O. (2007). *Cyphonanthus*, a new genus segregated from *Panicum* (Poaceae: Panicoideae: Paniceae) based on morphological, anatomical and molecular data. *Taxon* 56(2): 521–532.

Morrone, O., Aliscioni, S. S., Veldkamp, J. F., Pensiero, J. F., Zuloaga, F. O. & Kellogg, E. A. (2014) Revision of the Old World species of *Setaria* (Poaceae: Panicoideae: Paniceae). *Syst. Bot. Monogr.* 96: 1–161.

Peñailillo, P. (2002). The genus *Jarava* Ruiz et Pav. (Stipeae–Poaceae): delimitation and new combinations. *Gayana Bot*. 59(1): 27–34.

Penn, M. G., Sutton, D. A. & Monro, A. (2004). Vegetation of the Greater Maya Mountains, Belize. *Syst. Biodivers.* 2(1): 21–44.

Peterson, P. M., Romaschenko, K., Snow, N. & Johnson, G. (2012). A molecular phylogeny and classification of *Leptochloa* (Poaceae: Chloridoideae: Chlorideae) sensu lato and related genera. *Ann. Bot. (Oxford)* 109(7): 1317–1329.

Peterson, P. M., Romaschenko, K., Herrera Arrieta, Y. & Saarela, J. M. (2014). A molecular phylogeny and new subgeneric classification of *Sporobolus* (Poaceae: Chloridoideae: Sporobolinae). *Taxon* 63(6): 1212–1243.

Peterson, P. M., Romaschenko, K. & Herrera Arrieta, Y. (2015). A molecular phylogeny and classification of the Eleusininae with a new genus, *Micrachne* (Poaceae: Chloridoideae: Cynodonteae). *Taxon* 64(3): 445–467.

Scataglini, M. A. & Zuloaga, F. O. (2013). *Morronea*, a new genus segregated from *Panicum* (Paniceae, Poaceae) based on morphological and molecular data. *Syst. Bot.* 38(4): 1076–1086.

Scataglini, M. A., Lizarazu, M. A. & Zuloaga, F. O. (2014). A peculiar amphitropical genus of Paniceae (Poaceae, Panicoideae). *Syst. Bot.* 39(4): 1108–1119.

Sede, S. M., Zuloaga, F. O. & Morrone, O. (2009). Phylogenetic studies in the Paniceae (Poaceae-Panicoideae): *Ocellochloa*, a new genus from the New World. *Syst. Bot.* 34(4): 684–692.

Simon, B. K. & Jacobs, S. W. L. (2003). *Megathyrsus*, a new generic name for *Panicum* subgenus *Megathyrsus*. *Austrobaileya* 6(3): 571–574.

Soreng, R. J. (2010). *Coleataenia* Griseb. (1879): the correct name for *Sorengia* Zuloaga & Morrone (Poaceae: Paniceae). *J. Bot. Res. Inst. Texas* 4(2): 691–692.

Soreng, R. J., Davidse, G., Peterson, P. M., Zuloaga, F. O., Judziewicz, E. J., Filgueiras, T. S., Morrone, O. & Romaschenko, K. (2000–). *Catalogue of New World Grasses*. Online. Available: http://www.tropicos.org/project/cnwg (accessed 17 May 2016).

Soreng, R. J., Peterson, P. M., Romaschenko, K., Davidse, G., Zuloaga, F. O., Judziewicz, E. J., Filgueiras, T. S., Davis, J. I. & Morrone, O. (2015). A worldwide phylogenetic classification of the Poaceae (Gramineae). *J. Syst. Evol.* 53(2): 117–137.

Spellman, D. L., Dwyer, J. D. & Davidse, G. (1975). A list of the Monocotyledonae of Belize including a historical introduction to plant collecting in Belize. *Rhodora* 77: 105–140.

Standley, P. C. & Record, S. J. (1936). The forests and flora of British Honduras. *Publ. Field Mus. Nat. Hist.* 12: 1–432.

Swallen, J. R. (1955). Flora of Guatemala, part II. Grasses of Guatemala. *Fieldiana* 24(2): 1–390.

Urban, L., Bridgewater, S. & Harris, D. (2006). The Macal River: a floristic and phytosociological study of a threatened riverine vegetation community in Belize. *Edinburgh J. Bot.* 63(1): 95–118. DOI: https://doi.org/10.1017/S0960428606000436

Welker, C. A. D. & Peichoto, M. C. (2015). Considerations on the genus *Schizachyrium* (Poaceae–Andropogoneae) in Central America and West Indies, and confirmation of the occurrence of *S. glaziovii*. *Phytotaxa* 201(1): 087–095. DOI: https://doi.org/10.11646/phytotaxa.201.1.7

Zuloaga, F. O., Scataglini, M. A. & Morrone, O. (2010). A phylogenetic evaluation of *Panicum* sects. *Agrostoidea*, *Megista*, *Prionitia* and *Tenera* (Panicoideae, Poaceae): two new genera, *Stephostachys* and *Sorengia*. *Taxon* 59(5): 1535–1546.

Received 12 June 2016; accepted for publication 2 November 2016; first published online 15 December 2016