

This document is distributed as part of an effort to design new keys to all species of Hawaiian grasses in a lead-up to a new field guide for grasses. This work will eventually be expanded with keys to all species, and eventually a key to genera. As I have not yet had the time to make a key to genera, the key to genera in *The Manual* (Wagner et al. 1990) should work for most species. Please email me (faccenda@hawaii.edu) if you locate any issues in these keys.

If you would like confirmation on any IDs or find a species which you are unable to identify, please post it on <https://www.inaturalist.org/>. I am very active on that platform (username @kevinfaccenda) and will likely add an ID within a few days of posting.

The following keys have been prepared as part of a revision of the Hawaiian grass flora (Faccenda 2022; Faccenda 2023; Faccenda *in review*) and are compiled in this document for ease of use. Keys have principally been prepared for genera which have had multiple new state records found since 1990.

Species are labeled with “(in part)” if they key in multiple places.

The following genera are keyed herein:

- *Andropogon* / *Schizachyrium* (combined key) (**with figure**)
- *Aristida*
- *Bothriochloa*, *Capillipedium*, and *Dichanthium* (combined key) (**with figure**)
- *Bromus*
- *Cenchrus*
- *Chloris*
- *Cynodon*
- *Dichanthium* - see *Bothriochloa*, *Capillipedium*, and *Dichanthium* (combined key)
- *Digitaria* (**with figures**)
- *Eragrostis* (**with figure**)
- *Eragrostis* (alternate key)
- *Eriochloa* (**with figure**)
- *Ischaemum*
- *Leptochloa* sensu lato
- *Melinis*
- *Paspalum*
- *Saccharum*
- *Schizachyrium* - see *Andropogon* / *Schizachyrium* (combined key) (**with figure**)
- *Setaria*
- *Sporobolus* (**with figure**)
- *Urochloa*
- *Zoysia*

Andropogon* / *Schizachyrium (combined key)

The genera *Schizachyrium* and *Andropogon* are most reliably distinguished by the tip of the same internodes having a concave cuplike structure at their apex on *Schizachyrium* and no such structure existing on *Andropogon* (Figure 0a–b). However, that character is difficult to use in the field and this key was designed to avoid using it. The grasses in these genera in Hawai'i have a history of misidentification; hopefully, this key will help towards reducing misidentifications in the future.

1. Inflorescence uniformly narrow (Figure 0e–f)
 2. Florets fluffy and with conspicuous hairs; racemes paired, 3–5 cm long and <0.5 mm diam. *Andropogon virginicus* var. *virginicus*
 - 2'. Florets with minute hairs, these not visible to the naked eye; racemes single, 4–15 cm long and 0.8–1.5 mm diam. *Schizachyrium sanguineum*
- 1'. Inflorescence narrow at base and expanding in width towards tip with profuse branching (Figure 20g–i)
 3. Leaves stiff and strongly scabrous on margins; culms circular at base (Figure 0c); flowering culms 1.5–2.5 m tall *Andropogon bicornis*
 - 3'. Leaves usually rather soft, weakly scabrous or smooth-margined; culms circular or strongly laterally compressed at base; flowering culms rarely surpassing 1.5 m tall
 4. Base of culms circular; inflorescence held stiffly upright, rarely drooping; plants often with strong brick-red coloration on leaf sheaths; leaves evenly distributed along culm at flowering time
.....*Schizachyrium microstachyum* [formerly *S. condensatum*]
 - 4'. Base of culms strongly laterally compressed due to distichously arranged leaf sheaths (Figure 0d); inflorescence often drooping (Figure 0i); plants typically without reddish coloration on leaves or sheath; leaves basally disposed on culms at flowering time
..... *Andropogon tenuispathus* [formerly *A. glomeratus* var. *pumilus*]

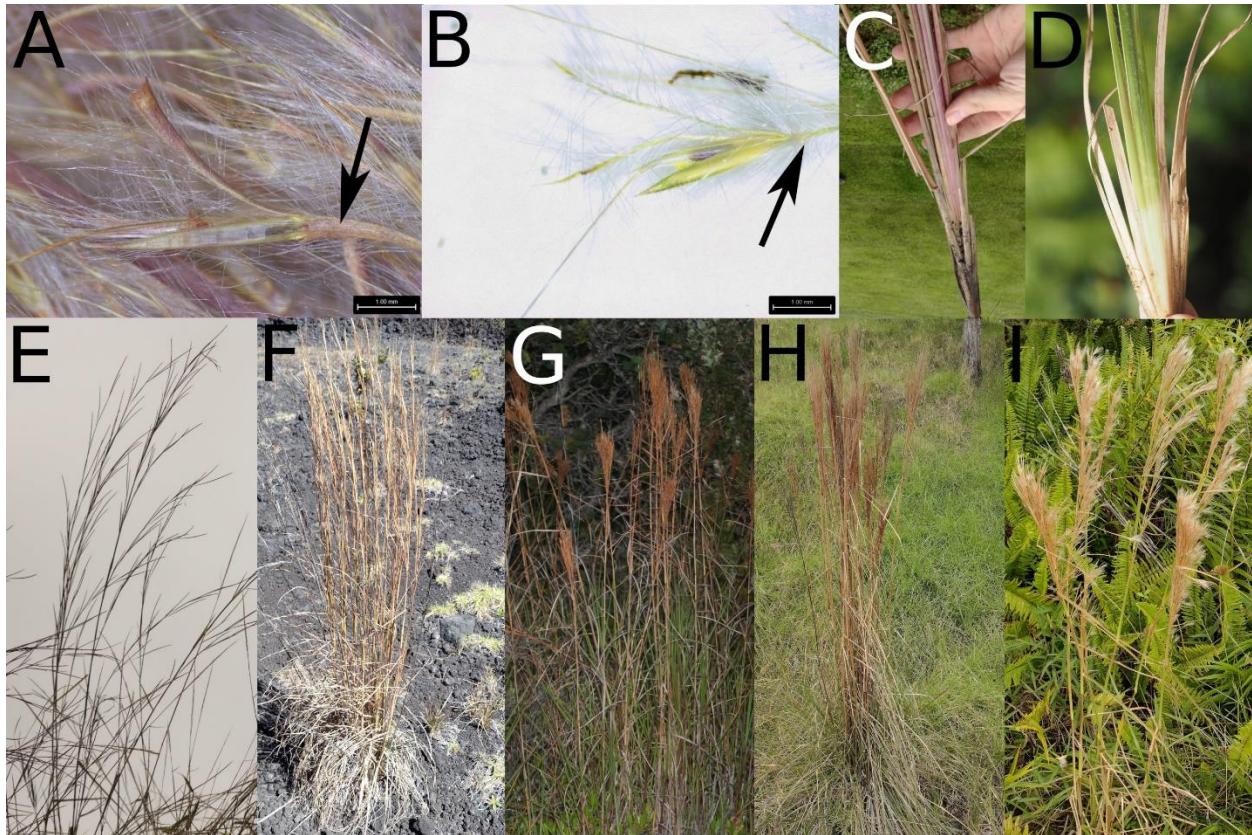


Figure 0. Comparison of *Schizachyrium* spp. and *Andropogon* spp. In Hawai'i. **A**, *Schizachyrium microstachyum* floret, arrow indicating rami internode (Iltis 132). **B**, *Andropogon tenuispatheus* floret, arrow indicating the rami internode (Lau OISC002). **C**, *Andropogon bicornis* culm base. **D**, *Andropogon virginicus* culm base, the culm base is very similar in shape to *A. tenuispatheus*. **E**, *Schizachyrium sanguineum* habit. **F**, *Andropogon virginicus* habit. **G**, *Schizachyrium microstachyum* habit. **H**, *Andropogon bicornis* habit. **I**, *Andropogon tenuispatheus* habit.

Aristida

1. Awns with obvious twist at the base; glumes equal or subequal *A. divaricata*
- 1'. Awns without any twist at base; glumes unequal *A. adscensionis*

***Bothriochloa*, *Capillipedium*, and *Dichanthium* (combined key)**

This key was designed to minimize reliance on one specific, difficult characteristic: the translucent medial groove of the pedicel. The presence of this groove defines the difference between *Dichanthium* and the other genera. The groove is present in *Bothriochloa* and *Capillipedium*, but not *Dichanthium*. Examining plants for this character can be very difficult and postponing its use until late in the key should help to make this group more approachable. Molecular evidence also suggests that these genera are artificial and further justifies inclusion of all these genera in one key (Sumadijaya 2015).

Examination of a specimen for a translucent medial groove is best done using a dried specimen as it tends to make the groove more visible, but can still be done on fresh material. The specimen should be placed under strong magnification, ideally dissecting scope at 20–40×. It is sometimes possible to locate the groove using a 10× hand lens, but is very difficult, in the author's experience. The easiest way to find the groove is to use forceps and tear away a

pedicellate spikelet, taking care to grab it at the base of the pedicel. Once it is extracted, the groove (if present) will be visible running through the middle (Figure 1b,d). The groove may not be truly translucent and it is often more red or purple than the edges of the pedicel. The groove will be visible from both faces of the pedicel. If a very fine needle is at hand (the author uses a 1RL tattoo needle for this task), it is possible to puncture the translucent medial line and easily split the pedicel in two down its length (at least in all specimens examined by the author). The groove can also be seen on the rame internodes (axis of the raceme of spikelets; the structures that connect the spikelet pairs) but is easiest to observe on the pedicels of the pedicellate spikelets. In *Dichanthium* the pedicels and rame internodes are typically convex with no groove, but in *Bothriochloa* and *Capillipedium* they tend to be shaped more like a compressed serified “I” in cross section, since the groove acts as a depression on both sides.

1. Racemes of spikelets with less than 8 spikelets each; panicle loosely branched with many secondary branches *Capillipedium spicigerum*
- 1' Racemes of spikelets with >8 spikelets each; panicle uncommonly with secondary branches
 2. Glumes pitted
 3. Axis of inflorescence longer than or equalling length of lowest panicle branch *Bothriochloa bladhii* (in part)
 - 3'. Axis of inflorescence shorter than lowest panicle branch
 4. Pedicellate spikelets reduced in width compared to sessile spikelets; pedicellate spikelets lacking a pit; sessile florets 4.75–7 mm long; panicle branches usually held stiffly erect and parallel to inflorescence axis *Bothriochloa macra* (in part)
 - 4'. Pedicellate spikelets generally similar to sessile spikelets, occasionally slightly reduced; pedicellate spikelets with or without a pit; sessile florets 3–4 mm long; panicle branches usually held weakly erect to strongly divergent from inflorescence axis *Bothriochloa pertusa*
 - 2'. Glumes not pitted
 5. Pedicellate spikelets reduced in width compared to sessile spikelets
 6. Hairs of inflorescence <2 mm, not obscuring florets; panicles reddish or whitish when mature
 7. Spikelets 4.75–7 mm long; axis of inflorescence shorter than lowest panicle branch *Bothriochloa macra* (in part)
 - 7'. Spikelets 3–4.5 mm long; axis of inflorescence longer than or equalling length of lowest panicle branch *Bothriochloa bladhii* (in part)
 - 6'. Hairs of inflorescence >4 mm long, obscuring florets; panicles whitish when mature
 8. Sessile spikelets 4.5–7.3 mm long; nodes pubescent *Bothriochloa barbinodis*
 - 8'. Sessile spikelets 2.5–4.5 mm long; nodes glabrous [questionably naturalized as of 2023] *Bothriochloa laguroides*
 - 5'. Pedicellate spikelets similar in width compared to sessile spikelets
 9. Lower glume apex blunt, obtuse, or rounded; lower glume typically oblong or obovate
 10. Peduncle of inflorescence pubescent just below inflorescence *Dichanthium aristatum*
 - 10'. Peduncle of inflorescence glabrous

- 11. Glumes nearly glabrous to shortly pubescent, hairs <1 mm, uniformly covering glumes *Dichanthium caricosum*
- 11'. Glumes with hairs 1–4 mm long, concentrated towards edges
 - 12. Hairs of glumes 4 mm or longer, partially obscuring florets, hairs not papillose-based; inflorescence branches umbellate or with inconspicuous internodes *Dichanthium sericeum*
 - 12'. Hairs of glumes 2 mm or less, not obscuring florets, hairs usually papillose-based around edge of glume; inflorescence branches separated *Dichanthium annulatum* var. *papillosum*
- 9'. Lower glume apex acute; lower glume typically lanceolate, elliptic, or obovate
 - 13. Glumes entirely glabrous *Dichanthium tenue*
 - 13'. Glumes with at least some hairs
 - 14. Pedicles of pedicellate spikelets lacking a translucent medial line (see key caption) *Dichanthium annulatum* var. *annulatum*
 - 14'. Pedicles of pedicellate spikelets with a translucent medial line
 - 15. Axis of inflorescence longer than or equalling length of lowest panicle branch *Bothriochloa bladhii* (in part)
 - 15'. Axis of inflorescence shorter than lowest panicle branch *Bothriochloa ischaemum*



Figure 1. Comparison of similar species of bluestems. **A–B**, *Bothriochloa ischaemum* (Hosaka 4009). **C–D**, *Bothriochloa pertusa*, **C** (W. Teraoka 291); **D** (P.J. O'Connor s.n., BISH 510052). **E–F**, *Dichanthium annulatum* var. *annulatum* (Nagata 1409).

Bromus

The following key is based off of the key to *Bromus* in *Flora of North America* (Barkworth *et al.* 1993) and Clayton & Snow (2010).

1. Lemmas 20–35 mm long; awns 3–6 cm long *B. diandrus*
- 1'. Lemmas < 20 mm; awns < 3 cm long
 2. Lower glume 3–7-veined
 3. Lemmas strongly keeled, at least near their apex; spikelets generally strongly laterally compressed; lemmas acuminate with lemma body, gradually tapering into the awn and lacking lateral teeth or with very reduced teeth < 1 mm long
 4. Lemmas 9–13-veined, occasionally with hairs near the apex; veins often raised and riblike at least toward the tip of the lemma; lemma usually glabrous *B. catharticus*
 - 4'. Lemmas 7–9-veined; veins usually flush with lemma surface; lemma typically pubescent, occasionally glabrous *B. carinatus*
 - 3'. Lemmas rounded on the back, spikelets generally weakly compressed; lemma body 2-lobed at tip, with an awn arising between teeth
 5. Lemma margins inrolled, exposing the rachilla and floret bases at maturity; lemmas typically glabrous, rarely pubescent *B. secalinus*
 - 5'. Lemma margins not inrolled, rachilla and floret bases obscured at maturity; lemma glabrous or pubescent
 6. Panicle open, pedicels equaling or longer than spikelets; lemma glabrous *B. japonicus*
 - 6'. Panicle contracted, its pedicels shorter than the spikelets; lemma pubescent *B. hordeaceus*
 - 2'. Lower glume 1–3-veined
 7. Panicle branches drooping; at least some panicle branches longer than spikelets
 8. Lemmas [excluding awn] 14–20 mm long; panicle branches rarely with more than 3 spikelets each *B. sterilis*
 - 8'. Lemmas [excluding awn] 9–12 mm long; panicle branches often with 4–8 spikelets each *B. tectorum*
 - 7'. Panicle branches upright, not drooping; panicle branches shorter than spikelets
 9. Panicle densely contracted, panicle branches < 10 mm; lemmas typically contracted at maturity; palea apex lobed *B. rubens*
 - 9'. Panicle open to contracted, panicle branches 10–30 mm long; lemmas spreading at maturity; palea apex obtuse to rounded *B. madritensis*

Cenchrus

Cenchrus is part of the bristle clade of Paniceae, and all species have bristles subtending the florets. *Setaria* is also a member of this clade, and the two genera can be distinguished by whether the spikelets fall with or without the bristles. The bristles are persistent on the inflorescence in *Setaria* but fall with the spikelet in *Cenchrus*. *Cenchrus americanus* is an exception to this rule and is also found in the key to *Setaria* in this paper. The genus *Pennisetum* is now included in *Cenchrus* based on molecular evidence; if the name dramatically changed when it was moved to *Cenchrus*, the former *Pennisetum* name is also provided below.

1. Leaves consistently pink to red; cultivated or uncommonly escaped plants [also compare to *Cenchrus americanus* × *purpureus* (bana grass), a sterile, cane-like grass resembling *C. purpureus* vegetatively, but with purple leaves and occurring only in cultivation]
 2. Leaves >20 mm wide; all bristles scabrous *C. elegans* [*Pennisetum macrostachys*]
 - 2'. Leaves <11 mm wide; at least one of innermost bristles plumose
..... *C. xcupreus* [*Pennisetum advena*] (in part)
- 1'. Leaves green, occasionally reddish when stressed; wild or cultivated plants
 3. Plants rhizomatous or stoloniferous
 4. Plants decumbent, long creeping, stoloniferous; conspicuously hairy; inflorescence concealed in leaf sheaths *C. clandestinus*
 - 4'. Plants erect, rhizomatous; glabrous or inconspicuously hairy; inflorescence prominently exerted *C. ciliaris* (in part; uncommon glaucous-leaved cultivar)
 - 3'. Plants clump-forming (caespitose)
 5. Spikelets enclosed in a spiny burr composed of stiff, flattened bristles
 6. Spines hooked at tip [potentially mistaken for *Cenchrus*]
..... *Tragus berteronianus*
 - 6'. Spines never hooked at tip
 7. Burs with spines in two distinct series, the outer <3 mm and terete; the inner stiff and flattened
 8. Burr 8–18 mm long; burr with conspicuous flaring pedicel ~2 mm long [endemic] *C. agrimonioides*
 - 8'. Burr 4–7 mm long; burr with pedicel <1 mm *C. echinatus*
 - 7'. Burs with only one series of stiff spines
 9. Spines grooved; burs 5–7 mm long; burrs scabrous *C. setigerus*
 - 9'. Spines not grooved; burs >1 cm long; burrs conspicuously hairy
..... *C. tribuloides*
 - 5'. Spikelets subtended by relatively soft, terete bristles (or bristles slightly flattened in *C. ciliaris* but not spiny)
 10. Bristles glabrous, scabrous, or with very sparse hairs
 11. Annual; bristles persistent after spikelets fall; bristles <1 cm long; waif occurrences from birdseed or use as soil stabilization
..... *C. americanus* [*Pennisetum glaucum*] (in part)
 - 11'. Perennial; bristles deciduous; bristles >1 cm; naturalized
 12. Canelike plants up to 4 m tall (but may flower before appearing canelike); inflorescence axis conspicuously hispid pubescent; bristles golden yellow..... *C. purpureus*
 - 12'. Not canelike; inflorescence axis scabrous or minutely pubescent; bristles typically brownish purple *C. complanatus*
 - 10'. Most bristles conspicuously ciliate
 13. Fascicle of spikelets sessile or on pedicel <0.5 mm long
 14. Inner whorl of bristles fused at base into minute cup 0.2–1 mm tall; inner whorl of bristles flattened and grooved longitudinally, weakly ciliate, cilia generally not obscuring spikelets; bristles generally wavy
..... *C. ciliaris*
 - 14'. Inner whorl of bristles not fused for any length; inner whorl of bristles terete and without groove, densely ciliate, cilia generally entirely obscuring spikelets; bristles generally straight
..... *C. setosus* [*Pennisetum polystachion*]

- 13'. Fascicle of spikelets borne on a pubescent pedicel >1 mm long
- 15. Leaves stiff, V-shaped, <3.5 mm wide *C. setaceus*
- 15'. Leaf soft, flat, >4 mm wide
- 16. Panicle <15 cm long
- 17. Panicle partially inserted into subtending leaf sheath
..... *C. clandestinus* × *C. setaceus*
- 17'. Panicle long-exserted from subtending leaf [not yet
naturalized] *C. longisetus* [*Pennisetum villosum*]
- 16'. Panicle longer
- 18. Annual; bristles persistent, <1 cm long; waif occurrences from
birdseed or soil stabilization
..... *C. americanus* [*Pennisetum glaucum*] (in part)
- 18'. Perennial; bristles deciduous, >1 cm; cultivated or naturalized
..... *C. xcupreus* [*Pennisetum advena*] (in part)

Chloris

Eustachys petraea has been reported on Midway Island and is easily confused with *Chloris*, and is therefore also included in this key.

- 1. Florets with 3 awns approximately equal in length, these awns all pointing in different
directions; sterile florets inflated *C. barbata*
- 1'. Florets with 0–3 awns, progressively reduced in length, these awns aligned with the axis
of the inflorescence branch; sterile florets not inflated
- 2. Florets lacking awns or with awns up to 6 mm; florets 2–3; rather robust perennials up
to 300 cm tall
- 3. Upper glume acute; awns up to 6 mm or absent *C. gayana*
- 3'. Upper glume bilobed; awns up to 1.2 mm or absent [easily confused with *Chloris*,
currently only known from Midway] *Eustachys petraea*
- 2'. Florets with awns 4–25 mm long; florets 2; annual or perennial, rarely surpassing 50
cm tall
- 4. Lowest lemma with dense tuft of hairs 2–3 mm long at its apex; panicle branches
usually held closely together and erect *C. virgata*
- 4'. Lowest lemma with short hairs <1 mm or glabrous; panicle branches usually
spreading
- 5. First sterile lemma truncate *C. truncata*
- 5'. First sterile lemma not truncate
- 6. First sterile lemma >1 mm long, bilobed for ¼–½ its length; panicle with 3–9
branches, all branches typically from one whorl, rarely plants are seen with
a single branch arising below the main whorl
- 7. Fertile lemma hairy along the entire length of its margins; first sterile
lemma bilobed for up to ½ its length; two sterile florets present [rare
sterile hybrid] *C. barbata* × *divaricata*
- 7'. Fertile lemma glabrous on margins or with some hairs apically; first
sterile lemma bilobed for ⅓ to ½ its length; only one sterile floret
present *C. divaricata*
- 6'. First sterile lemma minute, <0.7 mm, scarcely bilobed; panicle with 3–15
branches, branches from 1–4 whorls

- 8. Panicle branches 3–12, divergent, from 1 or 2 whorls; fertile lemma 2–2.5 mm long, lacking tuft of hairs..... *C. pycnothrix*
- 8'. Panicle branches 5–15, ascending, from 2–4 whorls; fertile lemma 2.5–3.3 mm long, often with a tuft of hairs at its apex *C. radiata*

Key to *Cynodon* in Hawai'i.

This key is provisional and is bound to fail with certain plants despite being largely based on the key in Barkworth et al. (2003). The genus *Cynodon* is in need of a modern revision and some Hawaiian populations seem to introgress, especially those with affinities to *C. nlemfuënsis*. It is very likely that a *C. dactylon* × *C. nlemfuënsis* hybrid occurs here in addition to the *C. aethiopicus* × *C. nlemfuënsis* hybrid which certainly occurs here.

- 1. Plants 5–40 cm tall; inflorescence with 3–6 branches always in a single whorl ... *C. dactylon*
- 1'. Plants 20–100 cm tall; inflorescence with 5–20 branches, in one or more whorls
 - 2. Inflorescences often with > 1 whorl; lemma keel glabrous or minutely hairy; plants stiff and woody, inflorescence usually red to purple *C. aethiopicus*
 - 2'. Inflorescence typically with 1 whorl, sometimes with 2 in hybrid populations; lemma keel densely hairy; plants softer
 - 3. Plants with consistently one whorled inflorescence, found in coastal through montane sites *C. nlemfuënsis*
 - 3'. Plants with at least some inflorescences with multiple whorls (examine large sample, at least 40 flowers), not currently known from coastal sites *C. aethiopicus* × *C. nlemfuënsis*

Dichanthium

see *Bothriochloa*, *Capillipedium*, and *Dichanthium* (combined key)

Digitaria

The inflorescence of *Digitaria* consists of a panicle of 2 to many branches arranged digitately or paniculately. The flowers are needed to identify these with certainty, but with practice, the majority can be differentiated based on largely vegetative characters and inflorescence structure. If an identification of a *Digitaria* needs to be made with certainty, a pressed specimen should be made, as identification using only a hand lens in the field is not possible for all species. Florets of all species naturalized in Hawai'i are photographed in Figures 2–5 for reference.

- 1. Spikelets ternately arranged (in groups of 3) at least in lower part of panicle branches; rachis with 2 wings; spikelets <2.5 mm long
 - 2. Fertile lemma whitish, straw, or light tan; plants decumbent with stolons; inflorescence branches typically 2–3, rarely up to 5
 - 3. Spikelets 1.7–2.5 mm long; sheaths conspicuously pubescent; spikelets hairy (look at mature spikelets) *D. mollicoma*
 - 3'. Spikelets 1.2–1.6 mm long; sheaths largely glabrous; spikelets entirely glabrous or hairy
 - 4. Florets entirely glabrous *D. fuscescens*
 - 4'. Florets with hairs *D. longiflora*
 - 2'. Fertile lemma dark brown to violet, occasionally lighter colored when immature; plants upright, caespitose; inflorescence branches 2–9

- 5. Apex of pedicel without any hairs; florets with pilose hairs or appearing nearly glabrous *D. violascens*
- 5'. Apex of pedicel with a corona of hairs surpassing tip of pedicel; sterile lemma with conspicuous clavate hairs (use >20× to view hairs)
..... *D. stricta* var. *stricta*
- 1'. Spikelets paired; rachis usually 3-winged or triangular and lacking wings; spikelets typically >2 mm long (<2 mm in *D. orbata* & *D. velutina*)
- 6. Perennials; caespitose, culms upright, without rhizomes or stolons, rarely rooting at nodes
- 7. Spikelets long-hairy with brown and white hairs clearly visible to naked eye
..... *D. insularis*
- 7'. Spikelets glabrous to pubescent, lacking brown hairs
- 8. Lower glume absent; spikelets <2 mm long *D. orbata*
- 8'. Lower glume present; spikelets >3 mm long
- 9. Panicle branches barren on lower ¼–⅓ of their length; spikelets remotely spaced above and typically not overlapping *D. divaricatissima*
- 9'. Panicle branches with spikelets uniformly distributed from base to apex; spikelets typically close and overlapping *D. eriantha* (in part)
- 6'. Perennials or annuals; culms decumbent, with rhizomes, stolons, or rooting at nodes
- 10. Panicle branches triangular, lacking wings of green tissue on edges (Figure 5d–e)
- 11. Spikelets entirely glabrous, with distinct lower glume
- 12. Lower glume without a hyaline margin; upper glume 3 (rarely 5)-nerved; leaves 5–12 mm wide, hairy; panicle branches generally held horizontally or weakly ascending *D. abyssinica*
- 12'. Lower glume with a hyaline margin; upper glume 5 (rarely 7)-nerved; leaves 2–6 mm wide, glabrous or sparsely hairy; panicle branches strongly ascending *D. scalarum*
- 11'. Spikelets with white hairs, with or without lower glume
- 13. Inflorescence branches 2–4; leaves 1–6 mm wide, often bluish; densely stoloniferous and/or rhizomatous, forming a tightly matted turf
..... *D. didactyla*
- 13'. Inflorescence branches >4; leaves 2–17 mm wide; stoloniferous or not, not forming a tight turf
- 14. Annual; sometimes rooting at nodes but not stoloniferous; lower inflorescence branches usually compound at their base
..... *D. velutina* (in part)
- 14'. Perennial; strongly stoloniferous; inflorescence branches always simple *D. eriostachya*
- 10'. Panicle branches triangular, with wings of green tissue coming from the three edges
- 15. Sessile and pedicellate spikelets dimorphic (check middle to apex of panicle branches), sessile spikelet with nerves equally spaced, and pedicellate spikelet with nerves close to margins; pedicellate spikelets often with dense, spreading hairs when mature, these hairs not present on immature material (Figure 3a–b) *D. bicornis*
- 15'. Not as above (florets of *D. ciliaris* occasionally dimorphic in pubescence but not venation) **[over left]**

16. Panicle branches held strongly ascending and parallel from inflorescence axis, diverging from axis by 20° at most
 17. Upper glume up to $\frac{1}{3}$ as long as floret; lower glume always absent *D. setigera* (in part)
 - 17'. Upper glume $>\frac{1}{2}$ as long as floret; lower glume present or absent
 18. Sheaths & leaf blades glabrous; spikelets 2.1–2.7 mm long *D. henryi*
 - 18'. Sheaths & leaf blades hairy; spikelets 1.5–2 mm long *D. velutina* (in part)
- 16'. Panicle branches strongly divergent from inflorescence axis, diverging by at least 30°
 19. Veins of sterile lemma unequally spaced with a large area between midvein and adjacent vein compared to spacing between marginal veins (e.g. Figure 3e)
 20. Lower glume absent; upper glume up to $\frac{1}{3}$ as long as spikelet *D. setigera* (in part)
 - 20'. Lower glume present or absent; upper glume $>\frac{1}{2}$ as long as spikelet
 21. Panicle branches scabrous on margins; lower glume always present; delicate or coarse grasses with culms 1–2 mm diam. at base *D. ciliaris*
 - 21'. Panicle branches smooth on margins; lower glume absent or present; delicate grasses with culms ~1 mm diam. at base *D. radicata*
 - 19'. Veins of sterile lemma equally spaced (e.g. Figure 4d)
 22. Spikelets 2.8–3.5 mm long; stoloniferous perennial; inflorescence branches without cilia *D. eriantha* (in part)
 - 22'. Spikelets <2.4 mm long; annual; inflorescence branches sometimes with 1–4 mm long cilia
 23. Panicle with secondary branches from base of lower panicle branches; florets <2 mm long; upper glume $>\frac{3}{4}$ as long as floret *D. velutina* (in part)
 - 23'. Panicle without secondary branches; florets 1.7–2.4 mm long; upper glume $\frac{1}{3}$ – $\frac{1}{2}$ as long as floret
 24. Upper leaf surface glabrous or with a few hairs near base; upper glume $\frac{2}{5}$ – $\frac{1}{2}$ as long as floret; lower glume usually absent on most florets *D. nuda*
 - 24'. Upper leaf surface usually hairy; upper glume $\frac{1}{3}$ – $\frac{1}{2}$ as long as floret; lower glume usually present on most florets *D. horizontalis*

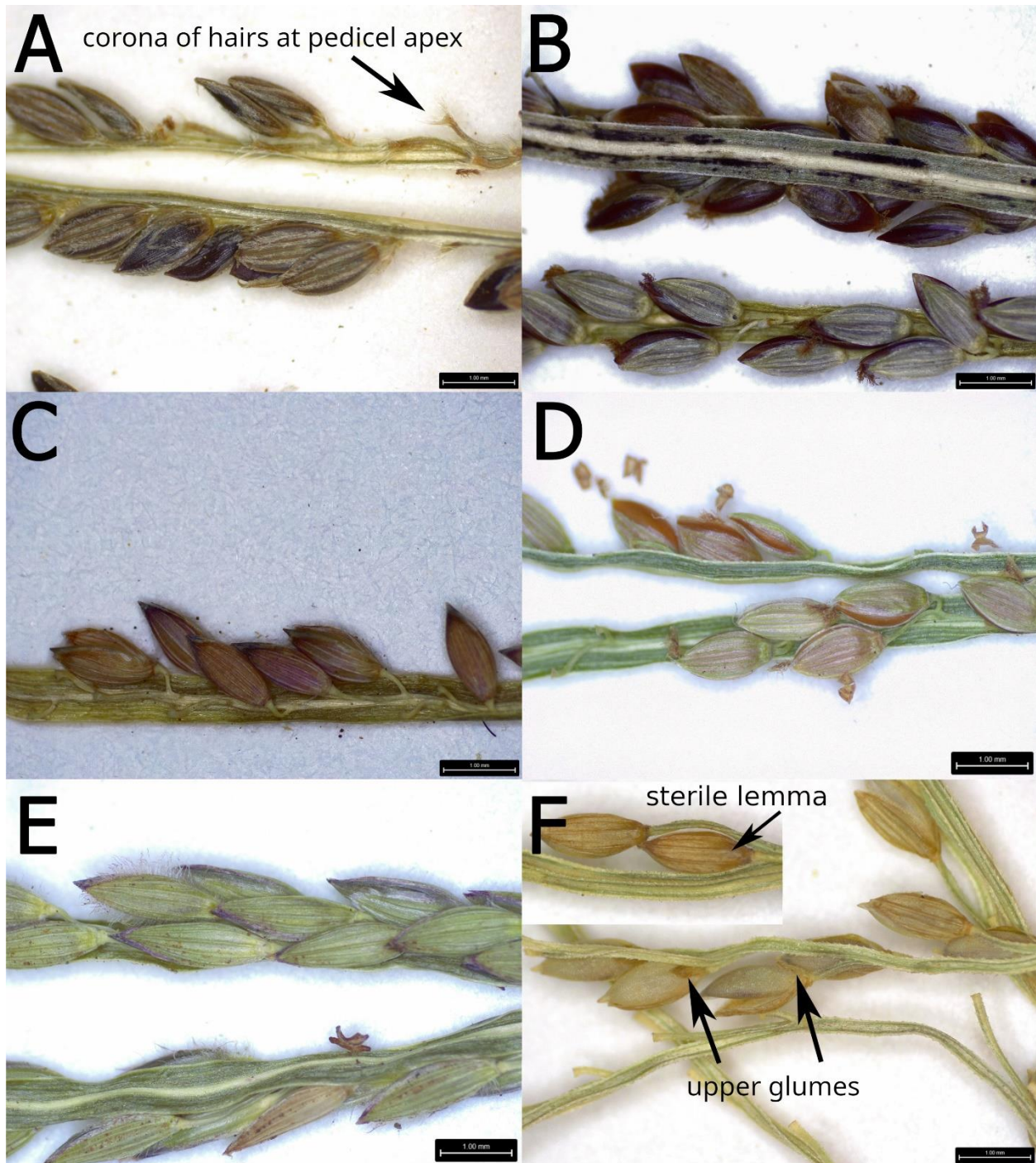


Figure 2. *Digitaria* spikelets. **A**, *D. stricta* var. *stricta* (Kawelo s.n., BISH 704712). **B**, *D. violascens* (T. Flynn 2720). **C**, *D. fuscescens* (D.R. Herbst 248). **D**, *D. longiflora* (K. Faccenda 3008). **E**, *D. mollicoma* (K. Faccenda 2591). **F**, *D. orbata* (R.W. Hobdy s.n., BISH 767427). All scale bars are 1 mm long. All photos were taken at BISH at 20 \times .

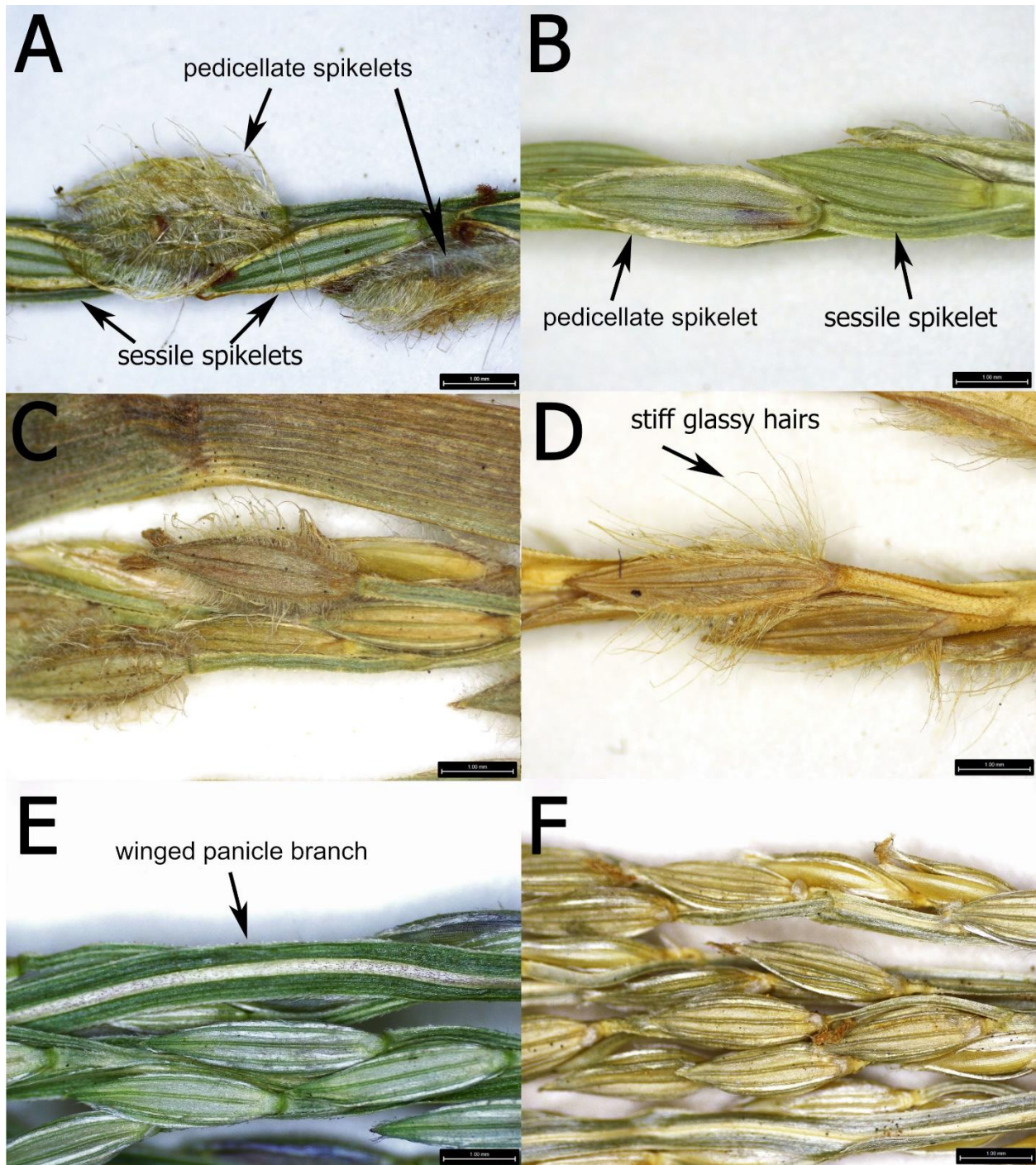


Figure 3. *Digitaria* spikelets. **A–B**, *D. bicornis*: **A**, spikelets at maturity with fimbriate hairs (Starr 020112-1); **B**, spikelets not yet mature (T. Flynn 2701). **C–E**, *D. ciliaris*: **C**, mature spikelets resembling *D. bicornis* (Starr 05334-18); **D**, form with glassy hairs on the florets, which is only found in the NW islands (Cornelison s.n., BISH 118638); **E**, most often encountered form (A. Ainsworth WNR005). **F**, *D. henryi* (Stone 1241). All scale bars are 1 mm long. All photos were taken at BISH at 20×.

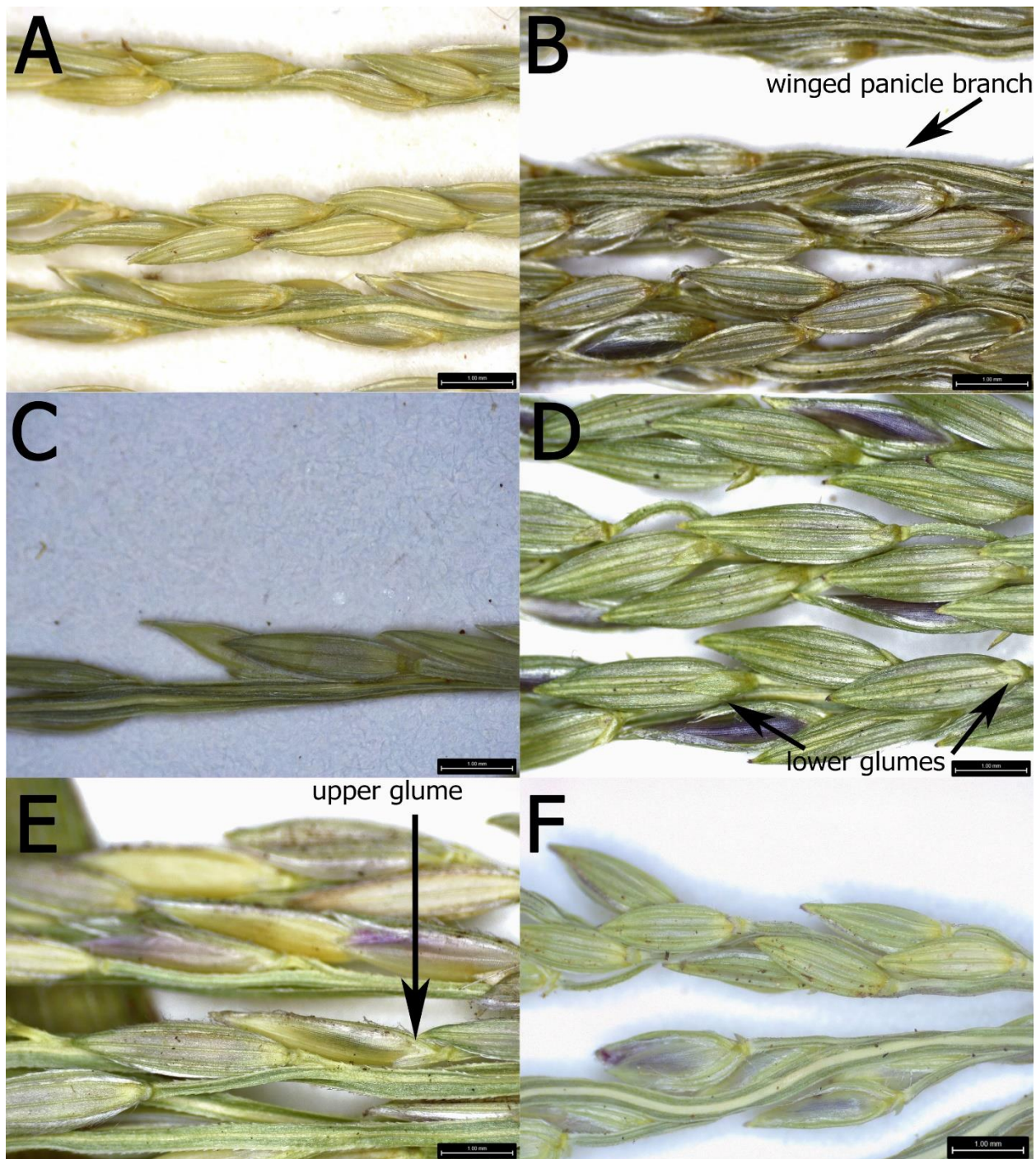


Figure 4. *Digitaria* spikelets. **A**, *D. horizontalis* (D.R. Herbst 696). **B**, *D. nuda* (D.R. Herbst 4027). **C**, *D. radicata* (T. Flynn 625). **D**, *D. eriantha* (T. Flynn 6134). **E**, *D. setigera* (K.M. Nagata 3854). **F**, *D. didactyla* (Faccenda 2590). All scale bars are 1 mm long. All photos were taken at BISH at 20 \times .

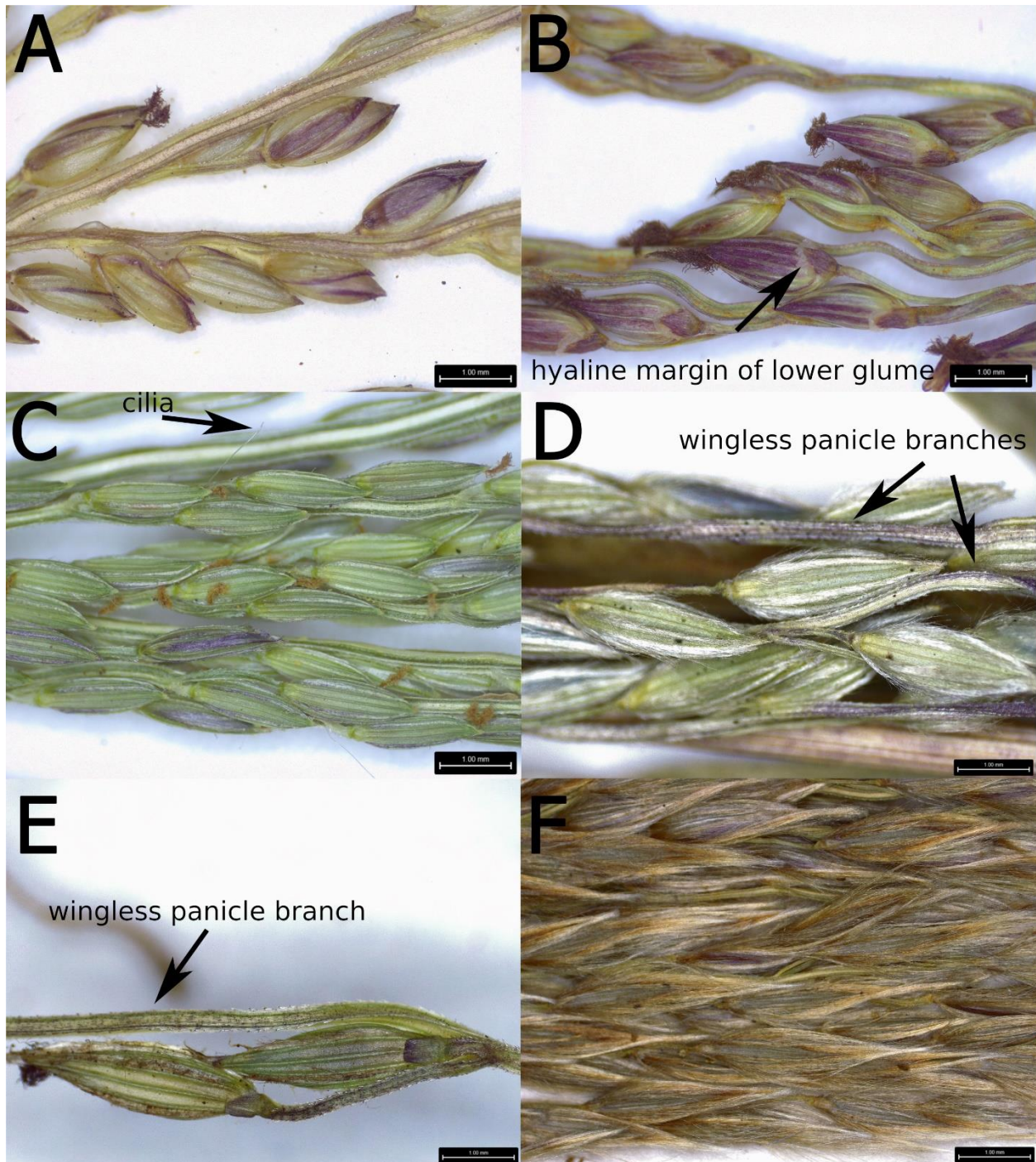


Figure 5. **A**, *Digitaria abyssinica* (R.W. Hobdy 434). **B**, *D. scalarum* (W.C. Fleming 764509). **C**, *D. velutina* (K. Faccenda 2799). **D**, *D. eriostachya* (K.F. Bio 03-0016-01). **E**, *D. divaricatissima* (C. Imada 2002-39). **F**, *D. insularis* (F.R. Fosberg 29542). All scale bars are 1 mm long. All photos were taken at BISH at 20x.

Eragrostis

The following key is presented for *Eragrostis* in Hawai'i and is based on modifications from the keys presented in Clayton & Snow (2010), as well as O'Connor (1990). For native species, the islands they are currently known from are indicated; distributions are not presented for introduced species, as they are likely present on more islands than have been reported as of the writing of this key. *Eragrostis* has been described as "a large and cumbersome genus that can present insurmountable difficulties" (Cope 1999). In Hawai'i, identification of *Eragrostis* is,

by far, the most difficult of all the genera of grasses. Identification is particularly challenging due to the diversity of species and often subtle differences between them. Identification of this genus is greatly aided by having mature material with well-developed seeds/caryopses (referred to as grains in this key) and also having spikelets that have begun to break up. Annual and perennial grasses can often be distinguished by their bases: perennial species typically retain dead leaves at their bases and are often branched below the soil line.

As mentioned by Snow & Lau (2010), the endemic Hawaiian *Eragrostis* species are in need of revision, and many specimens examined during the production of this key are intermediate between two species as they currently are defined. They may not key out easily in this key, as was also the case for the previous keys by O'Connor (1990) and Clayton & Snow (2010), due to somewhat fuzzy species concepts.

1. Lower glume longer than first lemma on at least some spikelets
 2. Inflorescence very narrowly contracted and spike-like, typically <1 cm wide
 3. Plants often with hard rhizomes, but also often without; leaves primarily cauline; panicles primarily >15 cm long; flowering stems typically >50 cm tall; inflorescence axis scabrous or smooth (Lānaʻi, Maui, Hawaiʻi) *E. leptophylla*
 - 3'. Plants never with hard rhizomes; leaves primarily basal; panicles 5–15 cm long; flowering stems typically <30 cm tall; inflorescence axis smooth (Molokaʻi, Lānaʻi, Maui, Hawaiʻi) *E. monticola*
 - 2'. Inflorescence wider, often still contracted, but at least a slightly open panicle, typically >2 cm wide
 4. Pedicels of spikelets often >1 cm long [only known from one collection as a contaminant at an agricultural experiment station on Oʻahu; likely extirpated] *E. trichodes*
 - 4'. Pedicels of spikelets <1 cm long
 5. Leaves >4 mm wide, flat; spikelets with 8–15 florets; lemma apex often obtuse (Oʻahu, Molokaʻi, Lānaʻi, Maui, Hawaiʻi) *E. atropioides*
 - 5'. Leaves <4 mm wide, folded or flat; spikelets with 4–7 florets; lemma apex often acute (Oʻahu, Molokaʻi, Lānaʻi, Maui, Hawaiʻi) *E. deflexa*
- 1'. Lower glume shorter than or almost equaling first lemma
 6. Plants with obvious woody rhizomes when culm is removed from ground, the rhizomes mostly short-creeping and the plants still caespitose; leaves strongly scabrous on upper surface
 7. Glumes and sometimes lemmas long-ciliate (Oʻahu, slopes of Kaʻala) *E. fosbergii*
 - 7'. Glumes and lemmas without cilia
 8. Panicle typically contracted; lower panicle branches <6 cm long; spikelets clustered along branches; panicle branches typically narrowly diverging from panicle rachis and ascending upwards (all islands and well distributed in Papahānaumokuākea) *E. variabilis*
 - 8'. Panicle typically wide; lower panicle branches typically >6 cm long; panicle branches typically diverging from panicle rachis widely and often perpendicularly (all main Hawaiian islands except Niʻihau) *E. grandis*
 - 6'. Plants lacking strong rhizomes; leaves scabrous or not; plants of various heights
 9. Plants with glands on clumps, leaves, sheaths, inflorescence, and/or lemma keels (see Figure 6)

10. A single glandular band present in each inflorescence below lowest whorl of branches, no other glands present; lowest inflorescence branches whorled; leaf sheaths glabrous or hairy with papillose-based hairs; seeds grooved
..... *E. trichophora*
- 10'. Glands not as above; lower inflorescence branches various; leaf sheaths without papillose-based hairs; seeds grooved or not
 11. Palea keels long-ciliate, these cilia typically visible without dissecting florets; glands present on inflorescence branches and/or as a weak annular ring of circular glands below the culm nodes
..... *E. tenella* (= *E. amabilis*; in part)
 - 11'. Palea keels not long-ciliate; glands various
 12. Plants without annular rings of glands below culm nodes, glands scattered mainly on sheaths *E. parviflora* (in part)
 - 12'. Plants with annular rings of glands on below culm nodes
 13. Glands present on lemma keels; spikelets 2–4 mm wide; annuals; nodes typically very darkly colored *E. cilianensis*
 - 13'. Glands absent on lemma keels; spikelets typically <2 mm wide; duration various; nodes various
 14. Perennials; seeds deeply grooved; plants 30–60 cm tall
..... *E. leptostachya*
 - 14'. Annuals; seed rounded, not grooved; plants 5–20 cm tall
..... *E. barrelieri*
- 9'. Plants without glands
 15. Plants typically <20 cm tall; leaves firm, needlelike; spikelets often >15 mm long
 16. Culms <20 cm long, erect; spikelets typical straight (indigenous, Papahānaumokuākea) *E. paupera*
 - 16'. Culms >20 cm long, often trailing; spikelets often curved *E. dielsii*
 - 15'. Plant height various; leaves softer; spikelets <20 mm long (may be longer in *E. brownii*)
 17. Spikelet rachilla breaking up from the apex downward at maturity; pedicels <3 mm long
 18. Panicle branches <2 cm long, panicle contracted with all florets clustered and aggregated; spikelets 3–7 mm long *E. elongata*
 - 18'. Panicle branches 2–7 cm long, panicle more open with spikelets not closely aggregated; spikelets 4–40 mm long *E. brownii*
 - 17'. Spikelet rachilla persistent after spikelets fall; pedicels various
 19. Spikelets ≥2 mm wide; spikelets ~2× as long as wide
 20. Spikelets 2.5–9 mm wide, spikelets falling as a whole unit at maturity *E. superba*
 - 20'. Spikelets 2–4 mm wide, spikelets breaking up at maturity
..... *E. unioides*
 - 19'. Spikelet <2 mm wide, if wider, spikelets >3× as long as wide
 21. Palea keels ciliate, these cilia typically visible without dissecting florets; florets typically <3 mm long
 22. Inflorescence a contracted spikelike panicle *E. ciliaris*
 - 22'. Inflorescence an open panicle
..... *E. tenella* (= *E. amabilis* ; in part)

- 21'. Palea keels smooth or scabrous, never ciliate; florets typically >3 mm long (sometimes <3 mm long in *E. pilosa*)
23. Lower glume acuminate, 2 mm long, almost as long as lowest lemma (known from low elevations on Maui and Lānaʻi, last collected in 1838, presumed extinct) *E. mauiensis*
- 23'. Not as above **[over left]**
24. Plant perennial; grain dorsally **or strongly** laterally compressed; grain strongly to weakly grooved or without groove
25. Panicles without substantial secondary branches (inflorescence appearing to be of racemes); spikelets with pedicel <1 mm long (easily confused with *Eragrostis*) *Diplachne fusca* ssp. *uninervia*
- 25'. Panicles with secondary branches; pedicels typical >1 mm long
26. Axils of inflorescence branches pilose; grain strongly laterally compressed and grooved; lower glume 0.5–1 mm long; basal leaf sheaths glabrous at the soil line; plants typically from compressed soil such as roads, trails, and lawns *E. tenuifolia*
- 26'. Axils of inflorescence branches glabrous; grain dorsally compressed and grooved; lower glume 1–1.8 mm long; basal leaf sheaths pubescent at the base of the plant near the soil line (this character is unreliable for young plants); plants not typically from compressed soil *E. curvula*
- 24'. Plant annual or short-lived perennial; grain weakly laterally compressed; grain without a groove (sometimes younger seeds may contract unevenly when drying and seem to have a groove, be careful when using immature seeds from dried material)
27. Lemmas 1.6–3 mm long, acuminate; grains brown to white; grains falling before lemmas and glumes, lemmas eventually falling after *E. tef*
- 27'. Lemmas 1–2.2 mm long, acute; grains brown; glumes shortly deciduous, falling before lemmas, lemmas falling before seed
28. Lemma with very obscure lateral veins; primary panicle branches without hairs in axils *E. parviflora* (in part)
- 28'. Lemmas with clearly visible lateral veins; primary panicle branches with or without hairs in axils
29. Lower glume >½ the length of the lowest lemma; lower glume 0.5–1.5 mm long; lower panicle branches typically single or paired; palea persistent after lemmas fall *E. pectinacea* var. *pectinacea*
- 29'. Lower glume <½ the length of the lowest lemma; lower glume 0.3–0.6 mm long; lower panicle branches typically whorled; palea shortly deciduous after lemmas fall
30. Collars all pilose; axils almost all inflorescence branches pilose with multiple hairs, pedicels >3 mm long *E. pilosa* var. *pilosa*
- 30'. Collar of the uppermost leaf sheath on each culm glabrous; axils of inflorescence branches typically glabrous or with 1–2 hairs; pedicels <3 mm long *E. multicaulis*



Figure 6. Glands on *Eragrostis*. **A**, *Eragrostis barrelieri* (H. Oppenheimer H40701) glands on inflorescence (not all glands are indicated with arrows). **B–C**, *Eragrostis leptostachya* (C. Imada 2002-24), **B**, Glands on inflorescence; **C**, Glandular band below culm nodes. **D–E**, *Eragrostis cilianensis* (Anon s.n., BISH 59338), **D**, Glands on lemma keels (all glands on the right side are indicated with arrows); **E**, Glands in the collar region on sheath and leaf margins, not all glands are indicated with arrows. **F–G**, *Eragrostis parviflora* (G.C. Munro 446), **F**, Glands on leaf sheath (not all indicated with arrows); **G**, Glands on lead midvein on abaxial surface (all glands indicated with arrows). All material photographed from BISH, all scale bars 1 mm long.

***Eragrostis* (alternate key)**

This keys Hawaiian *Eragrostis* to groups of similar species using less technical characteristics than the key above.

1. Plants typically <20 cm tall; leaves stiff, needlelike; spikelets often >15 mm long
 - E. dielsii*
 - E. paupera*
- 1'. Not as above
 2. Spikelets >2 mm wide
 - E. cilianensis*
 - E. superba*
 - E. unioloides*
 - 2'. Spikelets <2 mm wide
 3. Panicle contracted and spike-like at maturity, <1.5 cm wide
 - E. ciliaris*
 - E. elongata* (in part)
 - E. leptophylla*
 - E. monticola*
 - 3'. Panicle wider than 1.5 cm at maturity
 4. Mature culms with silky white hairs at the soil line (these typical absent on immature material)
 - E. curvula* (in part)
 - 4'. Bases of mature culms without silky hairs
 5. Plants clump-forming perennials, with distinct woody rhizomes [natives]
 6. Inflorescence 2–6 cm wide
 - E. atropioides*
 - E. fosbergii*
 - E. variabilis*
 - 6'. Inflorescence >6 cm wide
 - E. grandis*
 - 5'. Plants without woody rhizomes
 7. Sheaths with papillose-based hispid hairs
 - E. trichophora*
 - 7'. Sheaths without papillose-based hairs
 8. Plants without hairs from axils of any primary panicle branches
 9. Spikelet pedicels mostly <3 mm
 - E. brownii*
 - E. curvula* (in part)
 - E. elongata* (in part)
 - E. multicaulis*
 - E. trichodes*
 - 9'. Spikelet pedicels mostly >3 mm
 - E. barrelieri*
 - E. mauiensis* [extinct]
 - E. parviflora*
 - E. tef* (in part)
 - 8'. Plants with hairs from axils of at least some primary panicle branches
 10. Annuals
 - E. tenella* (= *E. amabilis*)
 - E. pectinacea* var. *pectinacea*

- E. pilosa* var. *pilosa*
- E. tef* (in part)
- 10'. Perennials
 - E. deflexa*
 - E. leptostachya* (hairs in axils more subtle than most species)
 - E. tenuifolia*

Eriochloa

Florets of all species are photographed (Figure 7)

- 1. Perennial, (but sometimes flowering first year); florets 4.2–5.7 mm long *E. punctata*
- 1'. Annual or short lived perennial, florets 2.7–5 mm long
 - 2. Florets 2.7–3.6 mm long (sometimes with an acuminate tip reaching to 4.6 mm); axis of inflorescence usually glabrous; leaves usually < 4 mm wide *E. procera*
 - 2'. Florets 3.8–5 mm long; axis of inflorescence usually pubescent; leaves usually > 5 mm wide *E. acuminata* var. *acuminata*



Figure 7. Spikelets of *Eriochloa* from Hawai'i. **A**, *E. procera* acute floret form, (H. Oppenheimer H71019). **B**, *E. procera* acuminate form (P. O'Connor s.n BISH 510049). **C**, *E. acuminata* var. *acuminata* (H. Oppenheimer H59002). **D**, *E. punctata* (R. Lyman s.n. BISH 447489). All photographs taken at BISH under 20x magnification.

Ischaemum

- 1. Inflorescences with >2 racemes *I. polystachyum*
- 1'. Inflorescences with exactly 2 racemes
 - 2. Inflorescences very hairy; at least some awns >1.5 cm long [native] *I. byrone*
 - 2'. Inflorescences shortly hairy only on edges of pedicels; awns <1 cm long or absent
 - 3. Leaves glabrous; spikelets with minute awns that barely exceed the florets; florets 5–6 mm long *I. aristatum*
 - 3'. Leaves tuberculate-villous; spikelets with obvious awns 0.5–1.5 cm long; florets 3–4 mm long on Hawaiian material *I. ciliare*

Leptochloa sensu lato

- 1. Lemma apex acute
 - 2. Panicle branches (including spikelets) 0.5–1 mm wide; panicle elongate; leaf sheaths papillose hispid; annual *Leptochloa panicea* subsp. *brachiata*
 - 2'. Panicle branches (including spikelets) 2–4 mm wide; panicles slightly elongate to digitate; leaf sheaths glabrous; perennial *Leptochloa virgata*
- 1. Lemma apex obtuse to blunt, emarginate, or blunt mucronate
 - 3. Ligule 1–2 mm long, ciliate *Disakisperma dubia*
 - 3'. Ligule 2–8 mm long, membranous and shredding to fibers at maturity
..... *Diplachne fusca* subsp. *uninervia*

Melinis

- 1. Florets glabrous; pedicels glabrous *M. minutiflora*
- 1'. Florets hairy; pedicels hairy, at least at their apex
 - 2. Basal leaves bristlelike, inrolled, 2–3 mm wide [questionably naturalized as of 2022]
..... *M. nerviglumis*
 - 2'. Basal leaves flattened, >4 mm wide
 - 3. Lower floret sterile, its palea reduced or developed; sterile lemma with an awn from 2–7 mm long *M. scabrida*
 - 3'. Lower floret male or sterile, its palea clearly developed; sterile lemma typically with awn <3 mm, rarely longer *M. repens*

Paspalum

The inflorescence of *Paspalum* is a panicle composed of one to many spikelike branches, simply referred to as branches in this key. *Paspalum* is closely related to, and similar to, *Axonopus*, which is also included in this key.

- 1. Inflorescences both terminal and axillary on same culm (sometimes manifesting as 2 inflorescences that appear to arise terminally since they arise out of the same leaf sheath, but are not united at the base); each panicle composed of 1–2 (rarely 3–6) branches
- 2. Lower glumes present and dimorphic between paired spikelets
 - 3. Panicle branch single; rachis of panicle branch usually with scattered setae; spikelets 2.6–3.2 mm long; spikelets glabrous; lower glume of lower spikelet the larger of the pair *P. pilosum*

- 3'. Panicle with 1–2 (rarely 3–4) branches; rachis of panicle branch without setae; spikelets 2.2–2.6 mm long; spikelets minutely pubescent, at least on upper glume; lower glume of upper spikelet the larger of the pair *P. langei* (in part)
- 2'. Lower glumes absent on all spikelets
 - 4. Plant caespitose or rhizomatous; spikelets round, blunt at apex [only known from Midway as of 2023] *P. setaceum*
 - 4'. Plant stoloniferous; spikelets ovate to lanceolate, acute at apex *Axonopus* spp.
- 1'. Inflorescence terminal, never axillary; each panicle composed of 2–70 branches
 - 5. Plants stoloniferous
 - 6. Panicle branches alternately arranged; panicle with ≥ 3 branches
 - 7. Florets with obtuse apex; plant erect or decumbent and rooting at nodes ...
..... *P. mandiocanum* var. *mandiocanum* (in part)
 - 7'. Florets acute; plant strongly stoloniferous *P. jesuiticum*
 - 6'. Panicle branches paired (or approximately so) at apex of inflorescence; panicle with 2 branches on most individuals (uncommonly with a 3rd lower branch)
 - 8. Spikelets 1–2 mm long; upper glume pilose around edges *P. conjugatum*
 - 8'. Spikelets >2 mm long; upper glume without hairs concentrated on edges
 - 9. Stolons 3–8 mm diam. with internodes <1 cm; leaves concentrated at tip of stolon; spikelets elliptic to ovate, obtuse at apex; not found in saline situations and not growing aquatically
 - 10. Florets >2.5 mm long; leaves flat or folded *P. notatum*
 - 10'. Florets <2.3 mm long; leaves flat *P. minus*
 - 9'. Stolons 1–3 mm diam. with internodes typically >1 cm; leaves evenly distributed along stolon; spikelets elliptic-lanceolate, acute at apex; often (but not always) found in saline situations or growing as an emergent aquatic
 - 11. Spikelets 2.4–3.2 mm long; upper glume obscurely hairy
..... *P. distichum*
 - 11'. Spikelets 3–4.5 mm long; upper glume glabrous *P. vaginatum*
 - 5'. Plants caespitose, rarely rooting at lower nodes
 - 12. Panicle with 1–10 branches
 - 13. Upper glume fringed with hairs or a lacerate wing
 - 14. Upper glume fringed with a lacerate, papery wing *P. fimbriatum*
 - 14'.. Upper glume fringed with hairs
 - 15. Upper glume fringed with stiff, spreading hairs; spikelets 2.5–2.8 mm long *P. humboldtianum*
 - 15'. Upper glume fringed with soft hairs; spikelets 1.8–4.5 mm long
 - 16. Hairs on florets minute, usually not visible without magnification ...
..... *P. virgatum* (in part)
 - 16'. Hairs on florets long and wispy (at least some 1 mm long), visible without magnification
 - 17. Panicle branches <7, held widely spreading from panicle axis; florets 2.5–4.5 mm long *P. dilatatum*
 - 17'. Panicle branches >7, ascending, loosely appressed to panicle axis; florets <2.8 mm long *P. urvillei* (in part)
 - 13'. Upper glume without fringe of hairs or lacerate wing around its edge
 - 18. Spikelets borne singly, rarely with some spikelets paired, if so, these are the minority of florets in an inflorescence [native?] *P. scrobiculatum*

- 18'. Spikelets borne in pairs, all florets consistently paired, although the lower of the pair may be aborted in some parts of the inflorescence
 - 19. Florets with lower glumes present, these glumes dimorphic between the spikelets of the pair *P. langei* (in part)
 - 19'. Florets with lower glumes absent
 - 20. Leaves linear, their width uniform or tapering from base; fertile lemma dark glossy brown; leaves <9 mm wide *P. plicatulum* (in part)
 - 20'. Leaves lanceolate, their width greatest above the base; fertile lemma pale; at least some leaves >10 mm wide
 - 21. Leaf margins scabrous or smooth, without cilia; spikelets glabrous or with limited hairs on edge of glume; leaves appressed pilose ... *P. mandiocanum* var. *mandiocanum* (in part)
 - 21'. Leaf margin ciliate; spikelets evenly pubescent on glume; leaves glabrous or pubescent *P. macrophyllum*
- 12'. Panicle with >10 branches (occasionally with <10 branches if mowed or grazed)
 - 22. Spikelets ~1 mm thick, with a noticeable bulge in central portion; spikelets of dried material often bicolored with a brown center portion and green rims *P. plicatulum* (in part)
 - 22'. Spikelets ~0.5 mm thick, relatively uniform in thickness, or hemispherical in *P. paniculatum*; color uniform when dried
 - 23. Spikelets entirely glabrous
 - 24. Sterile lemma ribbed over veins; both glumes lacking; weaker grasses with culms typically <6 mm diam. at base *P. malacophyllum*
 - 24'. Sterile lemma smooth; upper glume present; robust grasses with culms ~1 cm diam. at base *P. arundinaceum*
 - 23'. Spikelets with at least some hairs visible under 10× magnification
 - 25. Spikelets evenly pubescent; spikelets 1–1.3 mm long ... *P. paniculatum*
 - 25'. Spikelets with hairs concentrated on glume edge; spikelets 2–3 mm long
 - 26. Glume with a long-ciliate fringe around their edge, this obvious without magnification *P. urvillei* (in part)
 - 26'. Glume with a short-ciliate fringe around the edge, the hairs only visible under magnification *P. virgatum* (in part)

Saccharum

- 1. Inflorescence axis glabrous (pilose in some hybrid cultivars); cultivated and not currently known to naturalize *S. officinarum*
- 1'. Inflorescence axis densely pilose; naturalized
 - 2. Plant rhizomatous; leaf blades 0.2–0.8 cm wide *S. spontaneum*
 - 2'. Plant clump-forming; leaf blades 1–6 cm wide *S. xsinense*

Schizachyrium

see combined key to *Andropogon* / *Schizachyrium*

Setaria

1. Only one (or sometimes zero) bristle(s) subtending each spikelet
 2. Leaves strongly plicate (resembling a palm seedling), >15 mm wide *S. palmifolia*
 - 2'. Leaves flat, <10 mm wide
 3. Bristles inconspicuous; inflorescence of racemes *S. distans*
 - 3'. Bristles conspicuous; inflorescence spikelike [this is currently treated as an endemic genus but is likely instead a member of *Setaria*] *Dissochondrus biflorus*
- 1'. Multiple bristles subtending each spikelet
 4. Bristles retrorsely barbed, sticky to touch *S. adhaerens*
 - 4'. Bristles antrorsely barbed, not sticky to touch
 5. Spikelets fascicled, fascicle subtended by >30 bristles [potentially confused with *Setaria*] *Cenchrus americanus*
 - 5'. Spikelets not fascicled (but may have fused pedicles), subtended by <12 bristles
 6. Fertile lemma smooth or minutely rugose; annual; bristles green
 7. Fertile lemma smooth and shiny; inflorescence with secondary branches
..... *S. italica*
 - 7'. Fertile lemma dull, finely rugose; inflorescence without secondary branches [questionably naturalized as of 2023] *S. viridis*
 - 6'. Fertile lemma conspicuously rugose; perennial; bristles yellow, orange, green, or purple
 8. Inflorescence >10 cm; bristles typically yellow, orange, or purple; rhizomes stout *S. sphacelata*
 - 8'. Inflorescence <10 cm; bristles typically yellow to green; rhizomes knotty ...
..... *S. parviflora*

Key to *Sporobolus* in Hawai'i

Morphological identification of plants in the *S. indicus* complex (*S. africanus*, *S. diandrus*, *S. elongatus*, *S. fertilis*, and *S. indicus*) is notoriously difficult and in the authors opinion, mostly impossible in the field. If species level ID is required, a microscope is usually required to examine the seeds. The seed characters listed in this key are for the seed after it has been freed from the pericarp (the wrinkly, greenish or yellowish coating around the seed). If there are no seeds which were naturally freed from their pericarp on the specimen, a fruit can be dissected from its lemma and soaked in water for 5 minutes and be gently separated from the pericarp with a needle. Note that fresh material must be dried before the soaking technique works to remove the pericarp. Identification characteristics for these species have been largely adapted from the excellent *Sporobolus* treatment by Simon & Jacobs (1999) with minor influence from the treatments by Clayton (1965), Baaijens & Veldkamp (1991), and Barkworth et al. (2003).

1. Annual, rarely surpassing 30 cm tall
 2. Lower inflorescence branches not whorled; often associated with horticulture or moist disturbed areas *S. tenuissimus*
 - 2'. Lower inflorescence branches whorled; often associated with dry saline or calcareous conditions
 3. Leaves often with papillose based hairs and conspicuously spiny margins; lemmas minutely scabrous; panicle usually open even when immature; panicle with secondary branches usually divergent from the main axis *S. coromandelianus*

- 3'. Leaves without papillose based hairs, margins scabrous; lemmas smooth; panicle spike-like when immature; panicle with secondary branches appressed*S. pyramidatus* (in part)
- 1'. Perennial, 20–150 cm tall
 - 4. Upper glume > $\frac{2}{3}$ as long as floret; only found in coastal areas or below 50 m elevation
 - 5. Rhizomatous; blades distichous [native] *S. virginicus*
 - 5'. Not rhizomatous; blades not conspicuously distichous
 - 6. Lower inflorescence node whorled *S. pyramidatus* (in part)
 - 6'. Lower inflorescence node not whorled *S. domingensis*
 - 4'. Upper glume < $\frac{2}{3}$ as long as floret; uncommonly found in coastal areas, if in coastal area, in areas with low soil salinity (*S. indicus* species complex)
 - 7. Panicle raceme-like, secondary branches strongly divergent from the main axis at a > 45° angle
 - 8. Secondary inflorescence branches lacking florets on the lower $\frac{1}{6}$ to $\frac{1}{4}$, these branches 1–4 (rarely up to 10) cm long; spikelets 1.2–1.6 mm long..... *S. diandrus*
 - 8'. Secondary inflorescence branches with florets to the base, these branches < 2 cm long; spikelets 1.6–2 mm long *S. fertilis* (in part)
 - 7'. Panicle spike-like, secondary branches ascending and loosely to tightly contracted to the main axis, if divergent from the main axis at < 30° angle
 - 9. Spikelets 2–2.5 mm long; spike densely contracted; spike 6–20 cm long; inflorescence usually gray *S. africanus*
 - 9'. Spikelets < 2 mm long; spike densely contracted or loosely contracted; spike 13–50 cm long; inflorescence various shades of green, gray, or straw
 - 10. Seed blunt, bearing no sharp edges, generally 0.4–0.5 mm thick, minutely rugose in texture (Figure 8A); mature inflorescence straw colored; inflorescence 15–50 cm long; plants 50–150 cm tall *S. fertilis* (in part)
 - 10'. Seed with or without sharp edges, generally ≤ 0.3 mm thick; smooth or rugose in texture; mature inflorescence generally green or greenish gray (the only straw colored ones observed were old sun bleached ones); inflorescence 13–30 cm long (may be up to 35 cm in robust *S. elongatus*); plants < 100 cm tall;
 - 11. Seed with a blunt and convexly rounded apex (Figure 8C); grain of mature florets held such that it appears to be 80–90% as long as the lemmas; stamens always 3 *S. indicus*
 - 11'. Seed with a truncate apex with sharp edges, often concave distally (Figure 7D); grain of mature florets held lower, appearing closer to 60% as long as the lemmas; stamens usually 2 but can infrequently be 3 *S. elongatus*



Figure 8. Grains of selected members of the *Sporobolus indicus* complex, all three grains of each species came from the same plant. **A**, *S. fertilis*, note that the grain indicated with the arrow is sitting on its dorsal face. **B**, *S. africanus*. **C**, *S. indicus*, note that the grain indicated with the arrow is sitting on its dorsal face. **D**, *S. elongatus*.

Urochloa

The genus *Brachiaria* is now included within *Urochloa* based on molecular evidence.

1. Margins of primary panicle branch rachises tuberculate-ciliate
 2. Annual; spikelets paired *U. ramosa* (in part)
 - 2'. Perennial; spikelets solitary
 3. Raceme branches solid, crescent-shaped, 0.5–1.2 mm wide; inflorescence branches 2–16; clump-forming, without stolons; spikelets *often* appearing in 1 row on racemes [do not make identification solely based on the last character, as it is not always reliable] *U. brizantha*
 - 3'. Raceme branches flat, ribbonlike (may be curled and appearing crescent-shaped), 1–1.7 mm wide; inflorescence branches 3–10; *often* with stolons; spikelets *often* appearing in 2 rows on racemes *U. eminii* (= *U. decumbens*)
- 1'. Margins of primary panicle branch rachises scabrous to pubescent, not tuberculate

4. Perennial; robust, 90-200 cm tall; strongly stoloniferous or culms decumbent and rooting at nodes
 5. Spikelets paired; panicles often with secondary branches; panicles with spikelets often arranged in disorderly fashion; nodes villous *U. mutica*
 - 5'. Spikelets solitary; panicles never with secondary branches; spikelets neatly arranged in panicles; nodes glabrous *U. arrecta*
- 6'. Annual or perennial; smaller, typically <90 cm tall; stoloniferous, caespitose, or decumbent and rooting at nodes
 7. Primary panicle branch rachises triquetrous (3-angled), without wings
 8. Spikelets pubescent
 9. Spikelets 3–4 mm long; leaf blade 5-15 mm wide *U. mollis*
 - 9'. Spikelets 2–2.6 mm long; leaf blade 3-6 mm wide *Moorochloa eruciformis*
 - 8'. Spikelets glabrous
 10. Caespitose; spikelets 2.5–4.5 mm long *U. ramosa* (in part)
 - 10'. Stoloniferous; spikelets 1.5–2.2 mm long *U. reptans*
 7. Primary panicle branch rachises flattened or crescent-shaped, often winged
 11. Lower glume >0.7× as long as the spikelet; fertile lemma with a short mucro ~1 mm long *U. glumaris*
 - 11'. Lower glume <0.5× as long as the spikelet; fertile lemma without a mucro
 12. Caespitose; spikelets 4–5.5 mm long; panicle branches 2–11 cm long; primary axis of panicle 10–20 cm long *U. plantaginea*
 - 12'. Stoloniferous; spikelets 2.4–3.7 mm long; panicle branches 1–6 cm long; primary axis of panicle 3–10 cm long *U. distachyos* (= *U. subquadripa*; *U. distachya*)

Zoysia

This key is based entirely on the key in Anderson (2000).

1. Inflorescences with <15 spikelets; leaves <0.5 mm wide *Z. pacifica*
- 1'. Inflorescences with >15 spikelets; leaves >0.5 mm wide
 2. Pedicels >1.75 mm long; leaf blades 2–4 mm wide when flattened (not yet known to be naturalized) *Z. japonica*
 - 2'. Pedicels <1.75 mm long; leaf blades <2 mm wide when flattened *Z. matrella*

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